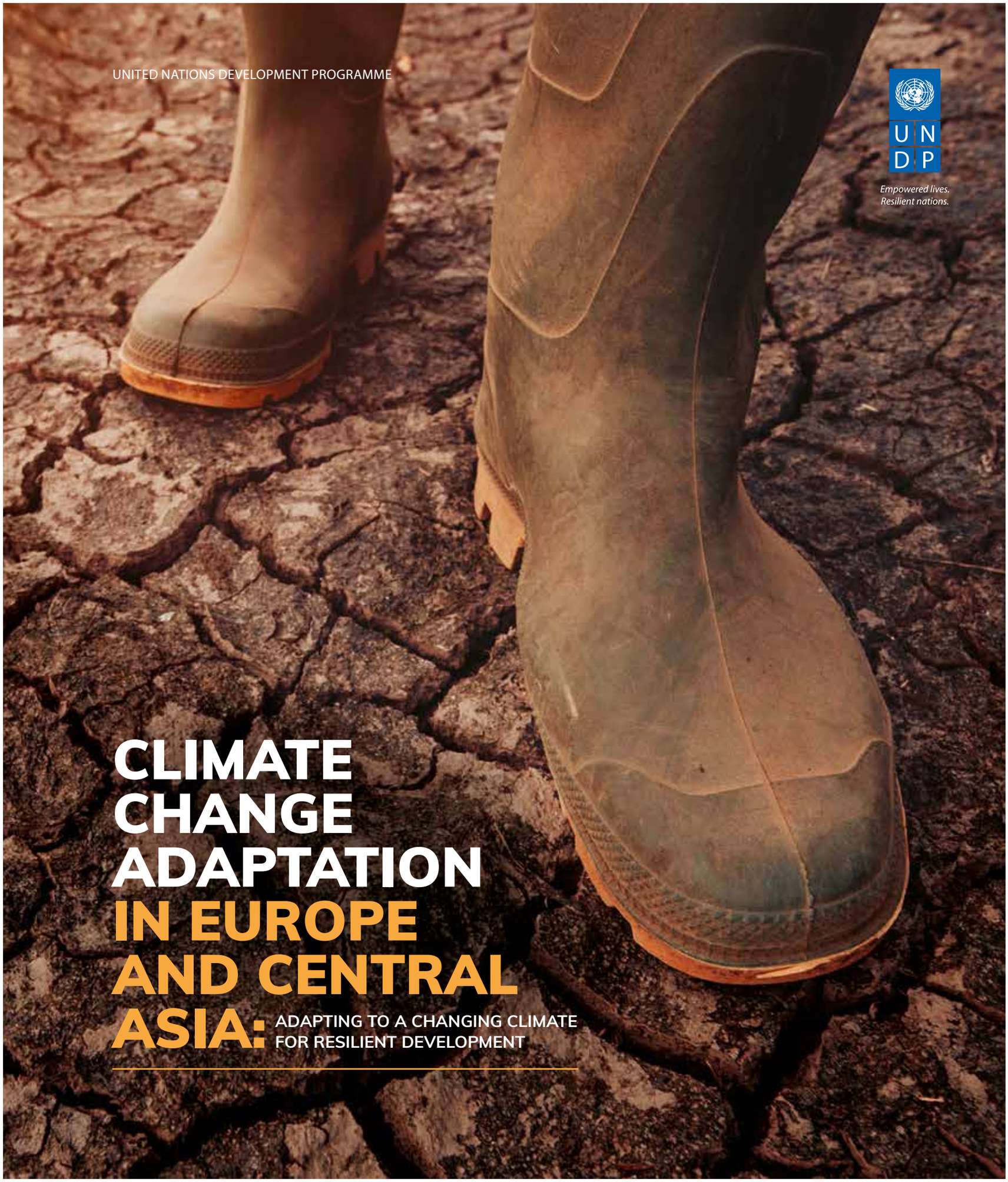

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CLIMATE CHANGE ADAPTATION IN EUROPE AND CENTRAL ASIA:

ADAPTING TO A CHANGING CLIMATE FOR RESILIENT DEVELOPMENT

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Mtskheta-Mtianeti region of north-eastern Georgia

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Iztuzu beach, Sulungur lake and Dalyan channels in Turkey

THE TIME IS NOW

FOR CLIMATE ACTION IN EUROPE AND CENTRAL ASIA

FOREWORD

Rastislav Vrbensky

Deputy Assistant Administrator
Deputy Regional Director
Regional Bureau for Europe and CIS,
UNDP

Low-carbon, climate-resilient development is going to look very different in Europe and Central Asia than it does in other parts of the world. With growing economies, strong local capacity, access to high-tech resources, and growing institutional resilience, the region has all the requisite ingredients to succeed in its goals of eradicating poverty in all its forms, accelerating the transition to sustainable development, and making sure the people of the region are able to withstand crises and shocks.

While gains in peaceful economic and social development over the past decades should not be dismissed, new risks from climate change threaten to derail these advances and challenge national efforts to reach targets outlined in the 2030 Agenda for Sustainable Development, Paris Agreement, Sendai Framework and other international accords.

The time for climate action in Europe and Central Asia is now. Climate change threats are already exerting pressure on shared natural resources and triggering devastating weather events. Not only do these events take lives and cost billions in lost productivity and destroyed infrastructure, they may also exacerbate ongoing issues related to ethnic tension, migration and violent extremism.

The objectives of UNDP's programme in the ECA region aligns with the organization's new four-year Strategic Plan. On a regional level, our plan focuses on supporting countries to establish effective systems of governance to accelerate structural transformations; promoting greener, more inclusive economies; fostering gender equality; ensuring that economic growth leaves no one behind and restores our natural capital; and charting risk-informed development pathways to build resilience and prevent shocks and crises.

Significant progress has already been achieved in supporting climate resilience in the region. For instance, comprehensive efforts to protect the peatlands in Belarus, Russia and Ukraine through an EU-funded project have created new economic opportunities for local residents, capitalizing on rich local ecosystems and biodiversity resources. This integrated approach to climate resilience could keep over 130 million tons of CO2 from entering our atmosphere over the next 20 years. More importantly, it will build climate-resilient livelihoods for thousands of people.

Countries have also significantly advanced progress in reducing risk and building effective climate information and early warning systems. In Georgia climate-induced hazards could mean up to US$10 billion in economic losses over the next 10 years. To support Georgia in reaching its goals for sustainable development and disaster risk reduction, a new project was approved in early 2018 by the Green Climate Fund that will scale up a nation-wide early warning system, providing increased protections for 1.7 million people. Support for this system was originally piloted through a project funded by the Adaptation Fund.

In the Western Balkans sub-region similar approaches to disaster risk reduction and early warning systems have been implemented. Bosnia and Herzegovina and the former Yugoslav Republic of Macedonia piloted innovative ICT tools for improved risk information access and management. Western Balkan municipalities facing an increased frequency of floods and other natural disasters have been working together to enhance urban resilience.

In Central Asia – one of the world's most vulnerable regions to the impacts of climate change – countries have received support from UNDP to enhance climate risk management and to improve resilience of farmers and rural communities. In Uzbekistan climate information and modeling were improved and a comprehensive drought early warning system was developed. Over 60,000 farmers and shepherds in Turkmenistan improved their resilience to climate-induced water scarcity by adopting efficient on-farm water and land-use technologies, while at the national level the project accelerated policy reform in the water and agriculture sectors.

This work is made possible through the close involvement and dedication of our partner country governments as well as through the support of financing mechanisms such as the Global Environment Facility, Adaptation Fund, Green Climate Fund, and other multilateral and bilateral entities.

Given significant advances over the last decade, the next step for the region is to mainstream and accelerate these climate actions, ensuring no one is left behind in our global efforts to protect our people and planet from the serious impacts of climate change.

Adriana Dinu

Executive Coordinator
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UNDP

Rastislav Vrbensky

Adriana Dinu

EXECUTIVE SUMMARY

With the requisite human, social, and political capital, the nations of the Europe and Central Asia region are ready to mainstream and accelerate climate change adaptation actions. This will build resilient nations, promote strong economies, protect lives and livelihoods from the threats of climate change, provide proactive - rather than reactive - stances to disaster risk reduction, and sup port nations in achieving the bold goals outlined in the 2030 Agenda for Sustainable Development and Paris Agreement. These climate actions will protect security in the region, contribute to global goals for a low-carbon, climate-resilient future, and enhance efforts to end poverty and foster greater social inclusion.

Ship graveyard in Muynak, Karakalpakstan

OVERVIEW

In this publication, we explore the lessons learned from over a decade of working with local and national governments, vertical and bilateral funds, and other thought leaders to build and implement climate change adaptation projects in the Europe and Central Asia region. As countries in the region look to mainstream and accelerate these approaches with support from the United Nations Development System, the United Nations Development Programme will continue its efforts to serve as a broker to connect nations and vulnerable communities with UN resources, vertical and bilateral funds, and private and blended finance mechanisms to provide the policy support, innovative ideas, financial backing, and technical know-how needed to build true resilience in the region.

THE CHALLENGE

Climate change is one of the greatest challenges that our interlinked societies face today. It exacerbates other development problems including food and water insecurity, loss of livelihoods, health problems, gender inequality, and environmental degradation and loss of biodiversity. In the ECA region, increases in annual air temperatures, changes in river runoff and precipitation patterns, glacial melting, wildfires, droughts, floods, hail, and the increasing scarcity of fresh water and other extreme weather events are exacerbating tensions over access to water and natural resources, derailing development gains, and threaten to unravel 20 years of economic and social growth.

While major steps have been taken to improve social and economic development in the region, many challenges remain: a third of the workforce remains in precarious jobs; 15 per cent of the world's migrants come from this region, triggering a rapid depletion in human capital; unemployment sits at 50 per cent among the Roma and 19 per cent among youth; 88 per cent of the energy supply comes from fossil fuels; investments in renewable energy comprise just 0.2 per cent of global commitments; and 35 per cent of people are highly excluded from main functions of the society as a whole.[1]

In the Europe and Central Asia region

88 %

of the energy supply comes from fossil fuels

Climate change threatens to extend these risks. For example, 97 per cent of agricultural land in Tajikistan is at least somewhat eroded, while Uzbekistan's water use currently exceeds its fresh water reserves.[2] Global warming has been causing an accelerated melting of Central Asia's glaciers, which play a critical role in the region's water balance. Changes in rainfall patterns lead to severe water shortages and flooding. Vulnerable rural households in the region's low and middle-income countries are particularly hard hit by a combination of climate and non-climate factors, and face significant food and energy security challenges.[3, 4]

Across the region, suboptimal policies and practices for farming, land, water and natural resource management, and energy development continue to provide obstacles to modernized, climate-resilient farming and economic development. The region inherited severe environmental problems, depleted land, and ecosystems at risk, caused by unsustainable resource management during the Soviet era and the subsequent hardships of economic transition. Throughout the region, the farmers were left without the training, tools, and know-how they need to build more effective climate-resilient practices that are optimised for the economy of the 21st century.

1 UNDP Europe and Central Asia Portal. http://www.eurasia.undp.org/content/rbec/

2 UNDP-GEF 2016 Annual Performance Report

3 UNDP in Europe and Central Asia: Regional Human Development Report 2016: Progress at Risk

4 https://www.ipcc.ch/report/ar5/syr/

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THE OPPORTUNITY

The economics of climate change adaptation show that investment in climate resilience and disaster risk reduction is good for national and local economies; good for the health, well-being, and prosperity of our people; and good for our planet. One example comes from Georgia, where according to national estimates outlined in Georgia's Nationally Determined Contribution (NDC) to the Paris Agreement, climate hazards without the proper adaptation measures could cost the people of Georgia between US$10 and $12 billion from 2021 to 2030. The estimated cost of adapting to climate change in Georgia over the same time period is estimated between US$1.5 billion and $2 billion. Coupled with the opportunity to end poverty, and food insecurity and conflict in the region, it's clear that robust, evidence-based and inclusive investments in climate change adaptation and related climate actions offer high social, economic and political value for the region.

Furthermore, this region has a significant potential to make sizable contributions to global efforts to keep temperature rises below 2 degrees Celsius by reducing the output of greenhouse gases, modernizing production on farms, building climate-smart cities and infrastructure, protecting vulnerable ecosystems, and creating the transformational shift needed to move from a production-based economy that's highly dependent on natural resources to a services-based economy that places greater value on natural resource protection and economic sustainability. Reducing the drivers of climate change (such as the high energy intensity of economies, natural resource depletion, and inefficient farming), will require investment into modern low-carbon and climate-resilient technologies. In this way, efforts to adapt to climate change are intrinsically and inextricably linked with global efforts to curb CO^2 emissions and protect our planet from the severe impacts that temperature rises above the 2-degree threshold will bring.

UNDP SUPPORT OVER THE PAST DECADE

The case studies outlined in this publication give a comprehensive overview of UNDP support for climate resilience in the region from 2005 to 2017. These country-driven projects benefitted from the financial and technical resources of a number of donors, including the Global Environment Facility (GEF), Adaptation Fund (AF), Green Climate Fund (GCF), European Union (EU), and bilateral donors.

Some highlights include an EU-funded project to protect peatlands in Belarus, Russia, and Ukraine that has delivered win-win ecosystem-based solutions for enhanced ecosystem resilience which will keep over 130 million tonnes of CO^2 from entering our atmosphere over the next two decades. In Turkmenistan, approximately 60,000 farmers and shepherds improved their resilience to climate-induced water scarcity by adopting efficient on-farm water and land-use technologies, while at the national level the project accelerated policy reform in the water and agriculture sectors. In Tajikistan, where there

FUTURE PROGRAMMING

The objectives of UNDP's programme in the ECA region aligns with the organisation's new four-year Strategic Plan. On a regional level, UNDP's plan focusses on supporting countries to establish effective systems of governance to accelerate structural transformations; promote greener, more inclusive economies; foster gender equality; ensure that economic growth leaves no one behind and restores our natural capital; and chart risk-informed development pathways to build resilience and prevent shocks and crises.

are domestic food shortages of around 20 per cent, and roughly half the population lives below the poverty line, a UNDP-supported project worked to increase agricultural productivity by: taking advantage of the country's naturally rich biodiversity, identifying native crops better adapted to climate change, and advocating for policies and practices to conserve agro-biodiversity. In Kazakhstan and Russia, UNDP worked with national and local governments to strengthen the protected areas network of the Altai-Sayan ecoregion that resulted in the protection of a significant carbon sink in virgin forest areas, estimated to harbour over 100 million tonnes of carbon stored in dry above-ground biomass. Climate information and early warning systems were advanced in Armenia, Bosnia and Herzegovina, Georgia, Moldova, and Uzbekistan, saving lives from floods, protecting valuable productive infrastructure, providing farmers with valuable insights on when to plant and when to harvest, and informing improved evidence-based decision-making for leaders across the region.

Given the significant advances over the past decade, the next step for the region is to mainstream and accelerate these climate actions. A strong example comes from Georgia, where a new GCF-financed project will scale-up an earlier basin-wide flood forecasting and early warning system - piloted with UNDP - to build a national multi-hazard early warning system that will serve 1.7 million Georgians currently at risk from climate-induced hazards.

Turkmenistan beneficiary community leader

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Working with national governments, local stakeholders, donors, the private sector and more, UNDP is working to scale-up the effectiveness of these projects, and build out a substantial pipeline of climate actions for the region that will support nations in reaching goals for resilient development, environmental sustainability, peace and prosperity.

TOP LESSONS LEARNED

- The time for action is now. Climate change threatens economic and social gains in the region, but with the requisite human and social capital in place, nations are ready to mainstream and accelerate climate actions.
- Inclusive human and social development remains essential, particularly in a region like ECA, where large advances in social, technological, and economic development have taken place over the last 20 years. This will provide the essential foundation to reach carbon emission reduction and adaptation targets outlined in Nationally Determined Contributions to the Paris Agreement, as well as the goals outlined in the 2030 Agenda for Sustainable Development.
- Climate change is not a series of individual, linear challenges. It requires interlinked, bespoke, reactive, adaptive, and holistic approaches to arrive at solutions.
- To support these actions, the United Nations Development System, donors, and other key actors should provide continued and sustained support to enhance capacity development and improve climate governance.
- Economic diversification, technology transfer, social protections, and other related health and wellness activities will promote climate resilient livelihoods through ecosystem-based approaches that will protect the environment and promote sustainable natural resource management both on land and at sea.
- Enhanced disaster risk reduction and evidence-based decision-making through the expansion of climate information and early warning systems will protect lives and promote improved adaptation planning.
- Clean energy solutions for a low-carbon, climate resilient future will help nations to transform their economies to the real and present risks posed by climate change and keep temperature rises below 2 degrees.
- Country-driven approaches are essential for the sustainability of climate actions.
- Continued engagement with a diverse group of stakeholders including women, men, national and local leaders, young people, and ethnic groups will ensure no one is left behind.
- Public finance is not enough. Engagement with the private sector and exploration of innovative finance mechanisms such as blended finance and green bonds will be essential to fill the significant gap in adaptation financing.

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BOX 1:

SIGNATURE SOLUTIONS OF THE UNDP STRATEGIC PLAN (2018-2021)

Under the leadership of Administrator Achim Steiner, UNDP launched a new four-year strategic plan in 2018. UNDP's adaptation efforts align with this plan and provide continued support to achieving the goals outlined in the 2030 Agenda, Sendai Framework, Paris Agreement, and other global accords.

Signature solution 1

Keeping people out of poverty. This signature solution will target the barriers and vulnerabilities that keep people in poverty or that push them back into poverty, including when shocks and crises occur. In rural areas which are largely dependent on agriculture and natural resources, this signature solution will be closely related to issues of food security and the resilience of agricultural systems.

Signature solution 2

Strengthen effective, inclusive and accountable governance. Inclusive and accountable governance systems and processes are recognised as crucial to sustainable development and human security. National Adaptation Plans and the work of joint programmes like the FAO-UNDP Integrating Agriculture into National Adaptation Plans Programme and the joint UNDP-UN Environment National Adaptation Plans Global Support Programme (NAP-GSP) fit well into this solution of the UNDP Strategic Plan.

Signature solution 3

Enhance national prevention and recovery capacities for resilient societies. Building resilience to the impact of disasters and emergency situations (whether from socioeconomic or natural causes) requires efforts to minimise the drivers of risk ingrained within development processes and to strengthen human security.

Signature solution 4

Promote nature-based solutions for a sustainable planet. Biodiversity and terrestrial and marine ecosystems provide the foundation for human societies and a safety net of resources and ecosystem services for billions of people. UNDP will apply integrated actions developed in partnership with FAO, UN Environment, and others to address biodiversity loss by tackling market, policy, and governance failures that lead to ecosystem degradation.

Signature solution 5

Close the energy gap. Access to clean and affordable energy is a critical enabler for sustainable development, whether it be for nutrition, transport, education, or economic opportunity, among others.

Signature solution 6

Strengthen gender equality and the empowerment of women and girls. Significant gender inequalities persist in every region of the world, manifest as the unequal distribution of care work, lack of equitable access to decision-making, and unequal access to basic services, assets, and finance. Through the NAP-Ag Programme, UNDP is working with governments in 11 countries to improve gender-responsive decision-making. Women and girls are key to improved nutrition and food security.







BARÇA









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Abbreviations and acronyms

ADC/ ADA	Austrian Development Cooperation Agency
AF	Adaptation Fund
BCE	Before Common Era
BCPR	Bureau for Crisis Prevention and Recovery
BiH	Bosnia and Herzegovina
BMU	Federal Ministry for the Environment, Nature Conservation and Nuclear Safety of the German Government (formerly BMUB)
CCA	Climate Change Adaptation
CCACM	Climate Change Adaptation Coordination Mechanism
CCAS	Climate Change Adaptation Strategy of the Republic of Moldova
CIS	Commonwealth of Independent States
cm	Centimetre
CO^2	carbon dioxide
CRM-TASP	Climate Risk Management - Technical Assistance Support Project
DEWS	Drought Early Warning System
DRM	Disaster Risk Management
DRR	Disaster Risk Reduction
EbA	Ecosystem-based Adaptation; Ecosystem-based Approaches
ECA	Europe and Central Asia
EMMA	European Multi-service Meteorological Awareness
EU	European Union
EUMET-NET	European Meteorological Services Network
FYR	Former Yugoslav Republic
GCF	Green Climate Fund
GDP	Gross Domestic Product
GEF	Global Environment Facility
GHG	Greenhouse Gas
GIS	Geographic Information Systems
GLOF	Glacial Lake Outburst Flood
GNI	Gross National Income
ha	Hectare
HDI	Human Development Index
ICA	Institutional Capacity Assessment
ICT	Information Communication Technology
IPCC	Intergovernmental Panel on Climate Change
KHM	Kazhydromet
km	Kilometre
LDC	Least Developed Country
LDCF	Least Developed Countries Fund
LGSAT	Local Government Self-Assessment Tool
LPA	Local Public Authority
m	Metre
m^2	metres squared
m^3	cubic metres
M&E	Monitoring and Evaluation
MDG	Millennium Development Goal
MRDI	Ministry of Regional Development and Infrastructure
NAP	National Adaptation Plan
NAPA	National Adaptation Programmes of Action
NAP-GSP	National Adaptation Plan-Global Support Programme
NCCC	National Commission on Climate Change
NDC	Nationally Determined Contribution
NGO	Non-Governmental Organization
OSCE	Organization for Security Cooperation in Europe
QR	Quick Response
SAP	Sector Adaptation Plan
SCCF	Special Climate Change Fund
SDG	Sustainable Development Goal
SHS	State Hydrometeorological Service (Moldova)
SMS	Short Message Service
SPA	Strategic Priority on Adaptation
t	Tonne
UN	United Nations
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNISDR	United Nations Office for Disaster Risk Reduction
US	United States
USAID	United States Agency for International Development
VPAs	Vashlovani Protected Areas
WMO	World Meteorological Organization
WUG	Water User Group
ZAMG	Zentralanstalt für Meteorologie und Geodynamik (Austria)

Glossary of Commonly Used Terms[5]

Adaptation
The process of adjustment to actual or expected climate and its effects. In human systems, adaptation seeks to moderate or avoid harm or exploit beneficial opportunities. In some natural systems, human intervention may facilitate adjustment to expected climate and its effects.

Adaptive capacity
The ability of systems, institutions, humans, and other organisms to adjust to potential damage, to take advantage of opportunities, or to respond to consequences.

Coping
The use of available skills, resources, and opportunities to address, manage, and overcome adverse conditions, with the aim of achieving basic functioning of people, institutions, organizations, and systems in the short to medium term.

Disaster
Severe alterations in the normal functioning of a community or a society due to hazardous physical events interacting with vulnerable social conditions, leading to widespread adverse human, material, economic, or environmental effects that require immediate emergency response to satisfy critical human needs and that may require external support for recovery.

Disaster Risk Reduction (DRR)
Denotes both a policy goal or objective, and the strategic and instrumental measures employed for anticipating future disaster risk; reducing existing exposure, hazard, or vulnerability; and improving resilience.

Exposure
The presence of people, livelihoods, species or ecosystems, environmental functions, services, and resources, infrastructure, or economic, social, or cultural assets in places and settings that could be adversely affected.

Mainstreaming[6]
The informed inclusion of relevant environmental concerns into the decisions of institutions that drive national, local, and sectoral development policy, rules, plans, investment, and action.

Resilience
The capacity of social, economic, and environmental systems to cope with a hazardous event or trend or disturbance, responding or reorganising in ways that maintain their essential function, identity, and structure, while also maintaining the capacity for adaptation, learning, and transformation.

Risk
The potential for consequences where something of value is at stake and where the outcome is uncertain, recognising the diversity of values. Risk is often represented as probability of occurrence of hazardous events or trends multiplied by the impacts if these events or trends occur. Risk results from the interaction of vulnerability, exposure, and hazard. In this report, the term 'risk' is used primarily to refer to the risks of climate-change impacts.

Sensitivity
The degree to which a system or species is affected, either adversely or beneficially, by climate variability or change. The effect may be direct (e.g. a change in crop yield in response to a change in the mean, range, or variability of temperature) or indirect (e.g. damages caused by an increase in the frequency of coastal flooding due to sea level rise).

Sustainable development
Development that meets the needs of the present without compromising the ability of future generations to meet their own needs (WCED, 1987).

5 Except where specifically stated, all definitions are based on IPCC Fifth Assessment Report

6 Ibid.

Ms. Alla Gevorgyan is a member of the Sanam Production Co-operative in rural Armenia. The Co-operative exists with the support of the EU-UNDP Clima East Pilot Project - in collaboration with the UNDP-GEF Small Grants Programme - to improve pasture management and enhance rural livelihoods.

1. Introduction

With impressive social and economic growth over the past two decades, the countries of the Europe and Central Asia region are primed for significant environmental, economic, and social growth. Climate change provides a significant hurdle that will require the adoption of new policies, concerted efforts involving numerous stakeholders, and substantial financial backing from the international community to create the enabling environments and transformative change necessary to reach targets for low-carbon climate-resilient development, and the goals outlined in various international accords, including the Paris Agreement, 2030 Agenda for Sustainable Development, and Sendai Framework on Disaster Risk Reduction.

1.1 REGIONAL OVERVIEW

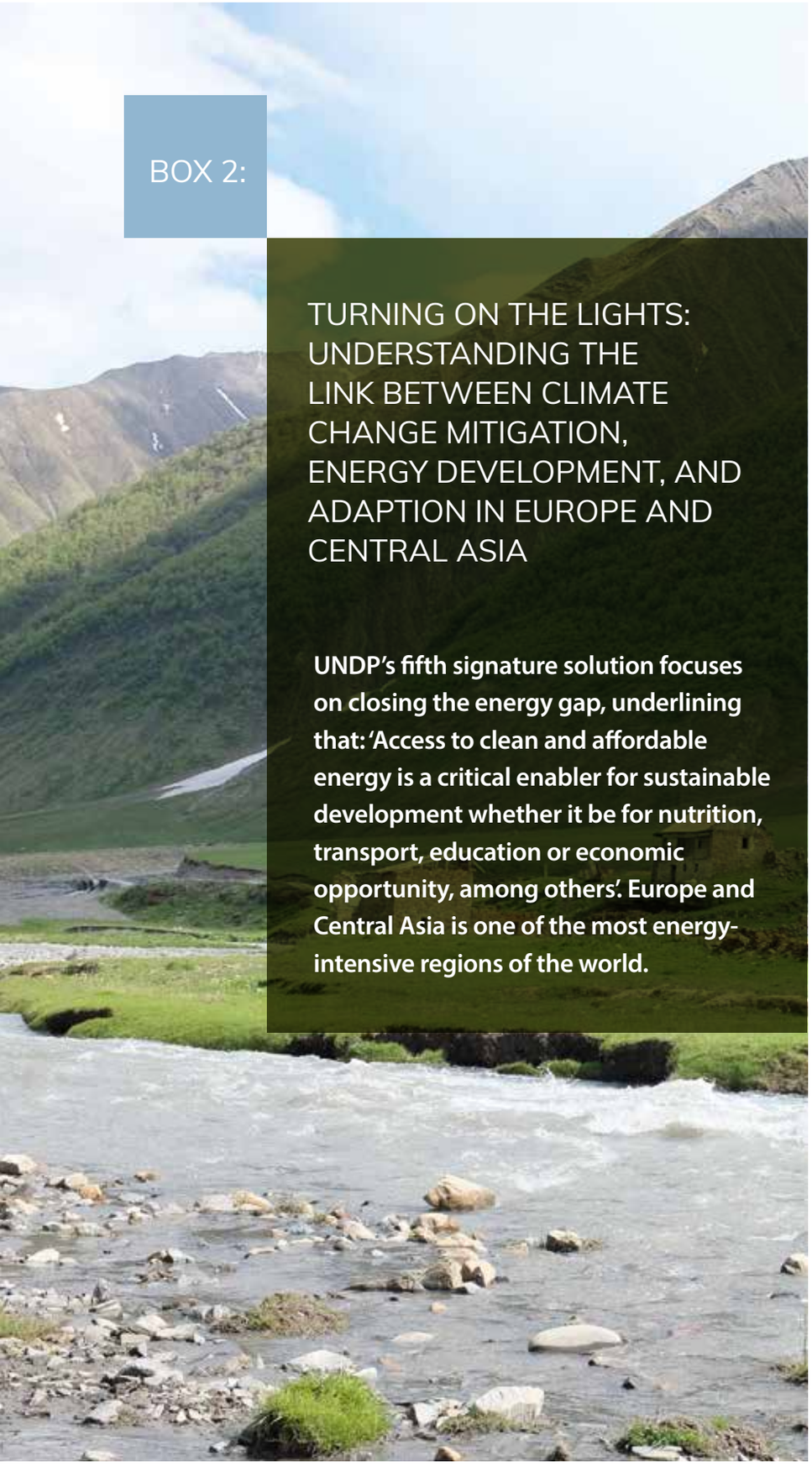
While extreme poverty has largely been eradicated, the countries of the ECA region, including the Eastern Europe, Western Balkans, South Caucasus, and Central Asia subregions, continue to face multiple development challenges.

Exclusion is widespread and inequalities are on the rise. In many countries, decent employment is scarce while social safety nets are outdated. Women's participation in the workforce and politics remains limited. Youth are particularly at risk of being marginalized at a time of rapid economic change. Outward and transit migration flows are among the highest globally, with many countries in the region experiencing extensive depletion of human capital. One of the biggest challenges will be to reconcile economic growth with social progress and environmental sustainability. Climate change is already exerting pressure on shared natural resources and triggering devastating weather events. And in some countries, conflicts and governance issues persist, exacerbated by weak social cohesion, ethnic tensions and violent extremism. [7]

The countries of the ECA region face mounting losses from a range of natural hazards, from severe flooding to storms and drought. These climate-driven hazards threaten to reverse decades of development progress. Climate change knows no borders, and its impacts will cut across countries and varying sectors, from agriculture and water resources to public healthcare and energy.

Countries in this region compare well with middle-income countries around the world in terms of economic and social growth, however many still face significant challenges. Across ECA, national economies have been growing slowly and are vulnerable to global commodity price fluctuations, which can aggravate labour markets and enhance other forms of social exclusion. Further, migration flows, natural disasters, environmental degradation, and conflict are threatening to undo hard-won development gains.

7 UNDP Europe and Central Asia, About the region: http://www.eurasia.undp.org



BOX 2:

TURNING ON THE LIGHTS: UNDERSTANDING THE LINK BETWEEN CLIMATE CHANGE MITIGATION, ENERGY DEVELOPMENT, AND ADAPTION IN EUROPE AND CENTRAL ASIA

UNDP's fifth signature solution focuses on closing the energy gap, underlining that: 'Access to clean and affordable energy is a critical enabler for sustainable development whether it be for nutrition, transport, education or economic opportunity, among others'. Europe and Central Asia is one of the most energy-intensive regions of the world.

Technical losses during transmission amount to 13% and 15% in Ukraine and Macedonia, respectively, and are as high as 20% in Tajikistan. Poorly constructed buildings throughout the region provide low heating and increase energy consumption at schools, places of work, and homes. Furthermore, while the region accounts for just 12 per cent of global greenhouse gas (GHG) emissions, this is twice the amount it should contribute, given its output. All of these factors contribute to an inadequate supply of affordable energy throughout the region – impacting households, especially poorer ones, in every country and prompting the need for action…Over the next 20 years it is estimated that investments of about $3.3 trillion – or 3% of Gross Domestic Product in the region - will be necessary to avoid severe energy shortages…[8]

New investments into clean and affordable energy in the ECA region need to be climate-proof, informed of future climate scenarios, and resilient to emerging climate change risks. To achieve this long-term vision, Moldova - with UNDP support - has developed recommendations for mainstreaming climate change adaptation goals in its energy sector. Development policies and plans for the energy sector were revised to include climate risk management objectives and adaptation responses based on sectoral vulnerability screening and institutional capacity assessment. Several other ECA countries prioritised their energy sector for National Adaptation Planning work .

Armenia provides another good example: Armenia's Nationally Determined Contribution gives preference to combined actions on adaptation and mitigation. To set up the enabling environments and policy frameworks required to mainstream and accelerate climate actions, UNDP has been providing support through the joint UNDP-UN Environment National Adaptation Plans Global Support Programme (NAP-GSP), as well as through a GEF-financed project entitled 'Capacity Building for Optimization of Information and Monitoring System in Armenia'.

8 World Bank, Brief: Energy Efficiency in Europe and Central Asia: http://www.worldbank.org/en/region/eca/brief/ee-in-eca

With support from UNDP, the Government of Armenia also accessed a US$3 million GCF grant in 2018 for national adaptation planning process. The 'National Adaptation Plan (NAP) to advance medium and long-term adaptation planning in Armenia' project will support the Government of Armenia to develop a national plan for climate change adaptation and to prioritise climate change adaptation investments in priority sectors including water resources, agriculture, energy, health, tourism, and human settlement, and increase the identification of finance options.

Another example of synergies between the climate change mitigation and adaptation objectives in the ECA portfolio is the flood risk reduction work in Georgia and Bosnia and Herzegovina (BiH) where engagements with hydro power sector stakeholders for co-operation on generation and management of weather and climate information, hazard assessments, early warning systems, and flood risk management are underway. With climate change bringing greater uncertainty on precipitation extremes, the hydropower sector is an important stakeholder for flood risk management and a beneficiary for enhanced hazard and risk information for climate-proofing of operations. Over 80 per cent of electricity in Georgia is produced by hydropower. BiH is among the leading hydropower production nations in Southern Europe due to its high hydropower potential. More frequent and intense rain events lead to intensive runoff and increased peak river flows and result in reduced power production and damage to hydropower infrastructure. UNDP's work on flood forecasting and early warning systems in Georgia's Rioni River Basin and in the Vrbas River Basin in Bosnia and Herzegovina provided technical knowledge on flood risks and tools to be scaled up through partnerships with the private sector and strengthened the role of hydropower plants in flood alleviation, thereby maximising their capacity to utilise flood forecasts in their operations.

Landscapes in Georgia

©Andrea Egan/UNDP

BOX 3: THREE SUBREGIONS OF EUROPE AND CENTRAL ASIA

Europe and Central Asia incorporates Central Asia, the South Caucasus and Western Commonwealth of Independent States (CIS), and the Western Balkans and Turkey.

The Central Asia subregion consists of Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan.

UNDP programme countries in the South Caucasus and CIS subregion include Armenia, Azerbaijan, Georgia, as well as Belarus, Moldova and Ukraine.

UNDP programme countries and territories in the Western Balkans and Turkey subregion include Albania, Bosnia and Herzegovina, Kosovo*, Montenegro, Serbia, the former Yugoslav Republic (FYR) of Macedonia, and Turkey.

* All references to Kosovo are made in the context of UN Security Council Resolution 1244 (1999)

1.2 UNDERSTANDING CLIMATE RISKS

Climate change is already having negative impacts, and more frequent and intensive droughts and floods and other extreme weather events are expected to worsen over time, according to most National Communications from the region.[9] This will result in adverse socio-economic impacts and will affect people's health, well-being, livelihoods, and quality of life.

The ECA region is remarkably diverse in terms of its unique landscapes, ecosystems, and climate zones, as well as its economic, political, social and cultural systems. With the Tian Shan ranges and deserts of Central Asia, vast Eurasian steppes, the Caucasus and the Balkans mountainous regions, boreal forests and wetlands, and rich coastal and marine ecosystems of the Black, Caspian, and Mediterranean Seas, the resilience of many of these ecosystems is likely to be exceeded by an unprecedented combination of climate change and associated disturbances (such as flooding, drought, and wildfires).

To improve the Smolyanka irrigation system, as part of the EU-UNDP Clima East Ukraine project, 12 km of the master channel were cleaned, 4 sluices repaired and 12 tube crossings replaced.

©Andrea Egan/UNDP Ukraine

9 National communications are prepared by countries for UNFCCC Secretariat to report on climate change impacts, mitigation and adaptation actions and other national activities.

0.5 - 1.6°C
Average temperature increase

1.6 - 2.6°C
Expected increase by 2050

Top: UNDP BiH is enhancing hydro-meteorological monitoring in Bosnia & Herzegovina's Vrbas River Basin
©Andrea Egan/UNDP BiH

Bottom: Burovdal to preserve access to their homes and prevent flooding and erosion.

©Andrea Egan/UNDP Azerbaijan

What all these areas have in common is that they are already witnessing the impacts of climate change.[10] Average temperatures have increased by 0.5 degrees Celsius (°C) in the south to 1.6 °C in the north (i.e. Siberia) of the ECA region, and overall increases of 1.6 to 2.6 °C are expected by the middle of the Century.[11] Summer heat waves are expected to claim more lives than will be saved by warmer winters. Water availability is expected to decrease everywhere, especially in southeastern areas of Europe and Central Asia. Extreme climate events have already had adverse effects on multiple economic sectors across the region, such as agriculture, forestry, water management, and electricity generation and supply, among others. Climate change impacts do not happen in isolation, and impacts in one sector can affect another. Floods and heat waves are expected to become more common and severe, as the possibility of droughts also increases.

In the Western Balkans and the South Caucasus, observed climate change has been affecting the national economies and communities through an increased frequency and intensity of natural climate-induced disasters – floods, flashfloods, mudflows, rainfall-triggered landslides, droughts, hail, wind storms, and avalanches. Coastal towns in Georgia, Turkey, and Ukraine are at risk from rising levels of water in the Black Sea. [12]

In the Russian Arctic, the permafrost has been receding, and seasonal thaw depths are projected to increase 30 to 50 centimetres (cm), increasing the risk to biodiversity, as well as putting infrastructure and buildings at risk of collapse. A large melting of permafrost happened around 130,000 years ago in this region as part of the Earth's natural cycles over tens of thousands of years. However, the current melting is happening over just decades, creating large craters in the Russian landscape.

10 IPCC http://www.ipcc.ch/pdf/assessment-report/ar5/wg2/WGIIAR5-Chap23_FINAL.pdf; World Bank

11 World Bank http://siteresources.worldbank.org/ECAEXT/Resources/258598-1243892418318/ECA_CCA_Summary.pdf

12 Ibid.

This poses a unique challenge for climate planners and carbon-reduction efforts. Permafrost generally works as a carbon sink. When it melts, however, carbon dioxide and methane are released into the atmosphere, creating new greenhouse emissions.

Scientists estimate that the soils of the Earth's circumpolar North contain about twice the amount of carbon as is in the atmosphere. Much of that carbon is frozen organic matter locked within permafrost. As global temperatures rise and permafrost thaws, the previously frozen organic material begins to decay and releases greenhouse gases like methane and carbon dioxide. The release of that carbon can, in turn, cause additional warming and the release of more carbon, something scientists call a positive feedback loop.[13]

Central Asia's semi-arid and arid climate will likely experience further aridification, affecting food production and availability of water resources. Take the desert country of Turkmenistan, already extremely hot and dry, where for the past five decades climate warming has been observed and documented as occurring at a faster pace than anywhere else on the planet.[14] The country is projected to experience an increase in average ambient temperature by up to 6-7 °C by the year 2100, while hydro-meteorological modelling forecasts predict steadily declining precipitation nationwide by 8-17 per cent through 2100 and beyond. In the last fifty years, glaciers in Central Asia are estimated to have receded by 25 per cent, and an equal amount is expected to disappear in the next 20 years.

In the last fifty years, glaciers in Central Asia are estimated to have receded by

25%

Masis Shrjan, Yerevan, Armenia

©UNDP Armenia/2011

Newly established potato storage house - housing 450 tons of produce in Kyrgyzstan.

©UNDP Kyrgyzstan/2011

13 University of Alaska Fairbanks, 2018, "Climate policy, carbon emissions from permafrost." https://www.sciencedaily.com/releases/2018/03/180326160953.htm

14 http://tm.one.un.org/content/dam/unct/turkmenistan/docs/Publications/NATIONAL%20CLIMATE%20CHANGE%20STRATEGY%20OF%20TURMENISTAN_en.pdf

Top Left: Flamingos in Khazar Nature Reserve, Turkmenistan,

©Adriana Dinu/UNDP Turkmenistan

Top Right: Griffon Vulture (Gyps fulvus) in Snt-Hasardag Reserve, Turkmenistan

©Michael Appleton/UNDP Turkmenistan

50 %

of water used for irrigation is lost due to inefficient irrigation technologies in Central Asian countries

The receding glaciers could provide increased run off, even leading to flooding in the short-term. From a long-term perspective, this could pose serious challenges for irrigation-dependent agriculture. There is a concern that water shortages may prove to be the main impediment to the development of Central Asian countries both under current conditions (around 50 per cent of water used for irrigation is lost due to inefficient irrigation technologies) and in the future (as the result of decreasing availability of snowpack and glaciers).

In Europe, sea level rise and extreme rainfall are projected to increase flood risk. This raises the spectre of costly flood damage, destroyed infrastructure, lost lives, and the re-alignment of financial resources to support disaster recovery, rather than prevention. In southern Europe, ecosystem services are projected to decline across all services, impeding economic activities such as in the tourism sector.[15]

The overall vulnerability of the region is as much related to the expected impacts of climate change as it is to the existing socio-economic vulnerabilities related to environmental mismanagement, poor infrastructure, and inefficient practices.

15 IPCC http://www.ipcc.ch/pdf/assessment-report/ar5/wg2/WGIIAR5-Chap23_FINAL.pdf

1.3 THE ECONOMICS OF CLIMATE CHANGE ADAPTATION

The cost of not investing in more effective climate change adaptation, evidenced-based policy insights for improved National Adaptation Plans, environmental protection, and disaster risk reduction is astronomical.

> According to a 2015 study by the Brookings Institute, 'unmitigated, climate change could reduce global GDP by over
>
> **20 %**
>
> by 2100 – a number roughly 5-10 times larger than current estimates'. [16]

This is exacerbated in both least-developed countries and middle-income countries, where increased vulnerability, instability, and risk mean that the numbers and impact of climate change are significantly magnified. This magnified risk then compounds, putting interconnected sectors such as energy, manufacturing and agriculture at increased risk.

With all these serious costs in mind, it becomes far cheaper to invest in improved planning, smarter evidence-based decision making, integrated ecosystem and environmental protections, and proactive disaster risk reduction.

Investment in more effective climate change adaptation is smart business. By ramping up efforts at the country level for climate management, countries that are highly vulnerable to climate change can support the achievement of Nationally Determined Contributions as well as development goals for food security and poverty reduction, lower risks, and support sustainable economic development that is built for the new climate reality of the 21st century.

In rural Armenia, improved pasture managements supports farmers like Alla Gevorgyan.

©UNDP Armenia/2017

In a world with competing demands for limited resources, critical questions need to be asked to form the most efficient policy response to climate change. Questions such as what is the magnitude of climate change impact on a sector like agriculture? To what extent will households that rely on agriculture be affected? Where are these changes expected? What kinds of adaptation interventions will have the highest return in terms of social welfare improvements? It is also key to address concerns over where and when adaptation investments should be made (recognizing that if one adapts too soon, resources may be wasted, and conversely that adapting too late will at the very least increase vulnerability for at-risk populations and perpetuate poverty traps, and may mean much greater costs).

In recent times, the need to demonstrate the costs and benefits of adaptation options has elevated in importance. With limits to available financial resources, especially in developing countries, countries need to prioritize between adaptation options. Policy makers are increasingly interested in finding the optimal mix of responses that maximize net benefits. A more rigorous understanding of the benefits and costs of adaptation to a changing climate has therefore become necessary, not only to justify donor funding but to strengthen national capacity to identify, assess, and adapt to climate changes.[17]

16 https://www.brookings.edu/blog/planetpolicy/2015/12/09/the-global-economic-costs-from-climate-change-may-be-worse-than-expected/

17 Pradeep Kurukulasuriya, UNDP, NAP-Ag Mooc. https://napmooc.uncclearn.org/

Ms. Susanna Muradyan, a member of the Sanam Co-operative.

©UNDP Armenia/2017

UNDP Georgia is supporting conservation efforts and promoting the sustainable use of agrobiodiversity.

©Andrea Egan/UNDP Georgia

Climate change adaptation and climate change mitigation are inextricably linked. Contributions to adaptation have follow-on effects that improve mitigation, and mitigation on its own reduces the need for adaptation.

Take agriculture for instance. Changes in rainfall patterns, rising temperatures, droughts and floods mean some crops will fail and farmers will need to plant, harvest, and market their crops differently. Many estimates indicate that we will need to feed an extra 2 billion mouths by 2050. With changing climate scenarios, the economics of climate change adaptation would thus demand improved productivity, as well as limits on increases of emissions to achieve food security. Following food across the value chain, this can impact energy (both biofuel consumption and energy market), industries such as transportation, manufacturing and service-level economic sectors such as markets, food exports and the such, in addition to directly impacting agriculture-dependent livelihoods. Adaptation solutions will need to be considered across value chains and respond to market development needs.[18]

Climate-related disasters are extremely costly. Not just in terms of lives lost, but also in terms of overall economic loss. According to a report by Rogers and Tsirkunov, 'Upgrading all hydrometeorological information production and early-warning capacity in developing countries would save an average of 23,000 lives annually and would provide between US$3 billion and US$30 billion per year in additional economic benefits related to disaster reduction.

With improved weather, hydro-meteorological, and climate services, weather index-based insurance also becomes a very real possibility for smallholder farmers. With insurance, farmers can invest in higher yield agricultural inputs without fear of financial ruin in the event of a drought.

> Some estimates suggest this can increase their income by
>
> **200 - 300 %.**
>
> For most developing country farmers, this is the difference between living above or below the poverty line.

18 Ibid.

business as usual damages in 2100 would reach

2.2 %

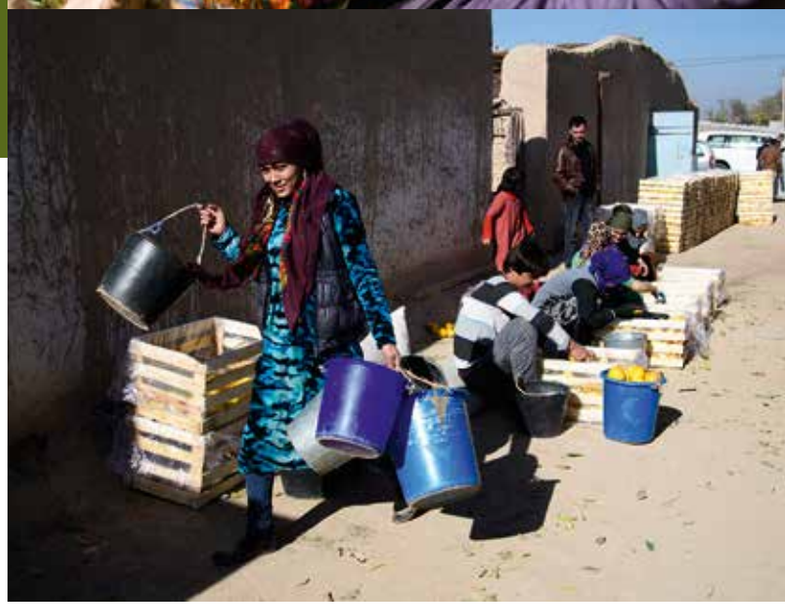
of global GDP

1.4 GAPS IN ADAPTATION FINANCE AND NEED FOR PRIVATE SECTOR ENGAGEMENT

Estimates of the costs of climate change and adaptation vary in global studies, depending on the sub-sectors covered, the assumptions made, and the level of climate change modelled (often under 3°C). Many do not account for tipping points – unpredictable and non-linear events in the earth's biophysical systems – and large-scale change.

The Fifth Assessment Report by the Intergovernmental Panel on Climate Change (IPCC) reported global estimates of the costs of adaptation in developing countries of between US$70 billion and US$100 billion per year until 2050. Nicholas Stern in 2006 estimated that mean business as usual damages in 2100 would reach 2.2 per cent of global GDP. Other studies during that time period on the costs of adaptation have estimated a range from US$4 billion to US$109 billion a year.

The most recent estimates say these earlier figures were too low. On a global level, 'the costs of adaptation are likely to be two-to-three times higher than current global estimates by 2030, and potentially four-to-five times higher by 2050' according to the 2016 UN Environment Adaptation Gap Finance Report.[19] 'Previous global estimates of the costs of adaptation in developing countries have been placed at between US$70 billion and US$100 billion a year for the period 2010-2050. However, the national and sector literature surveyed in this report



Cultivation of lemons in Tajikistan

©Nozim Kalandarov/UNDP Eurasia

19 UN Environment, 2016, The Adaptation Gap Finance Report, http://web.unep.org/adaptationgapreport/sites/unep.org.adaptationgapreport/files/documents/agr2016.pdf

Kyrgyzstan, Tajikistan and Afghanistan

©Marc Foggin/UNDP

Cultivation of lemons in Tajikistan

©UNDP Eurasia/2017

indicates that the costs of adaptation could range from US$140 billion to US$300 billion by 2030, and between US$280 billion and US$500 billion by 2050'.

Given these gaps, the public sector alone will not be able to finance climate change adaptation efforts in the region. The private sector will also need to step up, be actively engaged in planning and development processes, and become a key driver in building resilience for the region. Take the example of climate information and early warning systems: generally perceived as a public good offered by public services, when approached through a new lens that encourages public-private partnerships, climate services engage with a wide array of private-sector actors (from manufacturers to cloud-based big-data firms). This improved offering then spawns further private-sector engagements that can improve business efficiency, increase production on the farm, and support myriad interconnected economic sectors from transport to energy to farming. [20]

Small and micro-enterprises are also key. For instance, a project on 'Sustaining Agricultural Biodiversity in the Face of Climate Change in Tajikistan' targeted micro and small-scale agro-enterprise business development in the most vulnerable communities to address the loss of agro-biodiversity while promoting climate-resilient agriculture.

Interventions including skills training, capacity building, and providing access to finance helped farmers to diversify their produce to climate-resilient local species and expand their business into new markets.

20 Learn more about UNDP's vision for PPPs and climate services at http://adaptation-undp.org/resources/communications-products/new-vision-weather-and-climate-services-africa

BOX 4: UNDP ENGAGEMENT ON PUBLIC-PRIVATE PARTNERSHIPS

UNDP's climate change adaptation work with the private sector is organised around the '3 Cs' framework that also informs overall UNDP engagement with the private sector – Convening, Catalysing & Capitalising.

CONVENING

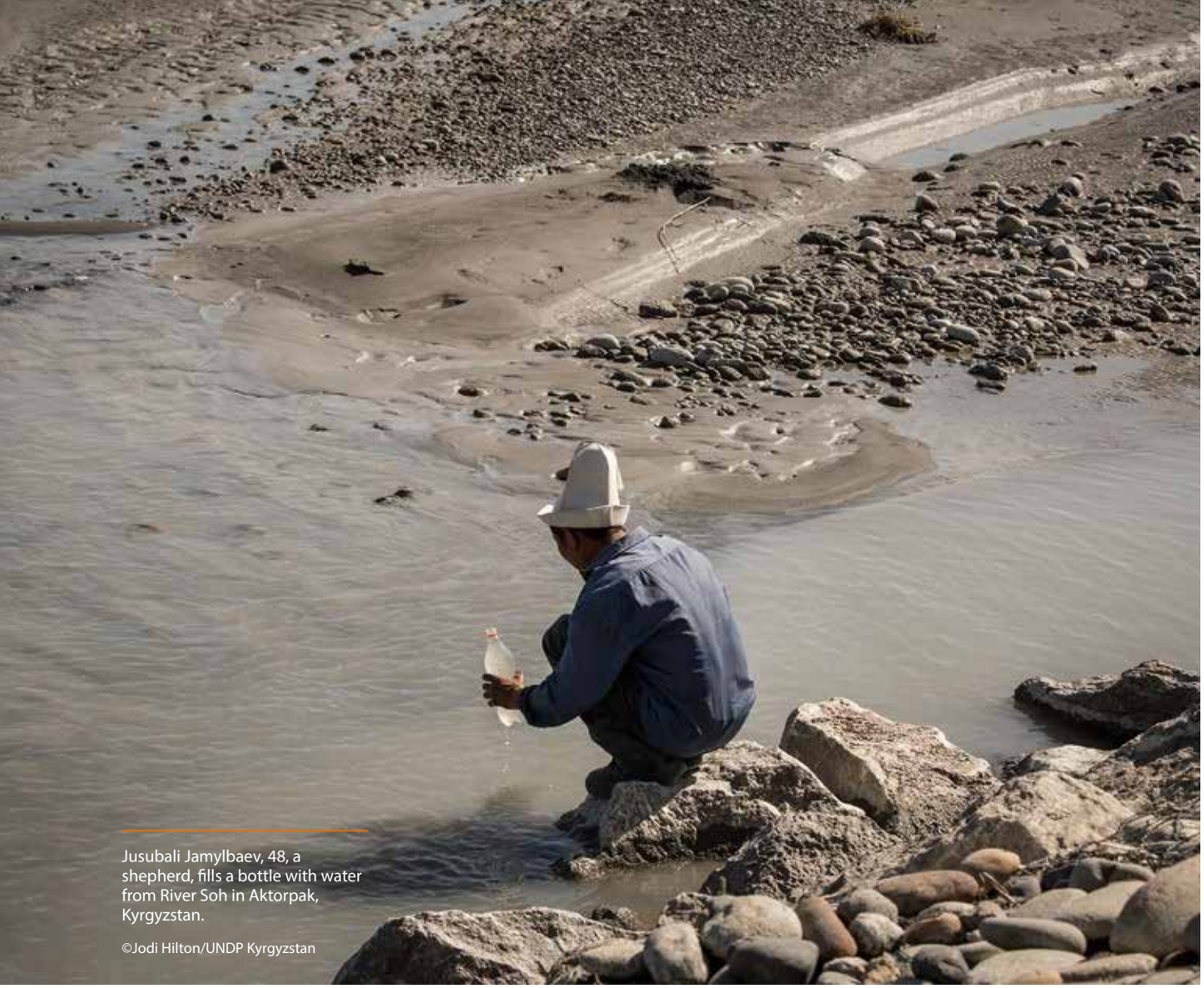
Around advocacy, knowledge services, policy dialogue and multi-stakeholder platforms

- Implementing capacity building around climate resilience so that policies and regulatory reform can take place to support the private sector in increasing their ability to absorb impacts and/or make available products and services that can help society cope better with unavoidable climate change impacts
- By assisting with mainstreaming and integrating climate change adaptation into national, sub-national and sectoral planning and budgeting, support the pivoting of key economic sectors away from expected impacts of climate change risks and uncertainty

©Andrea Egan/UNDP Georgia

Kosovo had a little lamb and its fleece was as white as snow.

©UNDP Kosovo/2013



Jusubali Jamylbaev, 48, a shepherd, fills a bottle with water from River Soh in Aktorpak, Kyrgyzstan.

©Jodi Hilton/UNDP Kyrgyzstan

CATALYSING

A better enabling environment for private sector engagement

- Helping private sector companies assess climate risks and build climate resilience through application of adaptation-focussed knowledge products
- Supporting countries to design and introduce policies that incentivise and facilitate private sector engagement in key sectors. This is done in the context of mainstreaming and integrating climate change risks into national planning and budgeting processes and policies

CAPITALISING

Private finance for climate risk management

- Identifying a pipeline of projects that can draw private investment on top of public finance that will ensure that key economic sectors grow in a resilient manner
- Supporting countries in accessing public climate finance which is used to leverage additional private sector finance, as co-financing, for bankable investments

©Andrea Egan/UNDP

1.5 AN OVERVIEW OF CURRENT UNDP PROGRAMMES

Considering current and expected impacts of climate change, measures to adapt and reduce vulnerabilities from unavoidable climate change impacts need to take place in all countries in the ECA region. UNDP is working with its partners to help ECA countries shift to climate-resilient and sustainable development in a risk-informed way. This work includes UNDP projects and programmes focussing on climate change adaptation along six UNDP Signature Programmes in alignment with UNDP's Strategic Plan (2018-2021). These projects and programmes ensure that all the necessary multisectoral and multilevel approaches are integrated when addressing climate change adaptation. Innovation in line with traditional knowledge systems ensures adaptation efforts are tailored and contextualised when addressing issues ranging from food security and disaster risk management to resilient livelihoods and water management.

Rooted in the work of the overall UNDP Strategic Plan, UNDP addresses climate change adaptation through its six signature programmes:

1. Supporting Integrated Climate Change Strategies,
2. Advancing Cross-sectoral Climate-Resilient Livelihoods,
3. Ecosystem-Based Adaptation,
4. Fostering Resilience for Food Security,
5. Climate Resilient Integrated Water Resource and Coastal Management, and
6. Promoting Climate Resilient Infrastructure and Energy.

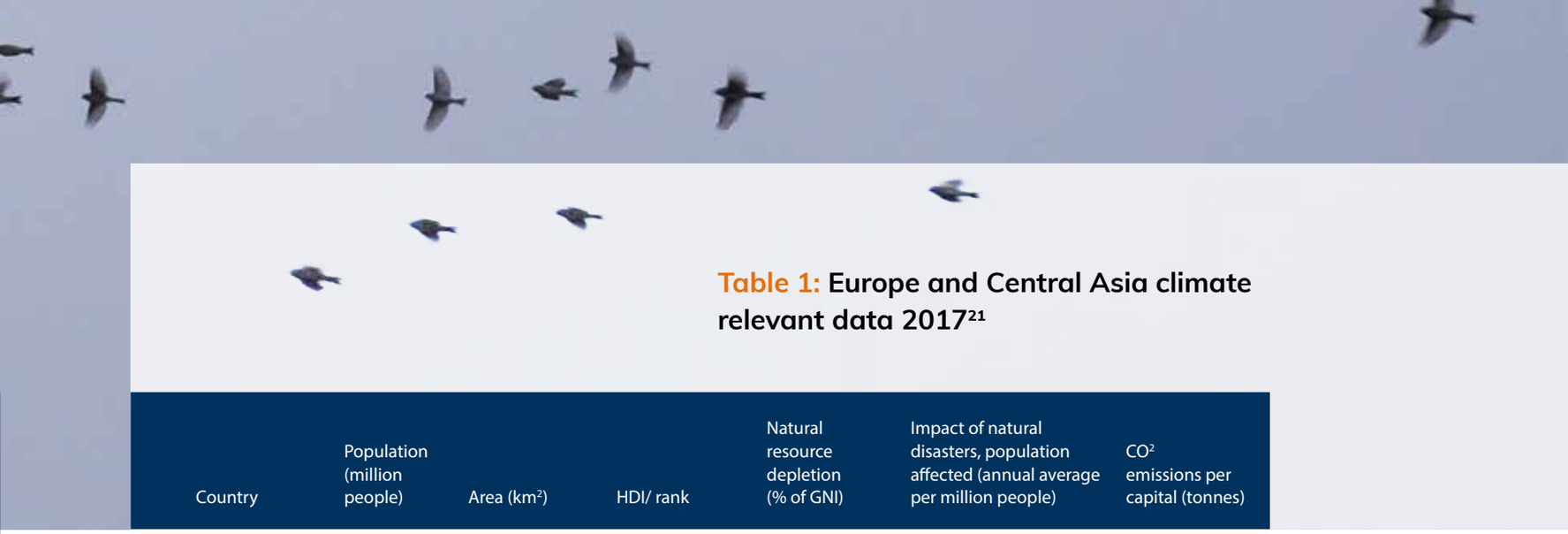


Table 1: Europe and Central Asia climate relevant data 2017[21]

	Country	Population (million people)	Area (km²)	HDI/ rank	Natural resource depletion (% of GNI)	Impact of natural disasters, population affected (annual average per million people)	CO^2 emissions per capital (tonnes)
1.	Albania	3.2	28,748	0.773 / 85	3.5	20,567.8	1.6
2.	Armenia	3	29,743	0.773 / 85	2.2	2,549.4	1.7
3.	Azerbaijan	9.5	86,600	0.751 / 78	26	1,078.6	3.6
4.	Belarus	9.3	207,600	0.798 / 50	1.5	471.5	6.7
5.	Bosnia and Herzegovina	3.8	51,197	0.733 / 85	-	27,578.4	6.2
6.	Georgia	3.7	69,700	0.754 / 76	0.7	3,300.9	1.8
7.	Kazakhstan	16.6	2,724,900	0.788 / 56	17.2	633.5	15.8
8.	Kosovo	1.8	10,887	-	-	-	5.7
9.	Kyrgyzstan	5.6	199,951	0.655 / 120	7.9	38,560.4	1.2
10.	FYR Macedonia	2.1	25,713	0.747 / 81	2.7	48,256	4.4
11.	Moldova	3.5	33,851	0.693 / 107	0.2	6,840	1.4
12.	Montenegro	0.6	13,812	0.802 / 49	-	1,999.9	4.1
13.	Serbia	9.5	77,474	0.771 / 66	-	18,081.5	6.8
14.	Tajikistan	8.4	143,100	0.624 / 129	1.3	38,571.5	0.4
15.	Turkey	75.8	783,562	0.761 /72	0.3	216.6	4.4
16.	Turkmenistan	5.3	488,100	0.688 / 109	37	0	12.2
17.	Ukraine	44.9	603,550	0.747 / 81	4.6	943.8	6.3
18.	Uzbekistan	29.3	447,400	0.675 / 114	13.8	5.7	3.9
	TOTAL	**235.9**	**6,025,888**				

Source: http://hdr.undp.org/en/countries, https://www.cia.gov/library/publications/the-world-factbook/rankorder/2147rank.html

21 All references to Kosovo are made in the context of UN Security Council Resolution 1244 (1999)

Figure 1: Climate change in Europe and Central Asia

0.5 - 1.6°C
Average temperature increase

1.6 - 2.6°C
Expected increase by 2050

CAUCASUS

Increase of extreme weather events increases risks in relation to agriculture ecosystems human health and security

CENTRAL ASIA

Increased frequency and velocity of climate-induced disasters, i.e. floods, mudflows, GLOFs; in addition to frequent droughts and changes in water run-off cloud negatively affect agriculture outputs, increase water demand for irrigation, and execrable desertification

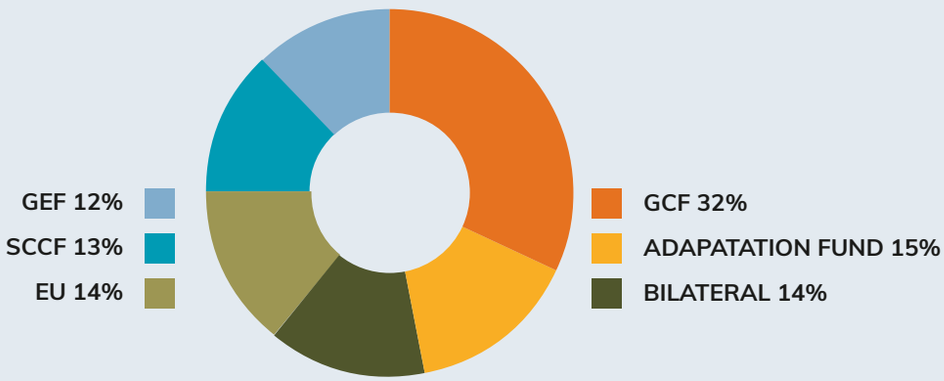
WESTERN BALKANS

Increase challenges to water availability, quality and management, in addition to weak transboundary cooperation and pollution

EXTREME TEMPERATURES | LANDSLIDES | DROUGHT | WILDFIRE | FLOOD | STORMS | HEAVY RAINFALL

CLIMATE HAZARDS IN EUROPE AND CENTRAL ASIA

Figure 2: Financing of the UNDP climate change adaptation and resilience portfolio in Europe and Central Asia (2005 -2018)



BOX 5:

UNDP CLIMATE CHANGE ADAPTATION

For UNDP, adaptation to climate change means advancing more resilient, sustainable development outcomes that take into consideration ongoing and future climate-related impacts. Our community-driven approach includes supporting integrated climate change strategies, advancing climate-resilient agriculture, promoting ecosystem-based adaptation initiatives, fostering resilience for food security, supporting integrated water resource and coastal management, creating improved climate information and early warning systems, and building climate resilient energy and infrastructure platforms designed for the 21st century.

Working in concert with international development agencies, donors (including the Global Environment Facility, Adaptation Fund, Green Climate Fund, and other bilateral and multilateral donors), civil society, national governments, and local stakeholders, this work is designed to build lasting resilience for at-risk communities and promote a global zero-carbon future. Our gender-responsive approaches work to empower women as agents of change and leaders in climate actions. The world faces an uncertain climate future. Without sustained support, hard-won gains in poverty reduction, food security, gender empowerment, access to quality education, and other objectives outlined by the sustainable development goals will be derailed. This means women and children will continue to go hungry, people will be forced to migrate to avoid the impacts of climate change or flee from rising seas, and global processes to build peace will face new and ever-more complex hurdles.

UNDP is a leader in climate change adaptation. These concrete activities are designed to inform climate-smart policy and strategy development, and support nations in building National Adaptation Plans and Programmes of Action that will protect vulnerable populations from the threats posed by a changing climate.

With GEF-financing, a UNDP Uzbekistan project helped to restore more than 16,000 hectares of desert and improve livelihood options for local farmers.

2. Supporting integrated climate change strategies

UNDP supports countries to formulate integrated climate change strategies, access climate finance mechanisms, and develop and strengthen the policies, institutions, capacities, knowledge, and transformative change required to build a climate-resilient zero-carbon future.

Through various projects and programmes, UNDP in many countries has been supporting the development of long-term strategies to reduce climate vulnerability. One of the examples includes a regional project, Capacity Development for Climate Risk Management, focused on expanding adaptation practices in ECA. Another regional project, Central Asian Climate Risk Management, helped institute far-reaching measures to build resilience. A project on mitigating climate change risks in rural communities in Armenia[22] supported the integration of climate risk management into national disaster risk reduction strategy and local development planning. In Moldova, UNDP helped create an enabling environment for climate change adaptation by setting up a comprehensive national adaptation planning framework and mainstreaming adaptation into various sectors of the economy.

UNDP's climate change adaptation work in ECA commenced in 2005 with the Lake Balaton Integrated Vulnerability Assessment, Early Warning and Adaptation Strategies Project in Hungary. The project, co-funded by the GEF, UNDP, the United Nations Environment Programme (UNEP), and the Government of Hungary, with a total budget of US$4 million and a duration of four years (2005-2008), supported the development of national and local climate change policies based on the experience and knowledge acquired through the Lake Balaton project. The project established a comprehensive online information system for the lake, applying a customised soil and water assessment tool to help local water authorities assess hydrology and climate impacts. This model has since been successfully replicated and adapted for several other Central European lakes. As a result of the project, the Lake Balaton Development Coordination Agency redeveloped its long-term plan via the integration of climate change considerations and the introduction of adaptation criteria into its small grant scheme. This prompted the mainstreaming and acceleration of a growing number of adaptation projects in the area.

22 Mitigation of Climate Change Risks of Rural Communities through Improved Local Development Planning

The beautiful but environmentally vulnerable region of the Prespa Lake Basin is home to more than 2,000 species of fish, birds, mammals and plants.

BOX 6:

WHY NATIONAL ADAPTATION PLANS ARE IMPORTANT TO EUROPE AND CENTRAL ASIA

By Umberto Labate

In Europe and Central Asia, climate change threatens to unravel the development advancements attained throughout the last quarter of the century. Countries in the region agree that the damaging impacts of climate change and their related costs will not be prevented by simply implementing stand-alone, ad-hoc/piecemeal adaptation measures, but rather by making climate change/adaptation an integral part of their systematic medium- and long-term planning and budgeting processes.

Climate change cannot be addressed as a narrow sectoral issue. Therefore, a whole-of-government response is essential. This will require co-operation, planning and action across government sectoral ministries and agencies, from finance to agriculture, from education to foreign affairs. 'Armenia has learned the value of involving all stakeholders for any planning and implementation, which is also a guarantee for strong political will, support and a favourable environment'.[23]

As outlined in several Nationally Determined Contributions, as well as national, local, and sectoral planning strategies, countries in the region are advancing the integration of adaptation considerations into their policies as part of their efforts to eradicate poverty and achieve other goals outlined in the 2030 Agenda for Sustainable Development and the Paris Agreement.

However, many countries still lack the resources required for long-term, iterative, and progressive adaptation planning and implementation.

What countries are doing about it and how UNDP is supporting them

To address the regional threats of climate change outlined in this publication – and build the enabling environments needed to develop more effective climate change adaptation actions – countries throughout the region have agreed to a medium-to-long-term, multi-dimensional, and multi-sectoral task to:

i) reduce vulnerability to the impacts of climate change, by building adaptive capacity and resilience; and

ii) facilitate the integration of climate change adaptation, in a coherent manner, into relevant new and existing policies, programmes, and activities, in particular development planning processes and strategies, within all relevant sectors and at different levels, as appropriate, as an opportunity to enhance capacity to adapt to climate threats through the National Adaptation Plans process.

As a part of UNDP's Signature Programme to **'Strengthen effective, inclusive and accountable governance',** UNDP is supporting countries in the ECA region to build effect National Adaptation Plans by supporting requesting countries to identify, categorise, assess, finance, implement, and monitor evolving adaptation needs, develop national strategies and action plans to adapt to climate change, and access and use dedicated climate finance for the identification and implementation of prioritised adaptation activities.

23 NAP process in focus: Lessons from Armenia - Mr. Artsvik Minasyan, Minister of Nature Protection of the Republic of Armenia (2017)

Since 2014, through the joint UNDP-UN Environment National Adaptation Plans Global Support Programme (NAP-GSP), UNDP, together with its partners, has worked with 14 ECA countries[24] to take stock of institutional and policy statuses on adaptation, identify gaps and needs, sensitise national teams and institutions on adaptation planning and budgeting through multi-stakeholder dialogues, and share experiences from other countries.

In addition, based on the groundwork from the NAP-GSP Programme, UNDP has provided technical support to 13 ECA countries[25] to access climate finance to advance their NAPs, through the identification of activities for the formulation of GCF project proposals.

GCF-financed National Adaptation Plans projects in the region

As of August 2018, nine proposals have been submitted and are under the review of the GCF, and two have been approved.

The **'National Adaptation Plan (NAP) to advance medium and long-term adaptation planning in Armenia'** project will support the Government of Armenia to develop a national plan for climate change adaptation through an iterative process focused on strengthening foundational capacities to ensure they are institutionalised for long-term sustainability. The project aims to address existing barriers, support the prioritisation of climate change adaptation investments in the priority sectors identified in the country's NDC - including water resources, agriculture, energy, health, tourism and human settlement - and increase the identification of finance options.[26] It will do so by strengthening the evidence base around risks and vulnerabilities for decision-making to identify, assess, and prioritise adaptation options.

The project to **'Advance the National Adaptation Plan (NAP) process for medium-term investment planning in climate sensitive sectors in Bosnia-Herzegovina (B&H)'** will support the Government of Bosnia and Herzegovina to advance the National Adaptation Plan (NAP) process and reach goals outlined in the Paris Agreement and 2030 Agenda for Sustainable Development. GCF resources will be used to enable the government to integrate climate change-related risks, coping strategies, and opportunities into ongoing development planning and budgeting processes. [27] An important feature of this project is its aim to establish innovative mechanisms to finance adaptation in the long-term at the sub-national/local levels through the development of a financing framework that assesses existing market barriers, identifies appropriate de-risking strategies, and incentivises and empowers municipal and private sector/domestic markets' investments/capital.

24 Albania, Armenia, Azerbaijan, Bosnia and Herzegovina, Georgia, Kazakhstan, Kyrgyzstan, The former Yugoslav Republic of Macedonia, Montenegro, Moldova, Serbia, Tajikistan, Turkmenistan, Uzbekistan. The NAP-GSP is financed through the GEF.

25 Ibid

26 http://adaptation-undp.org/projects/NAP-armenia

27 http://adaptation-undp.org/projects/national-adaptation-plans-bosnia-and-herzegovina

CASE STUDY 1: CAPACITY DEVELOPMENT FOR CLIMATE RISK MANAGEMENT

Project Title:	**Capacity development for climate risk management in Eastern Europe and Commonwealth of Independent States**
Implementing Partner:	UNDP Country Offices and Governments of the implementing countries
Project Budget:	US$1.35 million (UNDP), US$0.52 million (Government of Austria)
Period:	2008-2013
LOCATION	Armenia, Bosnia and Herzegovina, Croatia, FYR Macedonia, Kazakhstan, Kosovo*, Kyrgyzstan, Moldova, Russian Federation, Tajikistan, Turkmenistan, Uzbekistan
Beneficiaries:	National governments, farmers, local communities, UNDP Country Offices

Family in FYR Macedonia

©Ljubomir Stefanov/UNDP FYR Macedonia

Conservation work in Strumica, FYR Macedonia

©Ljubomir Stefanov/UNDP FYR Macedonia

By 2020, water demands in the Strumica River Basin are expected to increase by 40 percent, while extreme weather events – such as floods and droughts – are also expected to become more frequent.

©Ljubomir Stefanov/UNDP FYR Macedonia

PROJECT SUMMARY

Objective:	To improve climate risk management in the region of Eastern Europe and Central Asia by developing capacities for climate change adaptation.
Background:	The region is highly vulnerable to climate change and has been facing warming at a rate higher than the global average. Climate change already impacts communities and economies in the region. These impacts are expected to worsen over time.
Strategy:	The project sought to disseminate knowledge about climate change impacts and potential adaptation strategies. It worked at the local level to reduce vulnerabilities and strengthen capacities to manage climate risks. The enhancement of capacities of UNDP Country Offices across the region aimed at more targeted responses to specific national adaptation needs and were geared towards catalysing additional financial resources to help meet these needs.
Key results:	Armenia, Croatia, FYR Macedonia and Moldova developed national reports on the socio-economic impacts of climate change, with concrete proposals for adaptation measures included in official documents such as FYR Macedonia's Third National Communication under the UNFCCC. The project supported Bosnia and Herzegovina, Kazakhstan, Kosovo* and Moldova in advancing their national adaptation strategies. It piloted climate risk management at the local level in Armenia, FYR Macedonia and Moldova, benefitting nearly thirty communities. Climate-proofing has been applied to large UNDP community development programmes in Armenia, Tajikistan and Uzbekistan.
Mainstreaming and acceleration:	With UNDP support, Armenia accessed funds for two new grants from the GCF. The first grant will build a mitigation project on 'De-Risking and Scaling-Up Investment in Energy Efficient Building Retrofits'.
Building Retrofits'.	The second grant is dedicated toward advancing Armenia's National Adaptation Plans. Both projects benefit from the capacity building and policy support provided through this programme and the joint UNDP-UN Environment National Adaptation Plans Global Support Programme (NAP-GSP).

Despite vulnerabilities to climate change, some countries in the region have little or no experience with adaptation measures. As a result, there is a threat that they may inadvertently pursue development that can harm livelihoods and ecosystems. To tackle this problem, the Capacity Development for Climate Risk Management project engaged with the Governments of Bosnia and Herzegovina, Kazakhstan, Kosovo* and Moldova to support the development of their first national adaptation strategies. In each country, the strategy was carefully tailored to national contexts, but with common elements that have proven effective in the past. Inter-ministerial working groups were constituted, with representatives coming from different sectors such as environmental protection, agriculture, urban and spatial planning, water management, and trade. These working groups participated in strategy development and contributed to building capacities and knowledge of climate risks and opportunities over a broader stakeholder base.

With these strategies, the countries have launched an on-going process of integrating adaptation into national plans and policies. Presented in more detail later in this chapter, Moldova's strategy, for instance, identified key sectors requiring government intervention, analysed the climate resilience of existing government policies, put forward national adaptation objectives, and recommended specific measures for achieving these. It set the stage for the National Adaptation Plan (NAP), now a permanent framework for systematically incorporating adaptation measures in development policies. One priority sector that emerged clearly in preparing the strategy was food security and agriculture. In the wake of a 2007 drought, the output of cereal crops dropped by 70 per cent. [28] A World Bank post disaster needs assessment (PDNA) estimated an overall loss of US$1 billion, with the most affected sectors being agriculture and infrastructure.[29]

Many inhabitants of Slobozia Mare, a village located in southern Moldova, earn a living breeding poultry and cultivating vegetables.

©Victor Pictor/UNDP Moldova

In Moldova, UNDP project support developed pasture and forest management plans for 18 communities from Orhei National Park region.

©UNDP Moldova/2012

28 FAO Global Information and Early Warning System on Food and Agriculture World Food Programme Special Report. FAO/WFP Crop and Food Supply Assessment Mission to Moldova 25 September 2007 http://www.fao.org/docrep/010/ah871e/ah871e00.htm

29 Ibid.

UNDP support in the mountainous communities of Gegharkunik region worked to improve pasture management and enhance rural livelihoods.

©UNDP Armenia/2017

Destructive floods in both 2008 and 2010 brought an estimated US$120 million loss.[30] Moldova now focusses on enhancing the resilience of agriculture to climate change, ensuring that fallout from future events like this will be greatly diminished.

At the local level, various pilot activities were implemented to demonstrate effective and relevant adaptation measures. In Moldova, for example, all 1,681 of the country's communities were screened, and 20 were selected based on past disaster damage, expected climate impacts, and poverty levels. Local risk assessments were conducted and adaptation projects implemented in those communities. One such community was Horodiste, where - after the main risks were identified - the project supported measures to excavate a riverbed and reconstruct a dam: two simple activities that improved preparedness for future storms.

In Armenia, UNDP in concert with national partners used the results of vulnerability and capacity assessments, and mobilised other stakeholders such as the private sector to expand agricultural insurance [31] and develop new economic loss compensation mechanisms. [32] Currently, UNDP is working with the government of Armenia, the private sector, and farmers to scale-up the use of anti-hail nets, which demonstrates that multi-stakeholder partnerships are ensuring the sustainability of development results.

30 Republic of Moldova Post Disaster Needs Assessment. Floods 2010. Main Report. http://www.ipcc.ch/pdf/assessment-report/ar5/wg2/WGIIAR5-Chap23_FINAL.pdf

31 UNDP Armenia 2014. A Needs Assessment for Introducing Agricultural Insurance in Armenia in the Context of Climate Risk Mitigation https://info.undp.org/docs/pdc/Documents/ARM/Agriculture%20Insurance%20Report.pdf

32 UNDP 2013. Country Report. Climate Risk Management in Armenia http://www.nature-ic.am/Content/announcements/7154/Armenia_CRM_TASP_Report_eng-for_web.pdf

CASE STUDY 2: CLIMATE RISK MANAGEMENT IN CENTRAL ASIA

Project Title:	**Central Asian Climate Risk Management Programme**
Implementing Partner:	Governments of five Central Asia countries
Project Budget:	US$5.95 million (Organization for Security Cooperation in Europe, European Union, UNDP, Government of Finland)
Period:	2010-2015
LOCATION	Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan
Beneficiaries:	National governments, farmers, local communities, UNDP Country Offices

Across Kyrgyzstan, lack of access to clean drinking water presents a serious health problem in hundreds of villages.

©Jodi Hilton/UNDP Kyrgyzstan

The Republic of Uzbekistan covers approximately 447,400 km^2, of which 85% comprises deserts or semi-deserts, flanked by the extensive Tien Shan and Gissar-Alai mountain systems in the east and south-east. Uzbekistan has a high level of endemism, with several Central Asian species originating in the area between the Amu Darya and Syrdarya Rivers.

©Adriana Dinu/UNDP

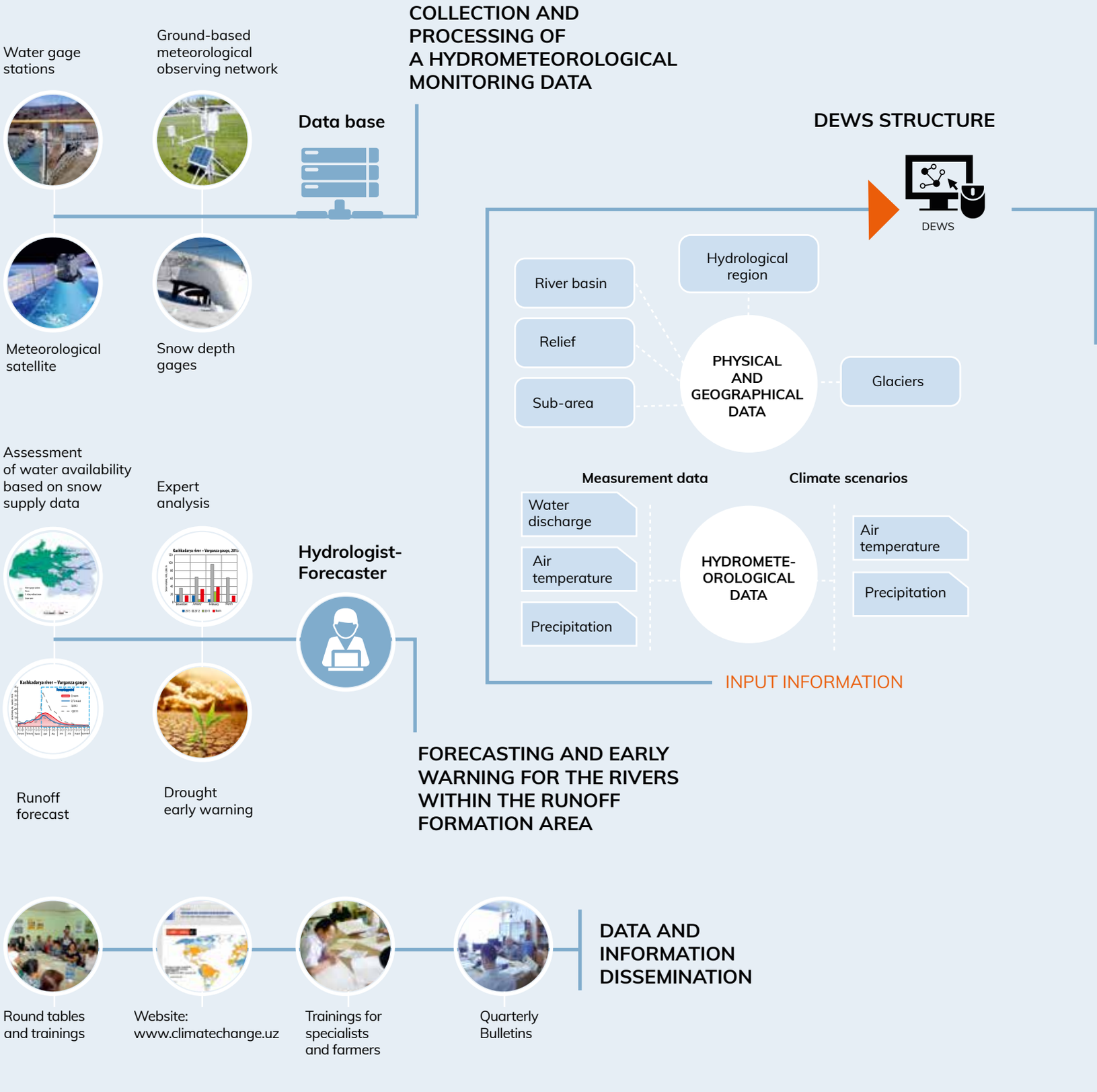
Kyrgyzstan rice fields

©Natalia Olofinskaya/UNDP Kyrgyzstan

PROJECT SUMMARY

Objective:	To promote the reduction of climate-related disasters and boost adaptation to climate change, and to integrate climate risk management into the core development policies and strategies of the five countries of Central Asia.
Background:	Central Asia is highly vulnerable to climate change because of its aridity, previous under-investment in infrastructure, high frequency of natural disasters, reliance on glaciers for water supply, and legacy of Soviet-era environmental mismanagement. All five countries are expected to become increasingly prone to floods, droughts, extreme temperatures and landslides, leading to considerable economic losses and socio-economic consequences, especially related to water resources, agriculture and energy.
Strategy:	The project focused on five themes: managing glacial water resources, disaster management, reforestation, livestock management, and water management in agriculture. It took a comprehensive approach to climate risk management, beginning with rigorous analytical techniques that informed the creation of required institutions, laws and economic policies. These efforts were complemented by examples of concrete climate risk management at multiple levels of governance.
Key results:	All five countries introduced a spectrum of measures: institutional reforms and legal initiatives, targeted climate risk mitigation steps based on participatory assessments, educational resource kits, 'young farmer schools', etc. Modern practices in agriculture, pasture and livestock management, agro-forestry, drought management, and agronomy have taken root and begun to spread. In Kazakhstan, two districts significantly improved the efficiency of water use in agriculture. Mountainous areas of Kyrgyzstan developed more sustainable pasture management. Tajikistan built capacities for agro-forestry in the Gissar Mountains. People in three areas of Turkmenistan learned how to mitigate climate risks through oasis agriculture as well as new approaches to orchard and pasture management, and agriculture at large. Drought management advanced in Uzbekistan through the growing use of drip irrigation.
Mainstreaming and acceleration:	In 2016, a new project on 'Supporting Climate Resilient Livelihoods in Agricultural Communities in Drought-Prone Areas of Turkmenistan' was approved by the GEF. The project will support three inter-related components, namely (i) improving climate-related socio-economic outcomes in agricultural communities in the Lebap and Dashoguz districts through community-based adaptation solutions; (ii) mainstreaming climate adaptation measures in agricultural and water sector development strategy and policy; and (iii) strengthening national capacity for iterative climate change adaptation planning, implementation, and monitoring in the country.

Figure 4: Drought Early Warning System (DEWS) in Uzbekistan



STRENGTHENING THE FORECASTING CAPACITY OF DEWS

Assessment of the snow area for river basins using MODSNOW software module

Development of the regional climate scenarios

Assessment of drought vulnerability

CAWA

GFZ Helmholtz-Zentrum Potsdam

DMCSEE Drought Management Centre for Southeastern Europe

Snow cover mapping by MODIS data

Development of the regional climate scenarios (REMO)

Mapping of the drought prone areas

DEWS's new capacity

OUTPUT INFORMATION

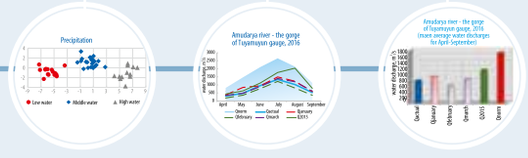
RESULTS OF MODELING

- Snow supplies in mountains
- Snow melted and rain inflow
- Glacial inflow
- Water discharge
- Drought indices
  - Pedya index
  - SPI
  - Snow supply index

STATISTICAL APPROACHES FOR FORECASTING AND EARLY WARNING

Qualitative forecasting of water availability for Amudarya downstream based on discriminant analysis

Runoff forecasts for Amudarya downstream by the multiple regression and optimal averaging aprroaches



Monthly runoff

Runoff for vegetation period

Drought indices use (validation is 75-90%)

Multiple regression approaches (validation is 75-95%)

APPROACHES TO FORECASTING WATER AVAILABILITY IN AMUDARYA DOWNSTREAM

Discriminant analysis use (validation is 85-95%)

Optimal averaging approaches (validation is 81%)

RECOMMENDATIONS ON AGRO CONSERVATION AND WATER SAVING PRACTICES FOR AMUDARYA DOWNSTREAM FOR THE LOW WATER OR DROUGHT PERIOD

Hydrotechnical activities

Agrotechnical activities

Operational activities

A Cemetery of Ship, Aral Sea, Qoraqalpoghiston, Uzbekistan

©UNDP Uzbekistan/2008

This multi-country Central Asian Climate Risk Management Programme was developed at the initiative of member-state governments, and aimed to enhance co-ordination of existing climate risk management approaches across this climate change-vulnerable region.

The project developed a knowledge platform, [33,34] to assist five Central Asian countries in adjusting their national development processes to address risks posed by climate variability and climate change. It is designed as a regional mechanism to improve the availability and accessibility of climate risk management data and information in Central Asia, as well as to facilitate learning and information sharing among countries.

In Uzbekistan, the 'Central Asian Climate Risk Management Programme' worked on mitigating the potential impacts of natural disasters related to climate change. It helped ensure the integration of climate risk management in the development of key strategies and plans. The project was designed to reduce climate risks, enhance adaptive capacity, and encourage the development of early warning measures, while also creating a basis for attracting long-term investments aimed at increasing resilience to climate impacts.

Turkmenistan

©Natalia Olofinskaya/UNDP Turkmenistan

33 Climate Risk Knowledge Platform for Central Asia http://www.ca-crm.info/en/

34 Climate Risk Knowledge Platform for Central Asia http://www.ca-crm.info/en/ca-crm-programme/ca-crm-programme-regional-project

New equipment for local nature protection agencies.

©UNDP Kyrgyzstan/2012

In Kyrgyzstan, the experiences of the regional project, together with the UNDP-supported 'Environment Protection for Sustainable Development Project' [35] led to the adoption of the 'Programme on Adaptation to Climate Change in Emergency Situations Sector', which will continue the work on early warning systems and introduce construction norms that consider dangerous climate effects.

Want to brainstorm new methods of adapting to climate change?

Ask the brightest students. In 2013, the project helped organise the Sight in EXPO 2017 [36] competition in Almaty, which brought students from Kazakhstan, Kyrgyzstan, and Uzbekistan together to propose practical technologies to save energy and water. Student proposals included water-saving uses of artesian wells, economical uses of irrigation water, the collection and use of rainwater, and schemes for solar water heating. Young participants not only had the opportunity to present their novel ideas, but also the chance to learn to develop proposals to implement them. A selection committee received more than 70 proposals, and named 15 as winners. Students who won had opportunities to realise their ideas with support from the project.

The project worked successfully in the agriculture and food production sectors, and built capacities of farmers on water availability forecasts and water saving approaches. In addition, a drought early warning system was tested and piloted. Finally, various exchange and learning activities were supported, and a group of farmers had the opportunity to learn from Kazakh and Slovenian experiences and best practices in drought monitoring, forecasting, and management.

35 http://www.kg.undp.org/content/kyrgyzstan/en/home/operations/projects/sustainable_development/env-protection-for-sustainable-development.html

36 https://www.expo2017.com/en/p/kyrgyzstan-predstavil-svoj-pavilon-expo

CASE STUDY 3: MOLDOVA NATIONAL ADAPTATION PLANNING

Project Title:	**Supporting Moldova's national climate change adaptation planning process**
Implementing Partner:	Climate Change Office, Ministry of Environment of Moldova
Project Budget:	US$1.17 million (Austrian Development Cooperation Agency (ADC/ADA); the Federal Ministry of Agriculture, Forestry, Environment and Water Management of the Republic of Austria)
Period:	2013-2017
LOCATION	Moldova national-level project
Beneficiaries:	4,596 direct beneficiaries, including 70 decision-makers and civil servants from 7 key ministries across 6 districts; NGOs and community groups; 3,853 farmers benefitting from the small grant programme, 654 participants of trainings and seminars.[37]

37 Supporting Moldova's National Climate Change Adaptation Planning Process: http://www.md.undp.org/content/moldova/en/home/operations/projects/climate_environment_energy/climate-change-adaptation-planning-process-in-moldova.html

In the Sîngerei district in the north of Moldova, Victor Burcovschi is the owner and manager of a large vegetable farm. His grant has provided the funding and support to build a reconstructed reservoir that uses snowmelt and rainfall to bolster groundwater storage ponds, ensuring that crops can continue to be irrigated during heat waves and droughts. Photo taken during seminar organized by the Climate Change Office of Moldova.

©Alexandru Chiriac/UNDP Moldova

Mr. Stefan Ocara, owner of a local farm in Marinici and renewable energy grant recipient.

©UNDP Moldova/2016

Old Orhei, Chisinau

©V. Corcimari/UNDP Moldova

PROJECT SUMMARY

Objective: To ensure that Moldova has a system and capacity in place for medium- to long-term adaptation planning and budgeting, with the overall aim to reduce the vulnerability of the population and key sectors to the impacts of climate change.

Background: Moldova's economy, population, and environment are highly vulnerable to climate variability and change. Climate variability is already challenging Moldova's development and future climate change projections show a wide range of impacts across all sectors.

Strategy: The project contributes to the creation of an adaptation-enabling environment through the development of institutional and policy frameworks for medium- to long-term climate change adaptation planning. The capacity-building efforts focus on strengthening the institutional and technical capacities for iterative adaptation planning and reporting. The implementation of concrete adaptation measures in priority sectors at the local level contributes to reducing the vulnerability to climate change of the most vulnerable districts, encouraging innovative ideas that enhance community resilience. Integrating gender perspectives throughout project activities - and incorporating these perspectives into policy documents - ensures equal participation of men and women in the decision-making process, and in the implementation of adaptation actions.

Key results: The project also contributed to an enabling environment for climate change adaptation by utilising sector-specific strategies and the implementation of action plans in two sectors (health and forestry).[38] Another two sectors (energy and transport) proposed adaptation measures for mainstreaming into sectoral development planning. A climate change adaptation mainstreaming approach was applied to local level development strategies in six of Moldova's most climate-vulnerable districts.

38 Ibid.

This project builds upon the findings of Moldova's Third National Communication to the UNFCCC and upon strategic directions outlined in the national Climate Change Adaptation Strategy (CCAS). The NAP project was co-ordinated with, and directly supported, the objectives and implementation of the CCAS.

To achieve its objectives, the project focused on three interlinked areas of work:

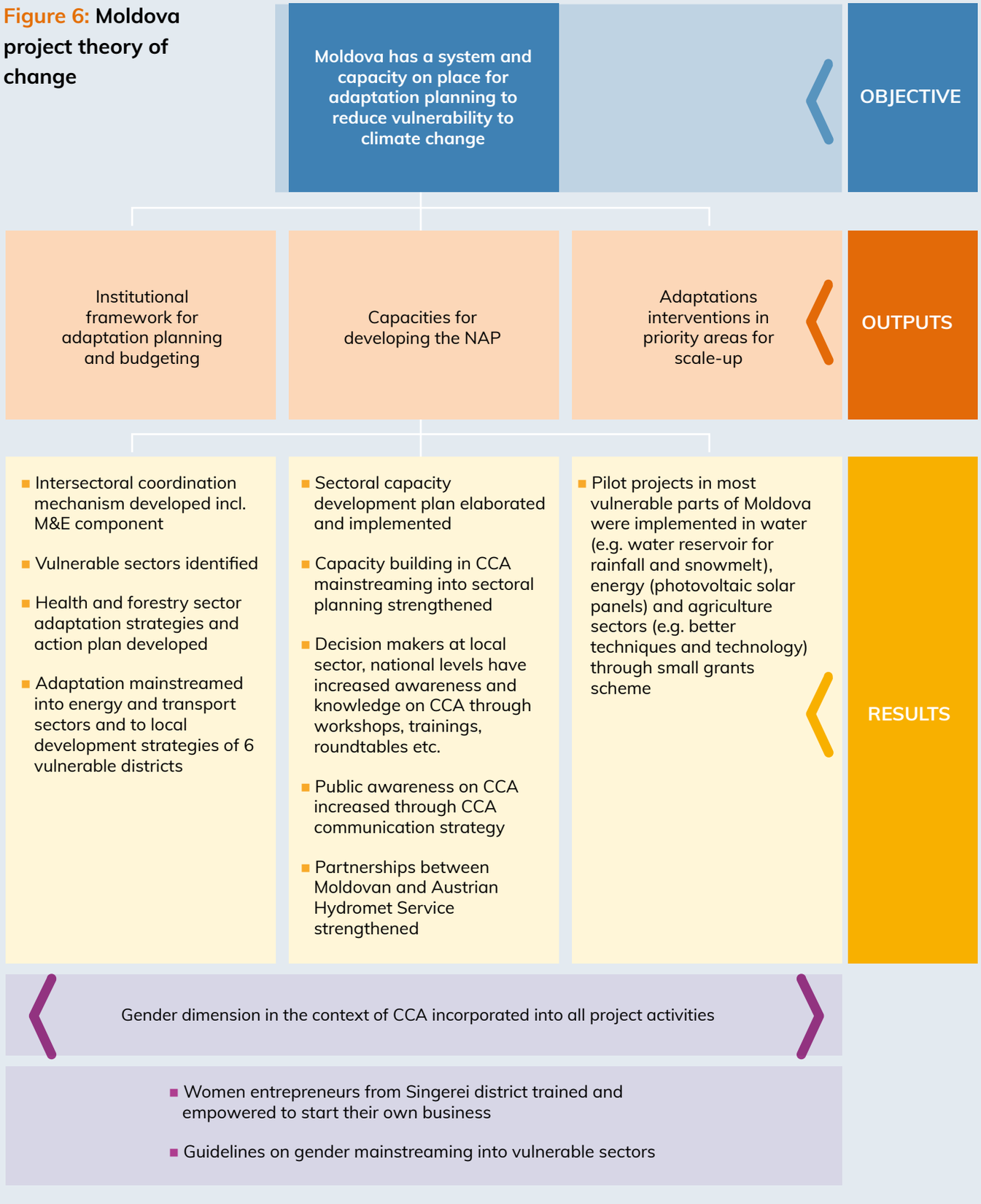
i) institutional and policy frameworks for medium- to long-term gender-sensitive adaptation planning and budgeting;

ii) institutional and technical capacities for iterative development of a comprehensive NAP; and

iii) implementation of adaptation interventions in priority sectors including demonstration projects at the local level to catalyse replication and scaling-up.

Figure 5: Moldova project interlinkages

Figure 6: **Moldova project theory of change**



Institutional Capacity Assessment. The Institutional Capacity Assessment (ICA) was undertaken in seven key sectors (water, agriculture, energy, health, transport, forestry, and regional development) during the initial steps of the NAP process. The ICA revealed systemic gaps in: i) information and processes for integrating climate change adaptation; ii) sectoral vulnerabilities and barriers to implementing adaptation measures; iii) organisational and institutional capacity constraints to effective climate change adaptation planning; and iv) technical capacity gaps in sectors which enable integration of climate change adaptation into planning. The ICA was supported by a self-assessment questionnaire-based survey undertaken by 38 institutions in seven sectors. It revealed capacity gaps across all climate-related dimensions. Based on the assessment, a two-pronged approach to developing and strengthening institutional capacity and adaptive responses was outlined in the Capacity Development Plan. The Capacity Development Plan aimed to: i) develop and strengthen enabling institutional capacity, addressing co-ordination, institutional change, and budget mainstreaming; and ii) develop and strengthen adaptive institutional capacity through climate awareness, human resources, and risk management information and technologies.

Creation of a policy framework for NAP. Mainstreaming climate risk management in Moldova's sectoral planning included incorporation of priority adaptation responses into sectoral strategies and action plans in four priority sectors. Climate change strategies and associated action plans were developed for the health and forestry sectors. Sectoral development policies and plans for the transport and energy sectors were revised to include climate risk management objectives. Based on the experience of mainstreaming climate change adaptation into the transport and energy sectors, a new guidebook entitled 'Mainstreaming Climate Change Adaptation into Moldova's Policy and Planning' was developed. Climate change adaptation was mainstreamed into local socio-economic development strategies in six districts of Moldova: Singerei, Falesti, Nisporeni, Calarasi, Basarabeasca, and Leova.

Strengthening institutions at the national, sectoral, and district levels to enhance adaptation planning capacity. During the NAP process, awareness was raised among all sectoral stakeholders, resulting in enhanced ownership and leadership. Through the knowledge sharing and training events, stakeholders increasingly engaged in the NAP process, particularly in setting

The reconstructed reservoirs will help increase harvests of vegetables in two rural districts in Moldova by 30+%.

©UNDP Moldova/2016

Sheep in fields in Ghetlova, one of the sites that has been part of the EU-UNDP Clima East project's carbon stock inventory of 5,890 ha of pasture lands.

©UNDP Moldova/2016

Rehabilitating soils is the linchpin for economic success and environmental sustainability in Moldova.

©UNDP Moldova/2016

up institutional arrangements, and monitoring and evaluation (M&E). Participatory approaches and tools have been applied to increase stakeholder knowledge on climate change adaptation and on medium- and long-term adaptation planning. Policies and plans have been analysed from a climate risk perspective at the sectoral level. This further contributed to the integration of climate change adaptation and gender considerations in sectoral and local development plans. A wide range of communication tools - dedicated websites, newsletters, media and publication materials, TV and radio broadcasts - contributed to the effective dissemination of the initiative. The project engaged with a broader audience through social media, including via Facebook, Instagram, YouTube, Flickr, Issuu, and UNDP websites.

Improved climate information services for decision-making at the national and sectoral levels. Among the many capacity-building activities implemented within Moldova's NAP support project, special efforts were focussed on improving data availability, climate information quality, management, and dissemination by the State Hydrometeorological Service (SHS) of Moldova in line with the standards of the World Meteorological Organization (WMO). In partnership with the Central Institution for Meteorology and Geodynamics of Austria (ZAMG) the project supported the SHS in becoming a member of the Meteoalarm [39] community under the European Meteorological Services Network (EUMETNET).

Stakeholders co-operative action on adaptation. In addition to sectoral adaptation strategies, an integrated cross-sectoral approach was introduced through the establishment of the Climate Change Adaptation Coordination Mechanism (CCACM). Stakeholders from all sectors, and especially the key, most vulnerable sectors, were empowered to participate in adaptation planning and implementation. The CCACM is built upon the existing National Commission on Climate Change and comprises actors of horizontal, inter-sectoral, and vertical planning, as well as subnational representatives, therefore ensuring dialogue between national and subnational governments. The NAP M&E framework was developed to assess the relevance and effectiveness of adaptation polices, planning, and action. Several M&E tools were applied, including: i) climate change risk and vulnerability assessments; ii) sectoral indicators to monitor progress against climate change adaptation priorities; iii) cross-sectoral indicators and a scorecard to measure institutional capacities and progress made in developing an enabling environment; and iv) national

39 Meteoalarm is an online service providing real time severe weather warnings to 30 European countries. It is a result of the EMMA project initiated by EUMETNET.

Young people from Chiscareni participate in a flash mob with the message "Cheaper. Cleaner. Now in my village, too" at the launch of the inter-community enterprise "Servcom-Chiscareni".

©UNDP Moldova/2016

climate expenditure reviews to examine whether public expenditures on climate change adaptation are aligned with programme goals and are allocated in a cost-effective manner. The M&E framework is supported by an information system, incorporating reporting procedures, data storage and analysis, a repository of adaptation-related materials, and other associated information.

Gender and climate change adaptation. Gender mainstreaming in climate change adaptation planning was addressed through awareness raising, guidelines, publications, public consultations, and by incorporating a climate component into existing gender-specific national policies. A successful collaboration between the Ministry of Environment, the Ministry of Labour, Social Protection and Family, and UNDP Moldova was established during the development of the Moldova Gender Equality Strategy for 2017-2021. A dedicated chapter of this strategy addresses the issue of gender and climate change, in particular, climate change adaptation. The success story 'Women leading the way to climate-resilience in Moldova', posted on national and UNDP media platforms emphasised the role of women-entrepreneurs at the local level and can be seen as a source for replication of best practices. Through the project community-based small grants scheme, the access of women to information, training, and funding was secured. As part of these efforts, the female-led pilot project 'Green energy for entrepreneurship activities' was supported.

GENDER DIMENSION IN THE CONTEXT OF CCA WAS INCORPORATED INTO ALL PROJECT ACTIVITIES

Pilot adaptation initiatives and scaling-up strategies. The Small Grant Scheme helped to engage local stakeholders, including Local Public Authorities (LPAs), regional development agencies, the private sector, and NGOs in climate change adaptation planning and action. The information campaign encouraged discussion and the generation of innovative ideas on local community resilience in the agriculture, water, and energy sectors. The private sector demonstrated strong engagement with planning and implementing selected adaptation actions.

Pilot adaptation initiatives and scaling-up strategies. The Small Grant Scheme helped to engage local stakeholders, including Local Public Authorities (LPAs), regional development agencies, the private sector, and NGOs in climate change adaptation planning and action. The information campaign encouraged discussion and the generation of innovative ideas on local community resilience in the agriculture, water, and energy sectors. The private sector demonstrated strong engagement with planning and implementing selected adaptation actions.

3. Advancing cross-sectoral climate-resilient livelihoods

UNDP is scaling up climate resilient livelihoods and risk management by supporting countries to advance sustainable economic development in rural areas, provide improved climate information and early warning systems, and promote the sharing of climate-smart tools, training, and techniques.

Local climate shocks and extreme weather events such as floods and droughts are changing and deepening the risks already faced by poor and vulnerable people, particularly those involved in agriculture and other ecosystem-dependent livelihoods, with dire implications for their livelihoods and welfare.

UNDP worked with countries throughout the ECA region to improve livelihoods and advance cross-sectoral approaches that help communities become more resilient. In Armenia, UNDP piloted climate resilient agricultural practices and reduced vulnerability to climate-induced forest fires. Flood forecasting and early warning systems were piloted in Azerbaijan and Georgia to increase resilience of local communities to increasing climate-induced flood risks. Projects in Uzbekistan and Turkmenistan supported resilience of rural agricultural livelihoods to droughts and water scarcity.

Notably, the impacts of the Georgia early warning systems project are being scaled up through a new GCF-financed project on 'Scaling-up multi-hazard early warning system and the use of climate information'.[40]

40 Learn more about the project: http://adaptation-undp.org/projects/scaling-multi-hazard-early-warning-system-and-use-climate-information-georgia.

CASE STUDY 4: LOCAL DEVELOPMENT PLANNING FOR RESILIENT RURAL COMMUNITIES IN ARMENIA

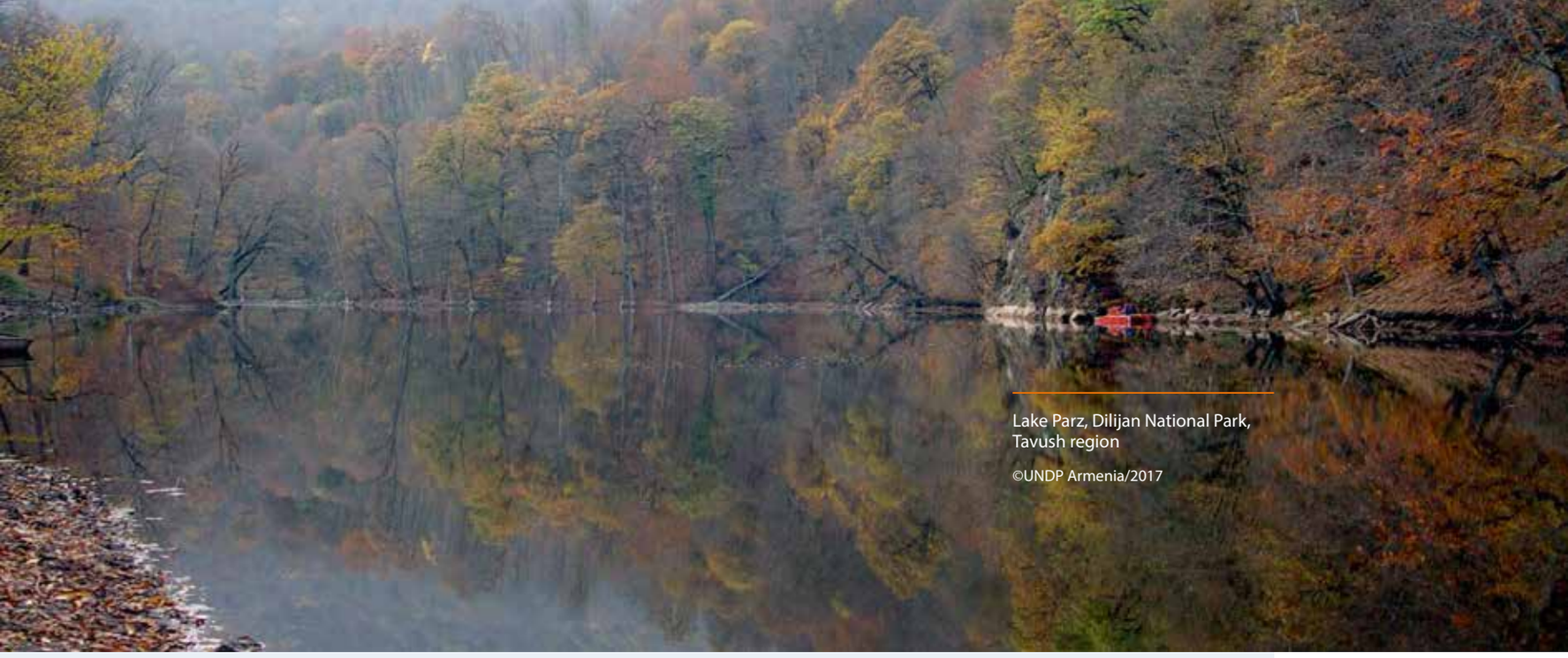
Project Title:	**Mitigation of climate change risks of rural communities through improved local development planning in Armenia**
Implementing Partner:	UNDP Armenia
Project Budget:	US$0.5 million (UNDP, Bureau for Crisis Prevention and Recovery (BCPR))
Period:	2013-2016
LOCATION	Tavush and Vayots Dzor regions of Armenia, 43 rural communities
Beneficiaries:	1,500 people directly and 6,000 people indirectly

As part of the EU-UNDP Clima East Pilot Project - in collaboration with the UNDP-GEF Small Grants Programme milk production was enhanced for rural farmers.

©UNDP Armenia/2017

EU-UNDP Clima East project worked to improve pasture management and enhance rural livelihoods.

©UNDP Armenia/2017



Lake Parz, Dilijan National Park, Tavush region

PROJECT SUMMARY

Objective:	To enhance the climate resilience of Armenia's agricultural sector and ensure national ownership through enhanced institutional knowledge and responsibility.
Background:	The disaster risk reduction (DRR) policies and plans in Armenia do not sufficiently incorporate climate risk management aspects, and the institutional mechanisms for anticipatory planning are generally weak. This includes limited capacity of national agencies in data processing, analysis, and sharing which translates into inadequate climate information and early warning systems. In addition, there was limited knowledge about climate change risks and vulnerability, and appropriate adaptation and resilience-building mechanisms at the rural community level. Armenia was one of six countries participating in the Global Project funded by the Government of Sweden.
Strategy:	The project supported the integration of climate risk management into national disaster risk reduction strategies, improving planning processes at the local level, strengthening early warning systems, and enhancing capacities of hydro-meteorological and agricultural extension services. Pilot climate risk management approaches and measures were implemented at the community level.
Key results:	The project improved early warning systems by providing automatic weather stations to the national Hydrometeorology Service and equipping the emergency call centre. A number of climate risk management measures were successfully piloted, including rehabilitation of 1.6 hectares of agricultural land, strengthening 96 metres of the Yeghegis River bank, as well as developing reinforcement plans for seven segments of local river banks. About 3,000 trees have been planted on two project sites, and 2.25 hectares of mudflow-prone areas were strengthened. The project supported 50 full-time jobs and created around 90 temporary jobs.

Solar drying station for apricots in Tavush, Armenia.

©UNDP Armenia/2012

This project was a part of UNDP's broader work on climate risk management, which includes building capacities to manage risks, providing stakeholders with relevant decision-support information, and promoting risk reduction solutions. The programme integrated disaster risk reduction and climate change adaptation approaches.

Project activities built upon the results of the Climate Risk Management-Technical Assistance Support Project (CRM-TASP) implemented in Armenia since 2008. The project mainstreamed climate risk management into the agricultural sector and strengthened the adaptive capacities of vulnerable communities. The project supported the integration of climate risk management into national DRR strategies to strengthen evidence-based decision making for climate risk management at both the national and community levels. It also supported climate resilient community development planning and strengthened early warning systems.

The survey, covering 715 households, showed that knowledge and awareness on climate change impacts and relevant mitigation and adaptation options increased in target communities. The mainstreaming of climate risk mitigation and adaptation measures into community development plans in selected target communities was done in a participatory fashion, with the involvement of UNDP national experts and community leaders.

Villages of Voskepar and Voskevan in Tavush region on the Azerbaijani border where UNDP has a greenhouse project. Beneficiary family, elementary school, people living under threat of shooting due to conflict.

©UNDP Armenia/2016

Her-her community cooperative member, Nune Abrahamyan working in her newly-planted apple orchard.

©Caroline Berger/Oxfam

A typical deforested area where climatic conditions, together with overgrazing, have prevented natural regeneration and have led to significant soil degradation.

©UNDP Armenia/2012

6,000

Around 6,000 people from more than 50 communities benefitted from the various activities of this project. For example:

131

131 people from 43 rural communities were trained on climate change risk management and risk mitigation activities

33

33 rural households directly benefitted from drip irrigation systems for 27 greenhouses in three communities

13

13 farmers from two communities received a total of 30,000 linear metres of anti-hail nets to protect their vineyards

3

Three rural households have obtained year-round job-security by operating a 260m^2 passive solar greenhouse

10

Farmers groups were constituted by 10 households for the management of a newly established 1.6 ha mountainous terrace orchard

50

50 households benefitted from new self-employment opportunities and livelihood improvement

In addition to this, the project generated a strong sense of ownership in the outcomes and helped increase the skills needed to develop more resilient communities.

CASE STUDY 5: CLIMATE RESILIENCE OF FARMING COMMUNITIES IN DROUGHT-PRONE REGIONS OF UZBEKISTAN

Project Title:	**Developing climate resilience of farming communities in the drought-prone parts of Uzbekistan**
Implementing Partner:	Centre on Hydro-meteorological Services under the Cabinet of Ministers of Uzbekistan (Uzhydromet)
Project Budget:	US$5.2 million (Adaptation Fund)
Period:	2014-2019
LOCATION	Karakalpakstan Republic
Beneficiaries:	40,000 farmers

A village in Uzbekistan adapts to climate change, and raises incomes.

©UNDP Uzbekistan/2017

Solar panels capture sunshine for energy in rural areas.

©UNDP Uzbekistan/2017

Karakalpakstan, an arid village in rural Uzbekistan, suffers severe water scarcity. With UNDP support, new agricultural techniques will advance more efficient uses of water resources.

PROJECT SUMMARY

Objective:	This project is the first large-scale climate adaptation initiative in Uzbekistan that seeks to develop climate resilience among farming and pastoral communities in drought-prone areas, specifically in Karakalpakstan Republic.
Background:	Karakalpakstan is the most economically disadvantaged region in Uzbekistan, and simultaneously the most vulnerable to climate change. Due to its location at the tail end of the Amudarya River, and given its arid hydro-climatic conditions, it suffers severe water scarcity. Previous unsustainable environmental management and inefficient water use adversely affected water availability in the region. Climate change further aggravates water scarcity, land degradation, desertification, and severe drought conditions. Yields of crops such as cotton and wheat, and supplies of forage for livestock - all vital to regional livelihoods - have fallen in recent years.
Strategy:	This project aims to establish an early warning system that informs local communities and water management authorities about drought risks and weather patterns. The project promotes new agricultural techniques to advance more efficient uses of water resources, and landscaping measures addressing land degradation and desertification. Communities are encouraged to collaborate and work together on pasture rehabilitation and water-efficient farming methods.
Key expected results:	Farmers will be better prepared for climate-induced droughts and more able to mitigate potential losses. New agricultural techniques, irrigation and drainage practices, and land use changes will cut water consumption by up to 20%, while over the medium-term, crop yields will increase by as much as 20% for households and up to 50% for 40,000 mostly subsistence farmers. Reforestation and other land restoration measures will improve soil conservation and moisture retention on over 1 million ha, and will employ at least 75,000 community members. Subsequent seasonal rehabilitation and maintenance work will provide another 25,000 jobs.

According to UN Environment's aridity index, [41, 42] most of Uzbekistan's territory is classified as a drought zone, susceptible to land degradation and desertification. Karakalpakstan, the project pilot region, is the most vulnerable administrative province in Uzbekistan based on assessments taking into account climate change and socio-economic factors.

Drought is the biggest climatic hazard in Uzbekistan, both in terms of areas covered and population affected. Droughts have serious impacts on agriculture, upon which most of Uzbekistan's population depends. In 2000, 2001, and 2008 a series of severe droughts dried up numerous artificial lakes in Karakalpakstan, leaving many villages without water.[43]

When the 2008 drought happened, Ismail Allaniyazov, a farmer in the Kegeli district of Karakalpakstan, witnessed the heat killing cattle and destroying crops. He estimates that every year his farm loses as much as 20 per cent of its potential yield due to water shortages, while droughts can push losses to 40 per cent or higher.

Dayletniyaz Kadyrbaev in the Chimbay district also reports how more frequent droughts have caused irrigation and drinking water shortages for his farm and family. Many of his pastures can no longer be used, because without water their soil turns into dust.

Through the UNDP project, some

40,000 farmers

like Allaniyazov and Kadyrbaev will be able to more accurately plan their farming and irrigation work on the basis of improved climate information and forecasts, thereby giving them a far better chance of sustaining their livelihoods. And this is just the beginning of a much more comprehensive and systematic approach to adapt to a warming climate in Uzbekistan.

41 http://www.uz.undp.org/content/uzbekistan/en/home/presscenter/pressreleases/2016/07/21/a-step-forward-in-strengthening-uzbekistans-readiness-for-access.html

42 The UN Environment aridity index is based on the ratio of rainfall to potential evapotranspiration (Middleton & Thomas, 1992, 1997)

43 Uzbekistan's Losing Battle Against Drought. 2016. http://www.eurasianet.org/node/79676

> **Thanks to the project, now we have engineers, technicians, and farmers who can proceed with laser levelling unassisted in the Northern districts. The laser levelling technology will gradually replace old and ineffective land cultivation techniques**
>
> - Mr. Oserbay Kzakbaev, Chimbay district

The inhabitants of Kyzyl Ravat, a remote village in the Kyzylkum desert of Uzbekistan, have employed a range of techniques to improve herding and breeding practices for their sheep and cattle.

©UNDP Uzbekistan/2011

The project is developing a Drought Early Warning System (DEWS) based on the assessment and modelling of water flows and water availability in downstream Amudarya. The DEWS integrates data from an expanded and automated hydro-meteorological observation network, and will include modules for the dissemination and communication of climate information to end users, including decision makers and vulnerable communities.

As a result of these improved practices, the inhabitants of Kyzyl Ravat raised the productivity of their cattle by 36 percent and increased their income by 32 percent.

©UNDP Uzbekistan/2016

> **We are waiting for reliable information on water availability and respective evaluation of the possible extent of droughts. We need reliable information in advance so that we can be prepared for a drought**
>
> - Mr. Marat Seyjanov, Kalynkul district

The project also helps promote and scale-up the use of water saving techniques by farmers. For example, laser levelling is among the effective water saving technologies in crop production, previously only implemented in a small part of Karkalpakstan due to limited capacity. The project organised trainings of farmers and local stakeholders in all five pilot regions to scale-up the use of such advanced technologies.

As a result of water supply improvement projects, the incidence of waterborne diseases dropped by 72 percent since June 2010.

©UNDP Uzbekistan/2012

CASE STUDY 6: CLIMATE-RESILIENT FLOOD AND FLASH FLOOD MANAGEMENT IN GEORGIA

Project Title:	Developing climate-resilient flood and flash flood management practices to protect vulnerable communities of Georgia
Implementing Partner:	Ministry of Environment Protection through the National Environmental Agency; Ministry of Regional Development and Infrastructure; Ministry of Internal Affairs through its Emergency Management Agency
Project Budget:	US$5 million (Adaptation Fund)
Period:	2012-2017
LOCATION	Rioni River Basin
Beneficiaries:	200,000 (direct), 986,000 (indirect)

Georgia Rioni AF mission

©Natalia Olofinskaya/UNDP Georgia

Georgia Rioni Kutaisi

©Natalia Olofinskaya/UNDP Georgia

Georgia Rioni Gabion 2

©Natalia Olofinskaya/UNDP Georgia

PROJECT SUMMARY

Objective:	To improve resilience of Georgia's communities at risk of climate-induced floods and flash-floods.
Background:	The mountainous topography of the Rioni River Basin in western Georgia makes the region extremely vulnerable to floods, flash-floods, mud-flows, and landslides that result in soil erosion, damage, and losses of property, infrastructure and agricultural assets, ecosystems, and human lives. Climate change has increased the frequency and severity of these extreme events. Damages are aggravated by human impacts such as inappropriate land use, destructive agricultural practices, deforestation, and inefficient dams. As agriculture accounts for 71% of employment in the Rioni river basin, the impact on livelihoods is severe.
Strategy:	The project focusses on three pillars: development of climate resilient risk management policies; introduction of flood management practices within local communities; and establishment of an early warning system to improve the preparedness and adaptation of the local population. The project delivered direct flood protection benefits to six vulnerable communities in the Rioni river basin.
Key expected results:	The project introduced a floodplain zoning policy that integrates flood risk management into the land use planning process across Georgia. This helps guide future development in the Rioni River Basin away from the highest flood risk zones. The project designed a weather index-based flood insurance scheme founded on state-of-the-art risk modelling techniques. The hydrometeorological observation network in the basin is upgraded with 35 hydro-meteorological posts/stations for an improved flood forecasting and early warning system. Six high risk municipalities implemented community-based adaptation and flood risk reduction measures such as vegetation buffers or agroforestry, new resilient agricultural practices, and flood protection structures.
Mainstreaming and acceleration:	In February 2018, the Green Climate Fund approved a new project on 'Scaling-up multi-hazard early warning system and the use of climate information in Georgia'. See Box 3, below, for more information.[44]

44 Learn more at http://www.ge.undp.org/content/georgia/en/home/presscenter/pressreleases/2018/02/27/georgians-to-be-better-protected-from-climate-hazards.html.

Following the flood that struck on June 13, Tbilisi witnessed an unprecedented display of unity, civic duty, and teamwork as people joined together to clean up their city.

©UNDP Georgia/2015

As a result of climate change, hydro-meteorological hazards in Georgia have become more frequent and intense over the last 20 years, with floods posing a major risk for communities in the Rioni River Basin. At the same time, there are no regulations for factoring climate threats into land use and no official zoning category to designate flood risks. Institutions at all levels of government make land use decisions in the absence of credible risk information, which results in highly fragmented policy. Gaps like these undercut prospects for resilient land use and effective natural resource management, and leave people and the environment acutely vulnerable to risks.

The project assisted with the introduction of a combination of structural and non-structural measures in managing floods and flash-floods, and development of new national policies including legislation on land use and flood resilient building codes and standards. The project also introduced tools such as flood zoning policy and risk mapping, a Weather Index Insurance Scheme, and a Flood Forecasting and Early Warning System currently covering the Rioni River Basin but extendable to the other parts of the country facing similar threats. A series of studies were conducted to provide credible information about the hydro-meteorological threats in the Rioni River Basin. Trainings for national and local authorities as well as for local residents have been organised on various topics ranging from hydrological and hydraulic modelling and the incorporation of socio-economic dimensions in flood assessments to bioengineering and agro-forestry.

> **Trenching, terracing, planting bushes and hazelnut - all those simple methods can protect us for the coming water**
>
> - Mr. Nadar Khabeishvii, Saravakho resident

The project demonstrated innovative flood management practices in the Rioni River Basin. Currently, Georgia primarily employs traditional hard-engineering approaches, such as flood protection walls that are not cost-effective and do not represent a long-term solution. These traditional approaches do not address the root causes of floods, and sometimes even exacerbate damages downstream. There are better solutions that can be used both in terms of cost and resilience and they include bioengineering treatments. These can come in many forms, including the cutting of willow branches into vertical bundles with a tree revetment as protection. Combinations of live plants and dead material reduce flood damage by preventing erosion and controlling sediment.

Figure 7: Flood prevention in Rioni River Basin[45]

RIONI RIVER FLOODING ZONES

AT RISK

38,857
PROPERTIES

200,000
PEOPLE

STABILISATION AND RESTORATION OF RIVERBANKS AND SHORES ACCORDING TO THE BEST INTERNATIONAL PRACTICES

The project also mobilised local communities around adaptation measures such as planting deep-root bushes and shrubbery to minimise erosion and landslides. Farmers are learning to adopt new agricultural methods, including the planting of flood-resilient cash crops.

Traditional engineering measures remain important, and the project is designing new - and rehabilitating old - flood defences in six high-risk municipalities. Climate risk flood modelling helps ensure that the design of structures factors in likely future changes - a big step forward from the outdated Soviet techniques that are still commonly in use.

Successful practices and models tested in the Rioni River Basin can be expanded to the other regions of Georgia.

BIO-ENGINEERING OPTIONS

Planting native greenery on about 10 ha. of selected territories, to protect the slopes and shores of the rivers

About 1150 local people living in Samtredia and Tskaltubo municipalities will be protected.

HARD STRUCTURES

Construction of flood defense structures (rip-rap boulders, gabion walls etc.) on the 9 most vulnerable places, which will protect about 4 000 people from flood/flashflood.

45 Source UNDP Georgia. Flood Prevention Project for Rioni River Basin 2012-2016, http://www.ge.undp.org/content/georgia/en/home/projects/flood-management.html

BOX 6: SCALING-UP MULTI-HAZARD EARLY WARNING SYSTEM AND THE USE OF CLIMATE INFORMATION IN GEORGIA

This new project will provide increased protection for over

40 %

of Georgia's population from fast-acting floods and other natural disasters'.

The Green Climate Fund approved a new project in February 2018 that will scale up early warning systems and the use of climate information in Georgia, enhancing the resilience of 1.7 million people and their livelihoods to floods, droughts, and other heightened climate risks.

> **Climate hazards are derailing government-led efforts to reduce environmental risks in Georgia', said Levan Davitashvili, Minister of Environment Protection and Agriculture of Georgia. 'This new project will provide increased protection for over 40 per cent of Georgia's population from fast-acting floods and other natural disasters'.**

The seven-year US$70 million **'Scaling-up multi-hazard early warning system and the use of climate information in Georgia'** project is supported through the United Nations Development Programme (UNDP), and benefits from a US$27 million grant from the Green Climate Fund (GCF), coupled with US$38 million in co-finance from the Government of Georgia, as well as a US$5 million grant from the Swiss Government. The project will be implemented by the Ministry of Environment Protection and Agriculture of Georgia.

According to national estimates and Georgia's Nationally Determined Contribution to the Paris Agreement, climate hazards - without the proper adaptation measures - could cost the people of Georgia between US$10 and $12 billion from 2021 to 2030. The estimated cost of adapting to climate change in Georgia over the same time period is estimated between US$1.5 billion and $2 billion.

Improving the roads along the Rioni River was one adaptation measure undertaken in high risk areas.

©Natalia Olofinskaya/UNDP Georgia

High risk site protected by boulders

©Natalia Olofinskaya/UNDP Georgia

Rioni Rver, Georgia

©Natalia Olofinskaya/UNDP Georgia

'Investing in climate resilience is good for the economy and good for our people', said Levan Davitashvili, Minister of Environment Protection and Agriculture of Georgia. 'To date, risk management in Georgia has largely been reactive, rather than proactive. This has meant large costs to compensate the victims of floods and other natural hazards, the increased number of "eco-migrants" leaving vulnerable areas, and higher costs for recovery. This project signals a paradigm shift centred around risk reduction, prevention, and preparedness'.

The project will achieve its goals of deploying an effective nationwide multi-hazard system by scaling-up several projects and initiatives already realising positive impacts in Georgia. One example comes from the UNDP-supported project financed through the Adaptation Fund that improved forecasting and early warning systems in the Rioni Basin, promoted climate-informed development policies, and demonstrated concrete community adaptation action in the high risk areas.

> **As Georgia moves forward to achieving its national Sustainable Development Goals, Climate Action becomes a crucial priority to build the adaptive capacity the country needs to ensure climate-resilient development into the 21st Century. UNDP stands ready to assist the Government of Georgia in improving the collection of climate information, planning, and decision-making across all sectors'**
>
> - Niels Scott, UNDP Resident Representative in Georgia.

CASE STUDY 7: ICT TOOLS FOR ENHANCED URBAN RESILIENCE

Project Title:	**Increasing urban resilience by use of Information Communication Technology (ICT) for mainstreaming disaster and climate risk reduction in Armenia, FYR Macedonia and Moldova**
Implementing Partner:	UNDP Country Offices in Armenia, FYR Macedonia, and Moldova; Istanbul Regional Hub
Project Budget:	US$0.4 million (UNDP)
Period:	2014-2016
LOCATION	Municipality of Yerevan (Armenia) 22,300 ha, City of Skopje (FYR Macedonia) 181,800 ha, Ungheni town (Moldova) 1,640 ha. Total: 204,740 ha
Beneficiaries:	City administrations, national emergency management agencies, National Civil Protection and Emergency Situations service, local authorities, and the general population in pilot cities

Hale distribution process in Artsvanik community, Syunik region, Armenia

©UNDP Armenia/2006

In Slobozia Mare residents and migrants abroad gradually joined forces to form Home Town Association, now an officially registered NGO.

©UNDP Moldova/2017

Photo: Participatory planning in Yervandashat community, Armavir region.

©UNDP Armenia/2006

PROJECT SUMMARY

Objective:	Objective: to advance disaster and climate resilience in Armenia, FYR Macedonia, and Moldova by increasing institutional capacity, mobilising knowledge, and transferring appropriate best practices and technologies.
Background:	Urban communities and infrastructure in Eastern Europe and South Caucasus are increasingly vulnerable to climate variability and climate change. The rate of urbanisation is rapidly growing, and this trend is likely to persist in the coming decades. This project addresses the enhanced resilience of small- and medium-sized cities.
Strategy:	The project sought to disseminate knowledge about climate change impacts and potential adaptation strategies within the three participating countries. The strategy was to work at the local level to reduce vulnerabilities and strengthen capacities to manage climate risks. The project has three national components and one regional component.
Key expected results:	The project increased capacities in the disaster and climate risk management domains for local stakeholders. In total, 927 participants from three countries benefitted from the project. This resulted in the elaboration of eight documents (development policies, guidelines, recommendations, and concepts) and eight ICT solutions in the three target countries. Experiences were shared during regional events, including summer schools held in partnership with the Central European University and International Conference on Urban Risks.[46]

46 International Conference on Urban Risks, ICUR 2016, June 30 – July 02, Lisbon, Portugal.

Armenia, the FYR of Macedonia, and Moldova are naturally prone to various disasters; the frequency and severity of weather-related disasters have been increasing over the last few decades, in particular due to climate change. More and more people are living in urban areas, and the risks of disasters in cities are significantly increasing both globally and regionally. To minimise the effects of weather-related disasters, the project addressed both the policy/decision-making level via improving local strategies and policies, and the operational level by providing stakeholders the most effective instruments - including ICT - to raise awareness, collect data, and establish feedback mechanisms for citizens. The project had a particular focus on strengthening collaboration between the selected pilot cities of the three countries (Yerevan in Armenia, Skopje in FYR of Macedonia, and Ungheni in Moldova), where several innovative techniques and methodologies were piloted.

Governments developed their capacity to use the Local Government Self-Assessment Tool (LGSAT) [47] and innovative foresight methods. This first phase helped participating cities to set baselines, identify gaps, plan actions, and have comparable data with the possibility to advance over time. Based on the gaps assessment, interventions have been identified and implemented that:

- Strengthened the capacities of local actors through various training programmes
- Contributed to a solid strategic framework by developing several policy documents, guidelines, concepts, and action plans
- Delivered and tested ICT solutions for disaster and climate resilience

The regional project delivered eight documents and eight ICT tools to support disaster- and climate-resilient development in three participating countries as follows.

> **Smart Yerevan is a constantly developing city, where modern technologies and approaches are being used to create comfortable and safe conditions for citizens and visitors, where effective and efficient development programmes are implemented based on the needs and demand of different social groups, with consideration of optimal spatial planning schemes and all types of risk, connected with natural hazards, climate change, as well as the results of technological and human activities**
>
> - Armen Harutyunyan, Head of the Development and Investments Programmes Department

Gegharkunik Field
Demonstration Event, Armenia.

47 UNISDR 2017. Making Cities Resilient: My City is Getting Ready: http://www.unisdr.org/campaign/resilientcities/home/toolkit.

Razlovci, FYR Macedonia. The population of Razloci, is about 700, an agricultural village in Eastern FYR Macedonia which has lost nearly half its population in recent decades, due to out-migration fueled by lack of opportunities.

©Jodi Hilton/UNDP FYR Macedonia

> **Creating a green cadastre will help improve the urban resilience of the City of Skopje. Over the coming years, our city will need to develop strategies for coping with the future impact of climate change on urban infrastructure**
>
> - Vasko Popovski, UNDP Project Manager

ARMENIA

- Early warning cell phone application
- Draft Smart City concept for Yerevan Municipality
- DRM Capacity Assessment based on Sendai Framework on DRR [48] and interlinked with the Sustainable Development Goals (SDGs)
- Community-based disaster management concept pape

FORMER YUGOSLAV REPUBLIC OF MACEDONIA

- GHG Inventory for Skopje
- Heat Islands maps for the City of Skopje
- Quick Response (QR) codes for evacuation
- Geographic Information Systems (GIS) service for urban resilience
- Study on ICT platform for Urban resilience
- Flood Model for the City of Skopje
- Mitigation chapter of the Climate Change Strategy
- Training drill for urban risks in high schools
- Integrated Urban Resilience Action Plan
- Climate Change Strategy 'Resilient Skopje'
- Skopje Green Cadastre [49]
- Smart City Concept

48 The Sendai Framework for Disaster Risk Reduction 2015-2030 is the first major agreement of the post-2015 development agenda, with seven targets and four priorities for action. For more information: http://www.unisdr.org/files/43291_sendaiframeworkfordrren.pdf.

49 http://www.mk.undp.org/content/the_former_yugoslav_republic_of_macedonia/en/home/presscenter/articles/2016/02/15/creating-a-green-cadastre-to-help-make-skopje-a-greener-city-.html.

A participant at "Energel" Summer Camp in the Orhei district of Moldova created an eco-lamp that is powered by a mini solar panel that she herself designed and built. She demonstrates how the wind turbine powers the lightbulb inside the model house her co-designer constructed for Nicola Harrington-Buhay, UNDP Resident Representative in Moldova.

©Mihai Maciuca/UNDP Moldova

Helen Clark meets with Prime Minister of Moldova Vladimir Filat

©UNDP Moldova/2010

MOLDOVA

- GIS disaster information layers for Ungheni
- DRM Strategy in Ungheni town
- Action plan for DRM for Ungheni
- Regulation of voluntary activities in DRM in Ungheni

The idea to engage volunteers in prevention and preparedness for disasters came from the local working group whilst implementing the LGSAT to identify priorities for disaster and climate risk activities in the coming years.

The regional component of the project facilitated experience and knowledge-sharing on ICT tools and innovative approaches in disaster and climate risk management. Through the project, the three beneficiary countries established co-operation on disaster and climate risk reduction.

> **Changing climate brings new challenges to our life and we should include youth and adults in education and awareness raising activities. Ungheni can become a positive example for other cities and municipalities of Moldova:**
>
> - Liliana Tincu, local project co-ordinator, Ungheni City Hall

Figure 8: **The Global Goals for Sustainable Development**

CASE STUDY 8: CLIMATE-RESILIENT FLOOD RISK MANAGEMENT IN BOSNIA AND HERZEGOVINA

Project Title:	**Technology transfer for climate-resilient flood management in Vrbas River Basin in Bosnia and Herzegovina**
Implementing Partner:	UNDP
Project Budget:	US$ 5 million (SCCF)
Period:	2015-2020
LOCATION	6,386 km2 in the Vrbas River Basin
Beneficiaries:	250,000 (direct: inhabitants in the high flood risk areas), 500,000 (indirect: population of the Vrbas River Basin, of which 51% are women)

Sladjana Bundalo, UNDP BiH Project Officer, pointing out how high the water levels rose in the May 2014 flood.

©Andrea Egan/UNDP BiH

Another tributary of the Vrbas River Basin where earthworks are building up the river bank.

©Andrea Egan/UNDP BiH

Part of the Vrbas River Basin

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PROJECT SUMMARY

Objective:	To transfer technologies for climate-resilient flood risk management and to increase the resilience of highly exposed rural communities in Vrbas River Basin.
Background:	Bosnia and Herzegovina's (BiH) slow rate of post-war economic recovery is compounded by the negative impacts of climate change on key sectors such as agriculture and energy (hydropower). The frequency and magnitude of flood disasters have tripled over the last decade. The Vrbas River Basin is characterised by a large rural population comprised of the poorest and most vulnerable communities in the country, including war returnees and displaced people, with high exposure to flooding and its devastating impacts.
Strategy:	The project aims to enable communities of the Vrbas River Basin to adapt to flood risk through the transfer of adaptation technologies for climate-resilient flood management. This includes enhancing the enabling environment by embedding climate change into key sectoral policies, such as in land use and spatial planning, forestry, agriculture, and the energy sector, to enable climate-resilient flood risk management. It also involves training communities in climate-resilient flood risk management, including non-structural measures.
Key expected results:	Key relevant development strategies/policies/legislation will integrate climate change-resilient flood management approaches. Climate-resilient flood risk management is enabled by transferring modern technologies and strengthening institutional capacities. New technologies and approaches for enhanced flood risk management are applied to increase the resilience of vulnerable communities in the Vrbas River Basin.

In May 2014, Bosnia and Herzegovina experienced its worst flooding in 150 years, resulting in 23 deaths and US$2.7 billion worth of damages, equal to 15 per cent of the GDP [50]. The Vrbas River Basin is characterised by a large rural population inhabited by the poorest and most vulnerable communities, including war returnees and the displaced, with high exposure to flooding and its devastating impacts.

To develop institutional and local capacities in flood risk management, project objectives are pursued through three integrated components:

1) Enabling environment: the institutional and regulatory framework in priority sectors (agriculture, water management, hydropower, forestry, and spatial planning) will integrate climate-resilient flood risk management approaches. Specifically, the project will introduce floodplain management regulations that will enhance the zoning of development and related activities away from high-risk areas;

2) Technology transfer: modern technologies will be transferred to enable climate-resilient flood management. New technologies entail the establishment of a hydro-meteorological monitoring network, hydrological and hydraulic modelling, development of flood risks and flood hazard maps, flood forecasting and early warning systems, emergency response plans, implementation of agro-forestation schemes, and the introduction of flood insurance financial instruments. Technology transfer will be accompanied with capacity-building of local institutions; and

3) Implementation of flood risk management measures based on flood modelling and flood hazard and risk maps, which will identify the most vulnerable areas and ensure a holistic, river basin-wide approach.

So far, a network of 28 gauges has been installed in the Vrbas River basin. The establishment of a network of hydro-meteorological stations in the Vrbas River basin and the harmonisation and centralisation of hydrometric database within hydro-meteorological institutes forms the basis for establishing a flood forecasting and early warning system in the Vrbas River basin. There is no flash flood early warning system currently operational in Bosnia and Herzegovina, thus, the effective piloting of this approach can lead to replication in other river basins across the country. Similarly, the methodology for flood hazard and risk mapping developed by the project is expected to be replicated in other river basins in Bosnia and Herzegovina.

> **“This is the first project where we, as a local partner, actually have a say**
>
> - Mr. Zoran Bozovic, Director of the Hydro-meteorological institute

Zeljko Cejic, an engineer in Banja Luka, holds up a photo of his family that was damaged in the 2014 floods. “Some flood damages can never be compensated for.”

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50 UNDP. 2015. Country: Bosnia and Herzegovina. Project Document: https://info.undp.org/docs/pdc/Documents/BIH/PIMS%205241_SCCF_BH_UNDP_Prodoc%2026%20Feb%20final%20LPACed.pdf

Part of the Vrbas River Basin

©Andrea Egan/UNDP BiH

4. Ecosystem-based adaptation

UNDP supports countries to preserve and restore natural ecosystems that can provide cost-effective protection against climate change threats. Ecosystem-based approaches to climate change support resilient livelihoods, protect food and water, and ensure healthier environments.

The impacts of a changing climate on a natural resource base that is already overexploited are devastating for many communities that depend on those resources. Through this signature programme, Ecosystem-based Adaptation, UNDP is applying cost-effective win-win adaptation strategies to improve the resilience of communities, community livelihoods, and ecosystem services in the face of climate change.

This chapter focuses on ecosystem-based approaches to adaptation piloted in vulnerable areas in Armenia, Belarus, Georgia, Kazakhstan and Uzbekistan. The projects demonstrated how sustainable management, conservation, and restoration of natural and agro-ecosystems helped to reduce vulnerability and improve the resilience of people and ecosystem services to climate change impacts.

In Kazakhstan, UNDP helped strengthen the protected areas network of the Altai-Sayan ecoregion with positive impacts on community livelihoods. With support from the European Union, UNDP piloted a wide range of EbA approaches in EU Eastern Neighbourhood Partnership [51] countries through the regional Clima East programme.

51 The Eastern Neighbourhood Partnership countries consist of Armenia, Azerbaijan, Belarus, Georgia, Moldova and Ukraine. The partnership aim was to strengthen relations between these six countries and the European Union.

Karaburun Sazan Peninsula – the first and only national marine park of Albania.

©Claudia Amico/UNDP Albania

CASE STUDY 9: BUILDING RESILIENCE IN ALTAI-SAYAN ECOREGION

Project Title:	**Conservation and sustainable use of biodiversity in the Kazakhstani sector of the Altai-Sayan Ecoregion**
Implementing Partner:	Forestry and Hunting Committee of the Ministry of Agriculture
Project Budget:	US$4.85 million (GEF: US$2.4 million; Government of Germany: US$2.4 million, with co-financing of US$21.5 million)
Period:	2007-2012
LOCATION	916,132 ha (newly protected areas) in eastern Kazakhstan (Altai-Sayan Ecoregion)
Beneficiaries:	671,200 people

New-born saiga calves in Altyn Dala steppe.

©Adriana Dinu/UNDP

Altai-Sayan, Kazakhstan

©UNDP Kazakhstan/2003

Beautiful mountain meadow
in Altai Sayan

©Adriana Dinu/UNDP

PROJECT SUMMARY

Objective:	To enhance Kazakhstan's national protected areas system by demonstrating sustainable and replicable approaches to conservation management in its portion of the Altai-Sayan Ecoregion.
Background:	Stretching across China, Kazakhstan, Mongolia, and the Russian Federation, the Altai-Sayan Ecoregion is one of the last pristinely natural areas of the world; Altai-Sayan ecosystems and biodiversity are of global significance. Yet climate change has brought catastrophic flooding, forest fires, and droughts. Forest composition is changing, and the tree line has moved up in altitude. These trends are expected to continue and even worsen over time, reducing traditional livelihood opportunities for local communities.
Strategy:	The project sought to expand the protected areas network in Kazakhstan's share of the ecoregion and to protect existing forest stands by preventing forest fires and increasing resilience through reforestation. The project brought climate change mitigation and adaptation benefits.
Key results:	One new protected area was established and plans were developed for two more. Local firefighting capacities have been developed to the point where no fires were registered during the project period. New firefighting methods have been replicated in 24 protected areas across Kazakhstan. Reforestation efforts have drawn on native species best suited to withstand climatic extremes such as storms and droughts.

An escalating number of forest fires wreaked havoc on valuable habitats and local livelihoods in Kazakhstan's portion of the Altai-Sayan Ecoregion. For communities living nearby, the losses extend from curtailed incomes to damaged houses. Many people depend heavily on natural resources such as herbal grasses and shrubs, foraged mushrooms and berries, and wood from forests to heat their homes.

Fire is a major threat in Altai-Sayan.

©UNDP Kazakhstan/2017

In the past, long time lags between the start of fires and their discovery allowed them to spread over large areas. As a response, the project helped set up 18 mobile firefighting groups, each equipped and trained to monitor forest areas and extinguish fires before they cause widespread damage. Full radio coverage was installed to bolster fire detection. Fire chemical stations and sheds for storing firefighting machinery were constructed close to forested areas to speed up response times.

Staff in the ecoregion's protected areas learned firefighting basics. They were also trained on how to involve local communities in managing and protecting the areas, in a way that balances the needs of nature and people. This represented a shift from past practices, when local communities were often bypassed in decision-making. In the past, conflicts over how to sustainably use the protected areas flared at times, and local people had little incentive to comply with choices that did not always reflect their interests.

Protected areas staff took part in a process of assessing public knowledge of fire safety in forests and identifying groups with risky behaviours. This helped in devising a highly successful fire prevention campaign to boost awareness of safe practices in forests, as some fires were caused by the growing number of people visiting forests for recreation or the illegal felling of trees. The campaign crafted messages targeted to people of different socioeconomic and demographic categories, including school children.

Through the project, the Government has for the first time started involving local community members in routine forest management activities as they acquired basic skills to thin trees, fight wildfires, and manage controlled burns – all necessary requirements to maintain a healthy forest stock.

Fire trucks transferred to the project area in Kazakhstan.

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Young people often serve as the best advocates for nature.

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Firemen training in West Altai

©UNDP Kazakhstan/2017

Recognizing multiple benefits for biodiversity and ecosystem services as well as for climate change mitigation and adaptation, the project sought to expand the protected areas in the Altai-Sayan and created green corridors to connect them. In parallel, the German Government's International Climate Initiative supported the development and implementation of carbon sequestration and climate change adaptation activities.

> The combined effect of these measures has been the protection of a significant carbon sink in high conservation value virgin forest areas, estimated to harbour over
>
> **100 million**
>
> tonnes of carbon stored in dry above-ground biomass.

The benefit in emission reduction is expected to occur mainly because of a reduction in fires. The project also supported a range of adaptation measures including reforestation with native species best suited to withstand climatic extremes (e.g. storms and droughts).

CASE STUDY 10: SUSTAINABLE PASTURE MANAGEMENT IN GEORGIA

Project Title:	Clima East: Sustainable pasture management in Georgia
Implementing Partner:	UNDP, Agency of Protected Areas of Georgia
Project Budget:	US$1.36 million (EU)
Period:	2013-2016
LOCATION	35,000 ha in Dedoplistskaro region
Beneficiaries:	Agency of Protected Areas of Georgia, Vashlovani Protected Areas administration, Association 'Tush Shepherd', Akhmeta Municipality, Dedoplistskaro Municipality, shepherds

Field visit to a wheat farmer with NGO Elkana, Georgia.

Kazbegi, Georgia

©Andrea Egan/UNDP

PROJECT SUMMARY

Objective:	To rehabilitate 4,064ha of degraded pastures in the Vashlovani Protected Areas, and to introduce sustainable pasture management practices among the farmers in the Dedoplistskaro region.
Background:	Weak pasture management practices have resulted in the unsustainable use of pastures and land degradation, negatively affecting the carbon stock of the pastures and protected areas.
Strategy:	The aim of the project is to introduce ecosystem-based adaptation to climate change through sustainable pasture management. Improved pasture management results in an improved quality of pastures, better carbon stock, and enhanced resilience of ecosystems and ecosystem-dependent livelihoods. The project activities were conducted in pastures at different levels of degradation within and around the Vashlovani protected areas, which include: i) rehabilitation of pastures, ii) introduction of sustainable land management practices, iii) improved sustainable livelihoods of farmers.
Key results:	A sustainable pasture management plan was prepared for 16,000ha of pastures, and a pasture policy discussion panel was established. Capacities of local shepherds for improved pasture management were increased. Two water supply systems have been set up, with direct impacts on 15 farms via the prevention of disorganized movement of sheep herds to water sources. Two automatic meteorological stations were installed and two pilot farms were set up to demonstrate sustainable pasture management best practices. The project established veterinary service for Tush transhumant shepherds. Methods for migratory route rehabilitation were introduced across 300ha of land.

Garsevan Garsevanidze,
Tush shepherd in the VPA.

> **Sheep are our main source of income. There is lambing time, followed by milk and cheese production. Our life depends on this income.**
>
> - Otar Parelidze, Shepherd

Located in the southeasternmost part of Georgia along the border with Azerbaijan, the Vashlovani Protected Areas (VPAs) include a strict Nature Reserve and a National Park with a total area of 35,053.7ha. The VPAs have a rich natural, historical, and cultural heritage. In addition to the rare and threatened species that exist within park boundaries, the VPAs provide opportunities for transboundary migration, benefitting key species such as migratory gazelles. The park is used by traditional transhumant Tusheti shepherds who have their winter pastures in the park. Tushetis consider sheep breeding as their traditional occupation, and as the most profitable activity in the region.

The Tush shepherds have a very close relationship with their environment. However, previous unsustainable uses of pastures, coupled with the negative effects of climate change, have led to a loss of vegetation and biodiversity, increased land erosion, and hastened desertification processes. The cutting of trees for wood, and the setting of intentional fires on the park's periphery – previously thought to improve pasture productivity - has compounded the erosion of soil surfaces and the degraded ecological condition of the pastures.

Thus, the project rehabilitated pastures and migratory routes within the VPA, introduced and promoted sustainable land and pasture management practices, and secured climate-resilient livelihoods for the local population.

The project targeted those pastures located in the VPA and surroundings suffering from varying levels of degradation using EbA to climate change. Noting that the majority of the pastures are located near main roads and residential areas - and are therefore prone to overuse - the project worked to highlight how these areas can be productively and sustainably used at the same time.

A sustainable Pasture Management Plan was prepared for more than 16,000ha of pastures within the Vashlovani National Park to incentivise long-term sustainable use of pastures by traditional users. For the first-time, Pasture Management Units were identified along with their carrying capacities. The plan offers activities for sustainable pasture use and provides recommendations.

To lower the pressure on migratory routes, and to decrease the distance shepherds need to take their sheep to find water, two water supply systems were installed in the park, and five new watering points supporting 15 farms were created in the area adjacent to the park.

With an understanding of how critical the collection of current climate data is, the project also supported the installation of two automatic meteorological stations and their connection to the national meteorology system.

> The lack of veterinary service was a major constraint on local livelihoods. As such, a unified veterinary service was established for Tush shepherds. In 2016, the service started providing veterinary treatment to the first batch of
>
> **5,000 sheep.**

The pilot activities of the project were designed with a vision of securing sustainability and replication of results in other pastureland areas of the country.

BOX 7:

WHAT IS CLIMA EAST?

Clima East (2013-2017) was a European Union funded project package assisting the Eastern Neighbourhood Partnership Countries and Russia in approaches to climate change mitigation and adaptation. The €19.2 million package consisted of two components: the first, with a budget of €11 million and implemented by UNDP, consisted of a number of Pilot Projects that supported the development of ecosystem-based approaches (EbA) to climate change; the second is a Policy component that seeks to foster improved climate change policies, strategies, and market mechanisms in the partner countries by supporting regional co-operation and improving information access to EU climate change policies, laws, and expertise.

The pilot projects implemented by UNDP include:

- Sustainable management of pastures and forest in Armenia to demonstrate climate change mitigation and adaptation benefits and dividends for local communities;
- Ecosystem-based approaches to climate change in Azerbaijan;
- Conservation and sustainable management of peatlands in Belarus to minimise carbon emissions and help ecosystems to adapt to climate change, while contributing to overall mitigation and adaptation efforts;
- Sustainable management of pastures in Georgia to demonstrate climate change mitigation and adaptation benefits and dividends for local communities;
- Sustainable management of pastures and community forests in Moldova's first National Park - Orhei - to demonstrate climate change mitigation and adaptation benefits and dividends for local communities;
- Conservation and sustainable use of peatlands in Ukraine; and
- Conservation and sustainable management of peatlands in Russia to minimise carbon emissions and help ecosystems to adapt to climate change.

Clima East projects complement UNDP, GEF, and regional partners' work on EbA and mitigation. Knowledge generated by the Clima East programme will contribute to a sound base for future climate change adaptation in each of the respective countries and in the region. Tools, technical guidelines, experiences, and lessons learned have been shared regionally and globally, to enhance the capacity to plan for and respond to climate risks.

Source: http://www.climaeast.eu/

CASE STUDY 11: CONSERVATION AND SUSTAINABLE MANAGEMENT OF PEATLANDS IN BELARUS

Project Title:	**Clima East: Conservation and sustainable management of peatlands in Belarus**
Implementing Partner:	Ministry of Natural Resources and Environmental Protection of the Republic of Belarus
Project Budget:	US$1.498 million (EU)
Period:	2014-2017
LOCATION	Zvanec and Sporaŭskae peatlands (15,000 and 18,000ha respectively)
Beneficiaries:	South-east Europe Republican Biological Reserve Sporaŭski (direct) and Biaroza district, population 63,710 (indirect), South-east Europe Republican Landscape Reserve Zvanec (direct) and Drahičyn, population 37,522 (indirect) and Kobryn districts, population 85,436, (indirect).

Coordinating traditional haymaking festivals is a good way of connecting with local communities.

©UNDP Belarus/2016

Local farmers compete as part of the haymaking festival's activities.

©UNDP Belarus/2016

Sporauskaje peatlands, Belarus

©UNDP Belarus/2016

PROJECT SUMMARY

Objective: To strengthen the country's capacity to mitigate and adapt to the climate change through conservation and sustainable management of peatlands.

Background: Conservation and sustainable use of peatlands by means of managing vegetation and water conditions has become a crucial factor underpinning sustainability in recent decades that were marked by intensified human activity. Increasing use of shrubby and woody biomass from peatlands is a clear trend of local energy markets, and has become a means of substituting renewable fuels for fossil fuels. Restoring open peatlands and collecting biomass for energy, construction, and other use can become a lucrative economic alternative compared to mining peat for fuel or draining peatlands for agricultural purposes.

Strategy: The project aims to address the most critical problems of peatland conservation and management in Belarus, seeking to demonstrate innovative approaches in ecosystem-based climate mitigation and adaptation in peatlands. It is expected that the project will result in avoided emissions of 15.6 tCO^2-eq/ha/year [52] by replacing fossil fuel use with peatland biomass. Retention (non-deterioration) of fen peatland carbon capacity will amount to 360 tC/ha[53].

Key results: The project provided for the procurement of a full line of equipment for work in fen mires; constant monitoring of fen mires before, during, and after biomass harvesting; monitoring of indicator species; construction and maintenance of water-regulating facilities; and raising awareness within local and national authorities on biomass uses and potential.

52 tonnes of carbon dioxide equivalent per ha/per year

53 Fen peatland or fen mire is the regional term for peatland in Europe and Central Asia. Peat consists of partially decayed plant material, which has accumulated under water-logged conditions over long periods of time. Peatlands can be found on every continent and are regionally known as peat swamp forests, fens, bogs, or mires and are found on every continent on Earth. https://unfccc.int/files/meetings/marrakech_nov_2016/application/pdf/unep_peatland_release_en.pdf

53 tonnes of carbon stored per ha

According to a research project of the European Commission 'the soil organic carbon stock is estimated at a global scale at ca. 1,500 PgC'. [54] It is the second largest carbon pool on the globe after the oceans. Peat soils are the world's richest carbon soils, which at the same time are the most prone to releasing carbon when exposed to degradation.

In the 1950s,

54 %

of Belarus's peat-bogs were drained, and as a result, peatlands were degraded up to the point when it was no longer possible to use them either as farmlands or as forestation areas. The groundwater level fell to 0.5-0.7mm, and led to changes in botanical species range and, at times, to extinction of botanical communities, the loss of organic components in the soil and, consequently, to the increasing level of peat mineralisation and carbon dioxide (CO^2) emissions.

Sporauskaje peatlands, Belarus

©UNDP Belarus/2016

The pilot project addressed the most urgent issues of conservation and management of peatlands in Belarus and showcased innovative EbA in climate change adaptation and mitigation for marsh ecosystems. The project was implemented at Zvanec and Sporaŭskae peatlands in Drahičyn and Biaroza districts in Belarus. Zvanec and Sporaŭskae are the largest natural fen mires in Europe (15,000 and 18,000ha, respectively). With appropriate technologies and equipment, the project cut shrubs, reeds, and trees on ≈3,500ha over the project's life, producing about 2,500 tonnes of dry biomass. The project resulted in avoided emissions of 15.6 tCO^2-eq/ha/year by replacing fossil fuel use with peatland biomass.

The project delivered the equipment necessary for biomass harvesting and transportation to the South-east Europe Republican Biological Reserve Sporaŭski and trained the local personnel in care and maintenance, representing novel measures in the Belarusian context.

Construction and maintenance of water-regulating facilities and access points was completed. These facilities provide active regulation of the water table at the Zvanec Reserve that in return helps to sustain the natural condition of the peatland and conserves endangered species of plants and animals.

54 PgC - petagrams of carbon (1015 grams = one trillion kilogram = billion tonnes)

Photo on the left: Construction of the water-regulating devices for provision of the ground-water table regulation at Zvaniec natural reserve.

Photo below: Sporauskaje peatlands – one of the two largest lowland bogs in Europe.

Photo on the right: The harvested wood can be used as biofuel for boilers that can heat the local villages.

In 2015-2016, 1,466ha of the territory of Zvanec and Sporaūski Reserves was harvested, resulting in the production of

3,576 tonnes

of peatland biomass. The harvested grass was turned into hay and was used for feeding cattle; chipped wood was used by local boiler facilities, and harvested reeds were dispatched to consumers.

> **The agricultural drainage of the fen mires of the 1950s caused deterioration of the natural habitat of the most important birds – the aquatic warbler to dramatically decline in population. It's an important indicator species for biodiversity and health of its habitat and 40% of its global population is in Belarus. That's why we are pleased to see that the number of aquatic warbler has increased significantly compared to previous years. This has much to do with the Clima East project which is helping restore the peatlands.**
>
> - Alexander Vinchevskiy, director of APB BirdLife, Belarus

One of the main tasks is to conduct a monitoring survey of Zvanec and Sporaūskae peatlands before, during, and after harvesting, including a survey of indicator bird species, vegetation proportions, and the water table. Results accomplished in 2015 allowed the composing of a vegetation map of Zvanec and Sporaūskae peatlands, as well as constructing models of vegetation dynamics depending on various manmade hazards. Both peatlands now have detection devices for automated recording of water table data. Information on density, quantity, and habitat factors of the indicated bird species (Aquatic Warbler, Great Snipe, Curlew) was updated.

CASE STUDY 12: CLIMATE RESILIENCE OF ARMENIAN MOUNTAIN FOREST ECOSYSTEMS

Project Title:	**Adaptation to climate change impacts in mountain forest ecosystems of Armenia**
Implementing Partner:	Ministry of Nature Protection
Project Budget:	US$2.8 million (GEF: US$0.9 million, US$1.9 Government of Armenia)
Period:	2009-2013
LOCATION	99,400ha in Syunik Province in southeast Armenia
Beneficiaries:	9,745 people (direct)

©UNDP Armenia/2016

Syunik region, Armenia

©UNDP Armenia/2016

PROJECT SUMMARY

Objective:	To enhance climate adaptation in vulnerable mountain forest ecosystems in the Syunik region.
Background:	The mountain forests of Syunik Province in the southeast of Armenia harbour rich biodiversity and carry significant livelihood value. They stabilise soil, regulate erosion and mitigate landslides. However, in recent years, fires have wiped out more and more forest, increasing the vulnerability of local populations. Pests infested more than 20,000 ha of forest. Higher temperatures, more droughts, and water stress linked to climate change are expected to further intensify both forest fires and pest outbreaks.
Strategy:	The project aimed to bolster fire management capacities by training and equipping early response forest firefighting teams in Syunik Province, helping to shape national policies to control fires, and improving public awareness through a grass-roots campaign. A second prong involved increasing abilities to monitor and control pests, and a third entailed establishing three pilot projects to restore forests.
Key results:	The project helped improve forest health and forest fire management on more than 100,000ha and spearheaded the development of national forest management legislation that takes climate risks into account. The early response teams have successfully prevented the spread of multiple grassland fires to neighbouring forests, spurring replication of the model. The National Assembly amended the Law on Atmospheric Air Protection to reduce the causes of forest fires, and the first National Action Programme for Forest Fire Prevention and Response was developed. Stakeholders are more aware of how to monitor and control pests. Restoration projects improved conditions across 95,000ha of forests.

Armenia's forest ecosystems host globally important biodiversity and have long been identified as a conservation priority. The Syunik forests are home to hundreds of rare and endangered plant and animal species, some unique to the region. At the same time, Armenia has been experiencing rising temperatures and drier summers and a resulting increase in severe forest fires. In the south-eastern Syunik region, increased fire intensity, pest outbreaks, and reduced regeneration and vitality are already severely diminishing the health of the remaining mountainous forest ecosystems. For all these reasons, and based on a comprehensive vulnerability and adaptation assessment, the UNDP project worked in the Syunik region to protect sensitive ecosystems and advance livelihoods in communities that depend on those resources.

Despite the increasing climate change impacts faced by this region, climate risks were not previously considered in managing forest ecosystems. The UNDP project addressed these knowledge and information gaps, and managed to provide necessary tools and information to the Armenian Government to improve forest management.

The first steps were taken through a partnership with local NGO Khazer, and resulted in the successful adoption of a provision in Armenian Law on Atmospheric Air Protection that banned the burning of agricultural residues in agricultural and forest areas. These agricultural blazes were identified as primary causes of forest fires. In addition, technical expertise was provided to the Ministry of Emergency Situations to analyse additional forest fire trends and causes, as well as the extent of forest fire preparedness. This analysis helped further inform the national programme and action plan on improving fire safety in forest and other vegetation-covered areas that the government approved in 2013. This became the first set of specific national measures to improve prevention, risk reduction, early response, and firefighting to be adopted in Armenia. The programme is grounded in an acknowledgement of the significant increase in the magnitude and intensity of forest fires over the past decade, and makes important links to climate change. It is expected to facilitate faster and more effective responses to fires, and contribute to climate resilience overall.

> The project also addressed deficiencies in responding to fires in the Syunik region and provided new equipment and trainings to early responders in forest management units. They are now prepared to stop fires on
>
> **89,400ha**
>
> of forest, with an additional capacity of
>
> **10,000ha**
>
> in case of urgent need.

Syunik region, Armenia

©UNDP Armenia/2016

Firefighting training

©UNDP Armenia/2016

This new equipment allows forest management teams to counter a wide variety of fires, regardless of break out locations. It includes backpack pumps suitable for smothering and extinguishing surface fires, collapsible water tanks, devices to track weather conditions conducive to fires, protective firefighting uniforms, and off-road vehicles with water tanks outfitted with engines and pumps.

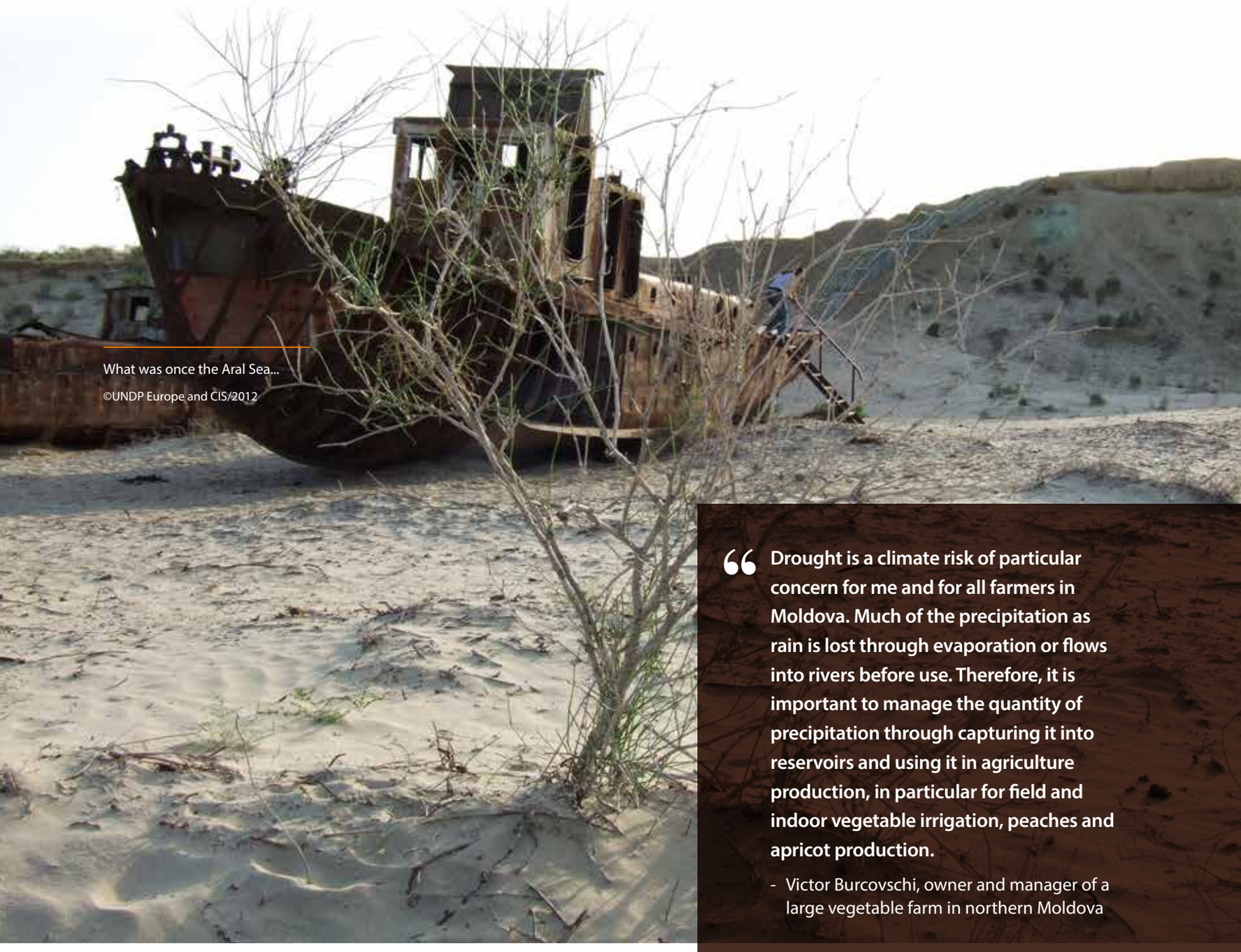
> Because of all these efforts, the capacity of the Syunik region to manage wildfire risk increased to cover nearly
>
> **95 %**
>
> of its forested area.

The teams have already suppressed multiple grassland fires, preventing them from spreading into forests. Given this success, the Rescue Service of the Ministry of Emergency Situations procured additional equipment for fire brigades in Syunik, as well as the regions of Lori, Tavush, and Aragatsotn. Furthermore, lessons from the project fed into a broader six-country regional programme funded by the European Union that is establishing a system for collecting water from streams for firefighting.

Pest outbreaks affect forests and make them drier and more prone to fires. In service of better pest control, the project helped develop a detailed guidebook to educate rangers, foresters, and academics on the main pests and control measures. Another quick reference manual was also developed to assist professional pest managers with practical methods for monitoring and control, as well as of early warning systems for pest outbreaks. Templates for pest monitoring and pest reporting were developed in close collaboration with pest experts, rangers, and foresters. Eventually, all foresters and rangers in Armenia will use the templates.

5. Fostering resilience for food security

Droughts, floods, changing rainfall patterns and other extreme weather events put vulnerable communities at risk. With improved access to climate information, new technologies, and advanced land and water management techniques, vulnerable communities are receiving the tools they need to feed their families today, tomorrow, and into the future.



What was once the Aral Sea...

> **Drought is a climate risk of particular concern for me and for all farmers in Moldova. Much of the precipitation as rain is lost through evaporation or flows into rivers before use. Therefore, it is important to manage the quantity of precipitation through capturing it into reservoirs and using it in agriculture production, in particular for field and indoor vegetable irrigation, peaches and apricot production.**
>
> - Victor Burcovschi, owner and manager of a large vegetable farm in northern Moldova

Through the 'Capacity Development for Climate Risk Management in Eastern Europe and Commonwealth of Independent States' regional project, UNDP helped countries reduce risks related to agriculture and food processing industries.

The effects of climate change on food security is apparent across the region. In Armenia, for instance, eight out of ten regions are prone to medium and intensive hails. Every year, hailstorms destroy about 4-5 per cent of crops and agriculture products (10-15 per cent if the impacts of droughts and wind are added), which is estimated to result in annual losses of US$8 million. This is significant, as agriculture is the main source of food for Armenia and forms at least 17 per cent of GDP, with 52 per cent of the population engaged in agriculture. In the Tavush region alone, from 2005 to 2012, 18 episodes of severe hail completely damaged 50ha of vineyards, which are crucial to livelihoods in the remote villages. A UNDP-supported regional project piloted innovative measures to deal with these threats by utilising anti-hail nets as an adaptation measure to protect vineyards from hailstorms. Local vine growers have purchased and installed the nets and the results were convincing. One farmer subsequently collected 15 tonnes of grapes despite hailstorms, compared to previous years when he lost his entire harvest. He expects his harvest to increase to 25 tonnes as branches previously damaged by hail recover.

Another example comes from Moldova, where a UNDP-supported project promoted resilient water management practices with rural entrepreneurs to address increasing water shortages in agriculture. Agriculture is the key economic sector in Moldova facing the risk of increasing water shortages.

> Climate change models show that surface water availability will decrease by up to
>
> **20 %**
>
> by 2020, aggravating risks to human health, ecosystems, and the economy. Seven community-based pilot initiatives implemented by the UNDP project promoted innovative climate change adaptation measures.

> As part of the small grant scheme, two water storage projects were piloted. The reconstructed reservoirs helped increase the harvest of vegetables in two rural districts by
>
> **30-40 %**

In the Sîngerei district in the north, a reconstructed reservoir uses snowmelt and rainfall to bolster surfacewater storage ponds, ensuring that crops can also be irrigated during heat waves and droughts. This secure water source benefits 3,500 residents in Tiplesti village and residents of neighbouring settlements – including Mr. Burcovschi and his peach and apricot groves. In the Călăraşi district, the rebuilt reservoir is used to irrigate six ha of open vegetable fields and 14.5 ha of greenhouse spaces. These sites are connected to an aqueduct that feeds drip and sprinkler irrigation throughout the combined indoor/outdoor plots. This water is invaluable to the 800 residents of Buda village, as well as for the residents of neighbouring settlements. With the restored reservoir, irrigation became viable, soil erosion is reduced, and productivity increased.

Based on the results of the pilot projects, plans are under way to expand the use of similar technologies to rural communities across Moldova. Scaling up water management projects is an effective way of decreasing climate vulnerability and ensuring the food security of rural communities and the entire country. These new measures will go a long way to protect Moldova's vital agricultural sector and ensure that businesses and communities are able to bloom. In order to scale up these innovative adaptation initiatives, the project developed a feasibility study for a nationwide climate resilience investment in the water management sector.

Another example can be found in the Qashqadaryo district of Uzbekistan, which frequently suffers long-term droughts that not only cause hefty crop losses for farmers, but also make ordinary life difficult for vulnerable groups of women and children. During the 2011 drought, home and school gardens - upon which families and children depend for nourishment - were left barren.

UNDP in Uzbekistan along with partners from the Ministry of Agriculture and Water Resources and several national and local organizations completed the retrofitting of a pumping station and the construction of a new machine canal – bringing water to more than 2,200 residents of four villages in southeastern Uzbekistan.

©UNDP Uzbekistan/2013

Drip irrigation is an efficient water-saving technology.

©UNDP Uzbekistan/2012

The Central Asian Climate Risk Management Programme project worked on minimising threats like these. It worked with the Uzbek Drought Monitoring Centre, along with other partners, to develop a full-scale drought early warning system that provides over

1,000 farmers

with forecasts on water availability and makes recommendations for water conservation.

Information from the system is also used for programmes educating communities about what they can do to mitigate follow-on consequences from droughts. The project introduced low-cost, readily available drip irrigation technology through pilots on farms, schools, and colleges. In addition, inefficient water regulation technologies that were not able to provide irrigation water were replaced with efficient alternatives such as the cascade of water regulating devices with gravity driven shuttles that provide water even in low water periods in Aralovul settlement.

The project also introduced a laser-levelling technique that helped farmers save water and other resources. The initiative included 40 farmers covering more than 100ha of irrigated lands, and afterwards resulted in other farmers adopting the method and scaling up its use.

To encourage the use of efficient technology in homes and school gardens, the project helped a group of women farmers, teachers, and home gardeners to travel to Kazakhstan, where another UNDP initiative had already piloted drip irrigation. Learning from their Kazakh peers, the Uzbek women gained confidence in the method as well as other water-saving practices. As a result, women have more time for other productive activities, as they no longer spend hours carrying heavy buckets of water to nourish their gardens, and overall food security was enhanced. To ensure that these practices are continually shared and spread, an information resource centre and 'young farmers school' was established.

In Tajikistan, rural communities have few economic opportunities and often struggle to survive through unsustainable activities, such as the widespread cutting of trees and overuse of pastures. In mountain areas, these make people vulnerable to risks such as landslides and mudflows.

A greenhouse in Turkmenistan constructed with project support

©UNDP Turkmenistan/2017

Vegetable production using energy efficient methods

©UNDP Uzbekistan/2012

> **Some time ago, our private business was at risk due to unfavorable climate conditions – in particular drought – and we desperately looked for solutions... Now, after building the reservoir, which will allow collection and storage of rainwater and provide a convenient and reliable water supply, we are making plans for this year's production and for upcoming years. The project helped to maintain the business and the well-being of our community.**
>
> - Valeriu Agapie, manager of the Radu Agapi Peasant Farm in Buda village, Călărași district

The Central Asian Climate Risk Management Programme project established an eco-agriculture microloan system to help rural community members in four areas to pursue more environmentally sustainable livelihoods, thus diversifying their incomes.

The system selects borrowers for low-interest loans and flexible repayment options. As a result, people in

66 villages

could invest in greater crop diversity, and measures to stabilise slopes, expand productive land, and rehabilitate topsoil. The loans come with training on modern agro-forestry techniques, and regular evaluations of progress and advice to beneficiaries.

In Kyrgyzstan's Susamyr Valley, higher temperatures mean longer growing seasons, but also a sharp drop in rainfall. This often results in massive losses for farmers who graze cattle in the valley's meadows, as drought dried up pastures and their herds ran out of food. Accurate information about weather trends, both short and long-term was needed to help them better manage their animals. The project helped establish a new weather station that provides early warnings of adverse events and three-day forecasts through Short Message Service (SMS) messages. Based on long-term forecasts, it assisted one particularly vulnerable village in setting up systems to irrigate pastureland.

CASE STUDY 13: ADDRESSING CLIMATE RISKS TO FARMING SYSTEMS IN TURKMENISTAN

Project Title:	**Addressing climate change risks to farming systems in Turkmenistan at national and community levels**
Implementing Partner:	State Committee of Turkmenistan for Environmental Protection and Land Resources
Project Budget:	US$2.93 million (Adaptation Fund)
Period:	2012-2017
LOCATION	60,000ha (area of three pilot projects) in Nohur, Karakum and Sakar Chaga areas
Beneficiaries:	20,000 people (pilot projects), 30,000 farmers (communal management systems)

Turkmenistan desert water storage

©Natalia Olofinskaya/UNDP Turkmenistan

The project supported the construction of small-scale dams, water reservoirs and pipelines for irrigation.

©Natalia Olofinskaya/UNDP Turkmenistan

Monitoring mission, Nohur, Turkmenistan

©Natalia Olofinskaya/UNDP Turkmenistan

PROJECT SUMMARY

Objective:	To strengthen water management practices at both local and national levels in response to climate change and increasing water scarcity.
Background:	Turkmenistan's arid climate, Soviet-era agricultural practices, and inefficient water planning system have resulted in severe irrigation water scarcity. Climate change adds additional pressures to an already dire situation through temperature increase, river flow decrease, and greater aridity. Since about 50% of people in Turkmenistan earn their livelihoods in agriculture, water deficiency could severely disrupt sustainable economic growth and the wellbeing of the entire population.
Strategy:	The project aim helped improve the management of water in agriculture, including through incentives for efficient use. It demonstrated methods for communities to adapt to climate risks in three different agro-climatic regions: Nohur (mountainous), Karakum (desert), and Sakar Chaga (oasis). The project also sought to create and empower water user associations to lead community adaptation plans and investments in water management.
Key results:	The project's proposed amendments to water legislation were adopted with the new Water Code, allowing for community-level involvement in water management through water user groups. The project also devised a clear method for calculating differentiated water tariffs to better guide consumption patterns and close funding gaps. The project implemented various adaptation measures in the three pilot regions based on assessments of the socio-economic impacts of climate risks on communities.

"Farmers from other villages keep coming to see what has been done in Nohur and replicate efficient practices on their farms," says Gurbanmuhammet Abdurahmanov.

©UNDP Turkmenistan/2018

> **When you plant cotton seeds, the first irrigation comes immediately after 60 days. If you wait, more cotton seeds will dry out. The second watering comes in 25 days after the first one. And this is a must because otherwise all your cotton will dry out and die. If the year is rainy and we are planting cotton, the seeds will rot in the land, because too much watering is not good either. Therefore, my income really depends on how much water we get and if the year is dry or wet.**
>
> - Ulugberdiyeva Ogultuwak, land leaseholder

Like many transitional economies, Turkmenistan has inherited centralised planning, including for water supplies. This means that the national-level government is responsible for allocation, delivery, irrigation infrastructure, and setting tariffs. The state controls production of major crops - primarily cotton and wheat - that farmers produce on state-leased agricultural land. Government institutions and collective farms manage irrigation water, but the system needs improvement. Water is underpriced, leaving inadequate funds to maintain distribution systems and few incentives for water saving. Turkmenistan now suffers one of the highest per capita water consumption rates on earth.

Addressing these issues requires actions on both national and local levels. The project started advocating changes in national legislation to allow community-level involvement, since communities needed to feel empowered to act. The project developed amendments and additions to the draft Water Code, including provisions that would pave the way for establishing water user groups as part of existing institutions, viz. farmers' associations. This approach gave legitimacy to community activities and helped ensure access to capital for new water-related investments. The project has also devised a clear method for calculating differentiated water tariffs to better guide consumption patterns and close funding gaps.

Farmers in Sakarchaga district learning how to measure ground water levels.

©UNDP Turkmenistan/2018

Initiatives at the local level started through studies of the socioeconomic impacts of climate risks on communities in three pilot regions. These helped guide community investment plans with priority adaptation measures, such as the construction of dams, repairs of hydraulic facilities, improvements to drip irrigation systems, and the establishment of local nurseries to supply trees for reforestation. Trainings were organised to assist local communities prepare investment proposals for projects.

Local project manager (Sakarchaga district) conducts training for local tenants on the rational use of fertilizers in cotton fields.

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Helen Clark travels to Bokurdak village 100 km north of Ashgabat to visit a UNDP project that combats desertification.

©UNDP Turkmenistan/2011

Table 2: Adaptation measures in pilot regions

IN THE DESERT ZONE BOKURDAK	IN THE IRRIGATED ZONE SAKARCHAGA	IN THE MOUNTAINOUS ZONE NOHUR
▪ Construction of new and renovation of 6 existing wells	▪ Cleaned or constructed 6 km of drainage systems	▪ Construction and renovation of 10 dams with water reservoirs
▪ Construction of 11 new and renovation of 4 existing dew mounds (sardobs)	▪ Renovation or construction of 16 water distribution and control structures	▪ Reconstruction of 20 new drip irrigation system
▪ 8 cleaning of takyrs[55] and kaks [56]	▪ 20 ha reclamation of wastelands previously used	▪ introduction of production technology and use of vermicomposting at 14 sites
▪ 10ha of sand dune remediation (with shrubs and reeds)	▪ 17 levellings of irrigated land using laser equipment	▪ Repair work around 4 springs
▪ Established local nursery	▪ Established local nursery	▪ Construction of a concrete basin (volume - 400m^3)
		▪ Established local nursery
		▪ Established Information and Resource Centre

55 Type of salt flat occurring in the deserts of Central Asia

56 Rainwater pits

As part of an Adaptation Fund Secretariat and UNDP monitoring mission, staff visited a greenhouse in Nohur. Greenhouses help to prevent evaporation and preserve the moisture resulting in increased productivity and water savings.

©UNDP Turkmenistan/2017

Locals in the Ahal region in Turkmenistan grow fruits and vegetables in addition to their main source of income from cattle breeding. All of this requires a consistent source of water.

© Claire Ladavicius/UNDP Turkmenistan

These measures benefitted over

40,000

people in the pilot regions.

For example, new earthen water harvesting reservoirs built on the mudflow route not only increased the availability of water resources, but also reduced flood risks to houses and croplands. Approximately 33,000 drip irrigation heads were supplied to the Water User Group (WUG) 'Cheshme'. This was sufficient to rehabilitate 10ha of fruit and 10ha of vegetable gardens, benefitting over 100 farmers by increasing yields and saving water. An additional 10ha in the Nohur region were reforested with Juniperus turkomanica tree species, that can withstand local extremes of cold and heat.

With the ingrained history of centralised decision-making, many farmers are used to acting based on directions from local or central government agencies. Being the main consumer of water resources and directly affected by the impacts of climate change, farmers themselves are important actors when it comes to adaptation. The project has helped support the establishment of nine initial demonstration WUGs.

These groups intend to facilitate community discussions on proposed changes to national regulations and devise plans to introduce sustainable water tariffs. They start by introducing water measuring tools on farms as the first step to calculate payments and make water-saving improvements. The project initiated field research to provide evidence-based recommendations on adequate amounts of water for each type of commonly cultivated crop, as well as appropriate timing and methods of watering.

Results of the research work will be scaled up by the newly established WUGs, which can result in

20 %

water saving - or as many as 200,000 litres - saved by each Farmer Group.

One project pilot in Sakarchaga district alone has 350 such groups; nationwide there are a total of 60 districts. At the same time, yields increase as a result of reduced salinity and soil degradation.

Building the capacity of the WUGs already started showing results. For instance, the WUG 'Cheshme' mobilised funds and labour to purchase pump parts and repaired a village potable water supply station, thus improving water availability for household needs - drinking, cooking, bathing, and watering livestock for over 500 people (55 families).

CASE STUDY 14: RESILIENCE OF GEORGIA'S AGRICULTURAL BIODIVERSITY

Farmers at the consultation session

©Daro Sulakauri/UNDP Georgia

Project Title:	**Recovery, conservation and sustainable use of Georgia's agro-biodiversity**
Implementing Partner:	The Biological Farming Association 'Elkana
Project Budget:	US$2.7 million (GEF, Elkana)
Period:	2004-2010
LOCATION	Samtskhe-Javakheti region
Beneficiaries:	Local farmers

The European Union and UNDP are lending a helping hand to small farmers in Georgia by helping them establish profit-oriented unions and enabling access to business consultations.

©Vladimer Valishvili/UNDP Georgia

Blueberry days in Georgia

©Vladimer Valishvili/UNDP Georgia

PROJECT SUMMARY

Objective:	To conserve and sustainably utilise threatened local plants important to biodiversity, food security, and agriculture in Georgia.
Background:	Although Georgia has been named one of 25 biological 'hotspots' on earth, with a rich reservoir of native plants, Georgian farmers had virtually abandoned these in favour of imported cultivars. Climate-induced floods, droughts, and pest outbreaks, have wrought havoc on the poorly-adapted imports, exacerbating food insecurity and poverty.
Strategy:	The project aimed to expand the use of climate-resilient indigenous crops by recovering seeds and planting material, and establishing a system to produce and distribute these.
Key results:	A seed multiplication system has allowed hundreds of households to cultivate over 25 revived local landraces and varieties of legumes, cereals, and fruits. These native crops have demonstrated strong resistance to droughts, pests, and harsh winters. Farmers benefit economically because of higher prices for revived native legumes, as well as decreased reliance on chemical fertilisers.

Farm, Kakheti, Georgia

©Daro Sulakauri/UNDP Georgia

Georgian agriculture can be traced back to the fifth millennium Before Common Era (BCE), when Kartvelian tribes began to domesticate basic crops such as wheat, barley, oat, rye, grain, legumes, fruit species, and other varieties. But under the Soviet command economy, which prioritised high-yield production, domestic varieties known for their flavour, nutritional, and storage qualities became neglected and abandoned.

Isolda Kitesashvili in her fruit garden.

©Daro Sulakauri/UNDP Georgia

The project sought to develop a replicable, self-sustaining model for restoring the use of domestic varieties of wheat, barley, millet, and legumes in the Samtskhe-Javakheti region. It first located sources of primary seeds and planting materials, and then helped local farmers establish an association to facilitate seed multiplication and distribution.

Each member received an initial allowance of seeds on the condition that they return

1.5 times

the original amount, leading to expanded distribution. The ancient varieties, as expected, proved to be not only very productive, but also highly resilient to pests, diseases, high altitudes, and water scarcity.

The project also helped local farmers access markets to sell the new crops, which now appear on the shelves of local supermarkets. It widely disseminated information about successes to local and national authorities. The process has improved food security and incomes, while preserving valuable natural resources critical to climate resilience now and in the future.

CASE STUDY 15: SUSTAINING AGRICULTURAL BIODIVERSITY IN THE FACE OF CLIMATE CHANGE IN TAJIKISTAN

Project Title:	**Sustaining agricultural biodiversity in the face of climate change in Tajikistan**
Implementing Partner:	National Biodiversity and Biosafety Centre
Project Budget:	US$ 6.1 million (GEF: US$2.1 million)
Period:	2009-2014
LOCATION	1.5 million ha in Baljuvan, Shurobad, Rasht and Zeravshan
Beneficiaries:	152,000 (population of impacted area)

Insulation and irrigation: the clay wall stores the heat, a drip irrigation saves water.

©UNDP Tajikistan/2011

Tajik apricots dry in the sun - and will eventually be available on the global market.

©UNDP Tajikistan/2011

Meeting with the farmers to evaluate the succes of organic cotton growing in Tajikistan (Khujand).

PROJECT SUMMARY

Objective:	To embed the conservation of globally significant agro-biodiversity as well as adaptation to climate change in agricultural and rural development policies and practices.
Background:	Tajikistan's mountainous regions host tremendous biodiversity, including native species of fruits and other plants that are the original source of cultivars produced around the world. But local farmers have little experience with these. They tended to plant imported species and seeds, even though these are proving highly vulnerable to climate change-induced floods, droughts, and plant epidemics. Tajikistan now faces a domestic food shortage of 20% and a poverty rate of nearly 47%.
Strategy:	The project endeavoured to increase agricultural productivity by taking advantage of Tajikistan's naturally rich biodiversity. It sought to identify native crops that are better adapted to climate change, and advocated for policies and practices to conserve agro-biodiversity.
Key results:	Planting native, climate-resilient crops prepares farmers for future weather conditions and boosts productivity. A new organic certification scheme encourages healthy production practices; crops that receive certification fetch higher prices. The conservation of agro-biodiversity contributes to the global drive to improve crops in the face of climate shifts.

In Tajikistan's mountains, a wide variety of fruits and legumes survived over thousands of years. Naturally, these species have become resilient to drought, cold weather, diseases, and other stresses, making their genetic material immensely valuable. However, during Soviet times, farmers deprecated these locally-adapted species in favour of commodity crops like cotton and wheat. Subsequently, farmers have diversified somewhat, but primarily with varieties considered easy to sell, like potatoes. They often resort to imported cultivars and genetically modified seeds promoted as providing more attractive and marketable fruits and vegetables. While these non-native cultivars thrive at first, they often fail within a few years, leaving farmers faced with a costly replanting investment.

The project helped local farmers make use of these local resources to improve productivity and income, while conserving biodiversity at the same time.

One of these farmers was Ismail Faizov in the Shuro-obod district. He had difficulty supporting his family because his crops, mostly imported cultivars, were not productive.

The project helped him establish a

1.5ha nursery

of well-adapted Tajik varieties of fruit trees and to develop a system for labelling and certifying grown seedlings. He could sell more than

50,000

seedlings at fairs and local markets throughout his district, and also in neighbouring Afghanistan.

Today he is an established provider of sustainable native crops profitable enough to invest in a roadside café and shop that together sell fresh and processed produce.

Another illustrative example of project achievements is the story of Sabzali Bozorov, who heads the production co-operative Komron. He owns a 10ha orchard of three million fruit trees including mulberry, a native species. Earlier, the orchard was not fenced and wild animals would damage trees and eat the harvest. Coupled with the lack of high quality processing and production equipment, this caused losses of 60 per cent of the harvest each year. With project support, he could obtain garden mesh fencing, production equipment, and packaging materials. He also constructed a shed for air-drying the mulberry, and developed attractive packaging for mulberry products. The national organic certification scheme devised with project assistance gave him a formal seal of approval.

Together, these enhancements led to a

40 %

surge in revenues.

Mr. Bozorov's large range of ecofriendly mulberry products, some with therapeutic properties, was featured at local and national trade fairs, seminars, and conferences in India, Georgia, Moldova, Switzerland, Turkey, and the United States.

Mr. Faizov and Mr. Bozorov are just two of the more than

3,300 farmers

who benefitted from project activities. News of their success with conservation is spreading, encouraging other farmers to adopt similar measures.

Through the Aid for Trade project, UNDP promotes trade and country competitiveness in 11 countries in the region, to reduce poverty and improve peoples' lives.

CASE STUDY 16: CLIMATE RESILIENCE OF KAZAKHSTAN WHEAT AND FOOD SECURITY

Project Title:	**Central Asian food security and improving climate resilience of Kazakhstan wheat**
Implementing Partner:	KazAgroInnovation
Project Budget:	US$2.92 million (USAID)
Period:	2012-2014 and 2014-2016
LOCATION	280,000ha in northern Kazakhstan
Beneficiaries:	632,000 in Kazakhstan, 323,640 in other Central Asian countries (Tajikistan, Afghanistan, Kyrgyzstan, Uzbekistan, Turkmenistan)

Tradition and technology help protect pasture land, Kazakhstan.

Restoring forage on wastelands near wetlands, Kazakhstan.

Staff of Zhongar-Alatau Park weeding the fruit tree nursery in Kazakstan.

©Rustem Vagapov/UNDP Kazakhstan

PROJECT SUMMARY

Objective:	Support regional food security through increased resilience at the national level.
Background:	In Central Asian countries, wheat provides more than 60% of daily calories, and a significant portion of that wheat is imported from Kazakhstan. Spikes in food prices have been one of the major sources of food insecurity in other Central Asian Republics. Unfortunately, Kazakhstan's wheat sector is highly vulnerable to climate change. Currently, spring wheat production is expected to decrease by 25-70% due to climate change after 2030. If the productivity of the sector is severely compromised, it will threaten the food security of the entire region
Strategy:	The project helped to improve the understanding of expected climate impacts in wheat growing regions of Kazakhstan, and to develop a system of delivering climate information to key stakeholders. The project brought stakeholders together to identify near-, medium-, and long-term adaptive actions, and then mainstream those actions into existing decision-making processes.
Key results:	Key results included improved weather forecasting, the introduction of no-till agricultural techniques, and adoption of new technologies to significantly improved crop yields in Kazakhstan, contributing to food security and income growth. Wheat productivity at the project pilot plots increased to 2.7 tonnes per ha compared to the average yield of 1.4 tonnes.

Agriculture is one of the key sectors impacted by climate change. Kazakhstan is the world's ninth-largest producer and seventh-largest exporter of wheat. Globally, wheat is the number one source of protein in the human diet. According to the Ministry of Energy, in Kazakhstan the average temperature is increasing twice as fast as the world average, due to its geography and climate.

But how can farmers prepare for the worst without clear and accurate weather forecasts? Relying on the vagaries of an age-old manual system consisting of worn out maps and indecipherable hand-written data, local experts found themselves repeatedly at a loss.

The project brought new life to weather forecasting in Kazakhstan by introducing 21st Century standards. With new equipment and software, meteorologists can now issue climate forecasts for the whole season in a few seconds, and share these with farmers immediately. Kazhydromet – the national hydrometeorology service - increased the long-term climate forecast confidence rate by 21 per cent. Farmers can use the reliable data to better plan and optimise their harvest.

> **600 farmers**
> who were receiving up-to-date weather and climate forecasts from Kazhydromet have reported
> **20 %**
> higher yields on average.

In addition to better forecasting, a web-based drought monitoring system was developed to enhance the delivery of drought information to farmers, and thereby enable better planning and management of production systems. This geo-portal, containing processed imagery data from climate scientists combined with geographical maps, was launched in 2015, making Kazakhstan the first country in the region with such an advanced information management platform.

> **"Sixty per cent of Central Asian countries' diets are based on wheat, so the wheat yield alone can directly affect food security and stability of our region. Delivering an accurate climate forecast could play an essential role to fight against hunger.**
>
> - Yerlan Zhumabayev, UNDP Project Manager

The project brought together key national and regional stakeholders - primary importers of Kazakh wheat - to discuss risk mitigation strategies that can be utilized at a national and regional level to buffer against the expected impacts of climate change on wheat production.

The project demonstrated advanced adaptive wheat growing technologies that are resilient to different climatic shocks in pilot plots in Shortandy, Kostanay, and Petropavlovsk. Among others, the benefits of no-till or zero tillage farming, a modern agriculture method in which the topsoil layer is not loosened and the soil surface is typically covered by the crushed remains of plants (i.e. mulch), was demonstrated. It helps to prevent water or wind from eroding the soil and reduces water losses, providing increased resilience to drought. In total, the project showcased 22 different adaptation options for wheat production and agro-technologies, through setting up experimental and demonstrative pilot plots in the three main wheat growing regions of northern Kazakhstan and Tajikistan.

> The project recommendations on improving the wheat production sector were incorporated into Kazakhstan's national green economy concept. More than
> **US$7 million**
> was committed by the government to spend annually to improve the wheat production sector for the 2015-2020 period.

6. Climate-resilient integrated water resource management

The Strumica River Basin is one of the former Yugoslav Republic of Macedonia's most vulnerable regions to climate change.

©Ljubomir Stefanov/UNDP FYR Macedonia

UNDP supports countries to promote integrated, ecosystem-based, climate resilient management of the world's rivers, lakes, and oceans through improved governance, smarter resource management, and continued environmental stewardship.

Water and climate systems are interconnected through evaporation and precipitation, and this is the primary cycle through which climate change impacts occur. Changing precipitation patterns, longer dry periods and more potent and frequent natural disasters, including floods, are all threatening livelihoods and water resources across the region. Through adaptation approaches we need to equip countries and communities better to withstand these shocks and disasters.

In Albania for instance, UNDP implemented a project that strengthened adaptive capacities in the Drini-Mati River Delta so that key ecosystems and local livelihoods are more resilient to climate change. The Drini-Mati River Delta ecosystem was restored to help manage rising threats from floods. In Azerbaijan, water and flood management was improved and the vulnerability of communities in the Greater Caucasus region of Azerbaijan to floods and flash floods was reduced.

CASE STUDY 17: ADAPTATION TO CLIMATE CHANGE IN THE DRINI-MATI RIVER DELTAS IN ALBANIA

Project Title:	**Identification and implementation of adaptation response measures in the Drini-Mati River Deltas in Albania**
Implementing Partner:	Ministry of Environment
Project Budget:	US$1.1 million (GEF: US$0.98 million)
Period:	2008-2013
LOCATION	4,500ha in the Drini-Mati River Delta region
Beneficiaries:	50,400 people (direct)

Heavy snowfalls and heavy rains contributed to the flooding Albania.

©UNDP Albania/2018

Erosion Kune Island

©F. Bego/UNDP Albania

Erosion Kune Island

©F. Bego/UNDP Albania

PROJECT SUMMARY

Objective:	To build adaptive capacities in the Drini-Mati River Delta so that key ecosystems and local livelihoods are more resilient to climate change.
Background:	Now considered 'critically vulnerable' to climate change, Albania's Drini-Mati River Delta harbours significant biodiversity and supports the livelihoods of many. Over the past decade, floods and storm surges have caused significant erosion, sea level rise, habitat destruction, and loss of flora and fauna. These hazards have had tremendous impacts on local settlements, and livelihoods in the agriculture and tourism sectors.
Strategy:	The project aimed to develop capacities to monitor and respond to climate impacts on the Drini-Mati River Delta, including through enhanced abilities to analyse data as the evidence base for informed decisions. It also sought to support local pilot actions for coastal adaptation.
Key results:	Officially designated protected areas in the Drini-Mati River Delta expanded from 4,500 to 9,400ha. An early warning system for extreme weather events was set up, and various pilot adaptation initiatives took place, including restoration activities such as dune planting. Project contributions encouraged national authorities to require that all management plans for protected areas now take climate change adaptation into consideration. The Albanian National Environment Monitoring Programme adopted the project's recommendation to integrate climate change indicators into its monitoring system. A project policy paper, 'Climate Change Adaptation in the Drini-Mati River Delta and Beyond', has been included in the Cross-sectorial Strategies for Environment, Agriculture, Energy, and Health of the National Strategy for Development and Integration. Public awareness events such as an annual climate change adaptation week have helped broaden understanding of the importance of adaptation.

The project emphasised collaboration with diverse stakeholders on the national, regional, and local levels, recognising that their knowledge of climate-related risks and management in the Drini-Mati River Delta would be indispensable. Numerous training sessions and workshops spread a common understanding of climate change, adaptation, restoration, and similar issues, while creating opportunities for stakeholders to learn from one another. As a result of such co-operation, a comprehensive risk assessment for the delta was done, guiding the project to focus on key risks such as dune erosion and sea-level rise.

The co-operation also resulted in the creation of an adaptation planning template, later used by the Lezha local government in Albania. Some adaptation measures have since attracted additional international support. The most recent example includes a new project financed by the GEF and implemented through UN Environment on 'Building the Resilience of Kune-Vaini Lagoon through Ecosystem-based adaptation: a follow-up to the Drini-Mati project'. One of its main activities is increased ecosystem and livelihood resilience from flood and drought risk through pilot EbA demonstration activities in the Kune-Vaini Lagoon System.

> Albania's First National Communication under the UNFCCC predicted an increase in air temperature of
>
> **up to 4.1 °C**
>
> and a rise in sea level of up to
>
> **61cm by 2100.**

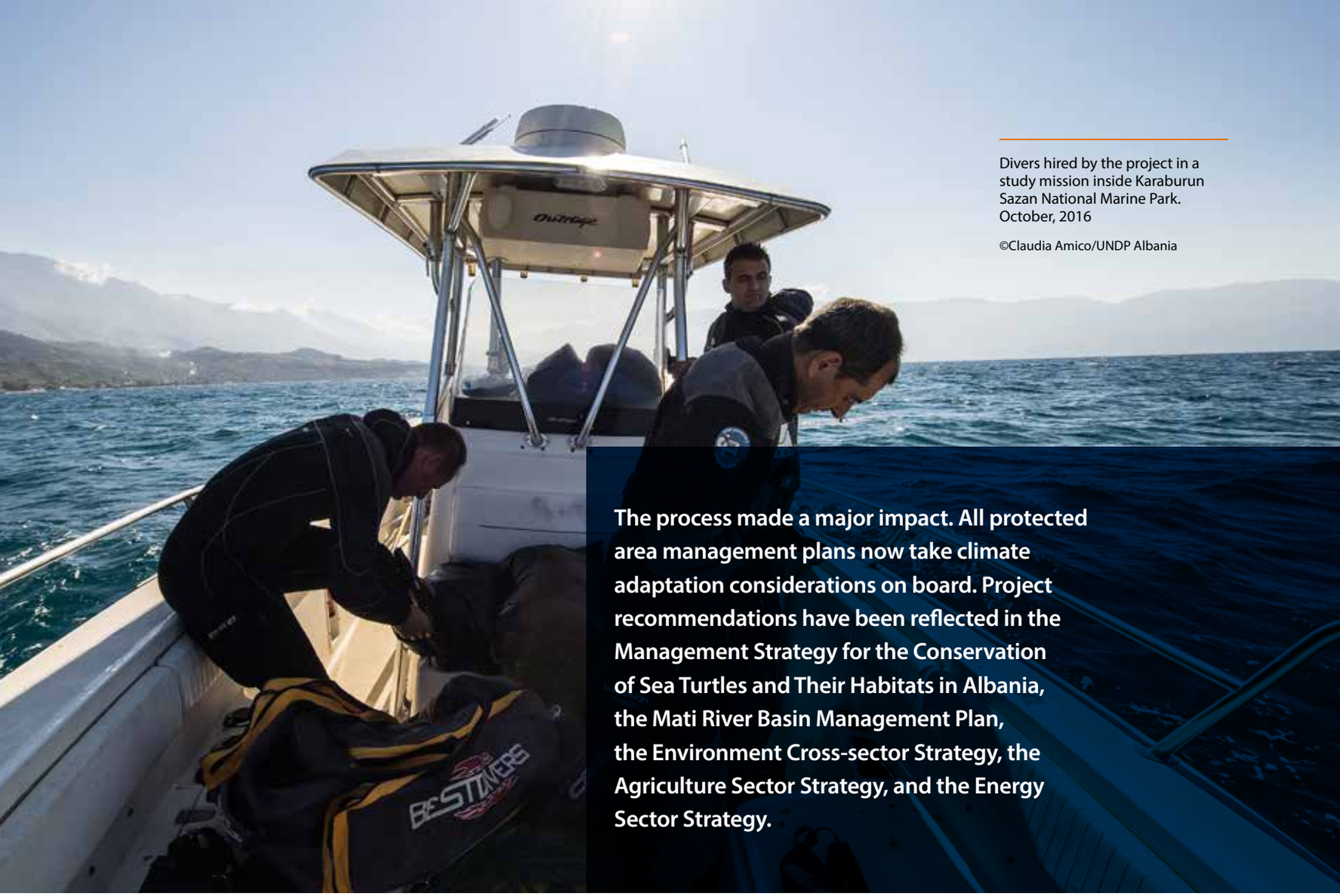
These projections highlight significant threats to the Drini-Mati River Delta's biodiversity and to the livelihoods of local communities. Rising sea level, more frequent and intense floods, more frequent rainfall, and more protracted submersion of low-lying coastal areas will likely disrupt the ecosystem and destroy habitats.

> **At the beginning of the project very few people knew what climate change meant … Now, a lot of people are aware of it … The local people are deeply convinced of the need to act quickly. Otherwise, the consequences will be irreversible.**
>
> - Pashk Gjoni, former Head of the Lezha Regional Council

Field trip to Karaburun Sazan National Park. Students from elementary school of Dukat looking at the marine park attractions during a field trip to Karaburun Sazan Peninsula – the first and only national marine park of Albania.

©Claudia Amico/UNDP Albania

> **The policy strategies represent an important opportunity for Albania to build on the success and momentum in adaptation planning that has been developed through the pilot initiative and to expand these outcomes to areas beyond the Drini-Mati River Delta.**
>
> - Fatmir Mediu, former Minister of Environment, Forestry and Water Administration



Divers hired by the project in a study mission inside Karaburun Sazan National Marine Park. October, 2016

©Claudia Amico/UNDP Albania

The process made a major impact. All protected area management plans now take climate adaptation considerations on board. Project recommendations have been reflected in the Management Strategy for the Conservation of Sea Turtles and Their Habitats in Albania, the Mati River Basin Management Plan, the Environment Cross-sector Strategy, the Agriculture Sector Strategy, and the Energy Sector Strategy.

The project conducted technical studies of climate risks to coastal development in the delta that not only provided a thorough climate risk analysis but also presented a comprehensive list of short- and long-term measures for adaptation. These addressed key concerns such as coastal erosion, preparations for and responses to extreme events, dune restoration and stabilisation, and wetland preservation and restoration, as well as hard-engineering activities such as the construction of embankments for flood protection. The studies informed a policy paper, Climate Change Adaptation in the Drini-Mati River Delta and Beyond, which identified strategies to integrate climate change adaptation across national development planning.

The project also influenced the Regional Development Concept for the Lezha Region (2010-2016), as well as local strategies for tourism, agro-tourism, and forestry. In addition, a list of project ideas has been developed based on the project process, which the regional government is aiming to scale up.

Other results include dramatic improvements in data. Robust evidence can now steer the incorporation of climate adaptation into future national policies and plans. Comprehensive climate change indicators were integrated into the National Environment Monitoring Programme, for example, covering issues including water quality, habitats, priority conservation species ,and coastline dynamics.

CASE STUDY 18: CLIMATE RESILIENT WATER AND FLOOD MANAGEMENT IN AZERBAIJAN

Project Title:	**Integrating climate change risks into water and flood management by vulnerable mountainous communities in the Greater Caucasus Region**
Implementing Partner:	Ministry of Emergency Situations, Azerbaijan
Project Budget:	US$9.96 million (GEF: US$2.7 million, Government of Azerbaijan, UNDP)
Period:	2012-2016
LOCATION	Over 10,800 km^2 in the Greater Caucasus region
Beneficiaries:	645,000 inhabitants of vulnerable mountainous communities

Ensuring access to remote mountain communities can be challenging.

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Community members construct gabions in Burovdal to preserve access to their homes and prevent flooding and erosion.

©Andrea Egan/UNDP Azerbaijan

Remote mountain villages of Azerbaijan benefit when climate change risk management is integrated.

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PROJECT SUMMARY

Objective:	To improve water and flood management, and reduce the vulnerability of communities in the Greater Caucasus region of Azerbaijan to water stress and hazards.
Background:	The steep mountains of the Greater Caucasus region make it especially vulnerable to floods and mudflows, which are exacerbated by climate change. Over the past 15 years, the number of floods has multiplied tenfold. At the same time, water stress has intensified; water resources are projected to decline by 23% from 2021 to 2050. To date, national flood and water supply management projects do not factor in the long-term impacts of climate.
Strategy:	The project aims to address both sides of the water crisis. First, it helps shift the focus of flood management from the short-term tactic of constructing floodwalls to long-term solutions such as flood zoning, watershed management, and early warning systems. Second, it promotes new water management techniques where groundwater complements the traditional reliance on surface water, fostering a more sustainable response to water scarcity. Towards both aims, the project assists in filling gaps in the Water Code, including a lack of attention to climate change. Pilot projects in three river basins demonstrate ways forward.
Key results:	The project assisted in enhancing the hydro-meteorological observation network, flood risk modelling and forecasting, and capacities of the new water management agency. A community-based floods Early Warning System was piloted in one community. New flood and water management techniques will reduce flood damages and water stress, and will be scaled up through a more supportive Water Code and associated legislation.

Burovdal, Azerbaijan

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Although climate change has exacerbated water stress and floods in Azerbaijan, the country has limited capacity to deal with these threats. At the local level, vulnerable communities lack essential monitoring networks and early warning systems to protect them from potential catastrophes.

In the Turyanchay river basin, the project started by engaging with local community groups. They are learning new ways to build community resilience to water stress and floods, such as through hydro-meteorological forecasting, which estimates rainfall, snowmelt, and river flows and levels. Response planning mechanisms are being introduced to mitigate impacts from imminent floods. Watershed management focused around climate adaptation encourages communities and water user associations to explore measures including reforestation and other steps to curb erosion.

The State Agency for Water Resource of Azerbaijan expanded their technical capacities through new modelling, mapping, and monitoring technologies - vital for assessing water resources, land use changes, and flood risk management options. Improved monitoring feeds into early warning systems, as well as more sustainable use of surface and ground water resources. The national monitoring network was expanded with additional stations to measure rainfall and water levels in the basin, and other key hydro-meteorological variables in the Greater Caucasus region and in the Kura River Basin. The established monitoring network consists of nine hydrological and three meteorological stations.

All of the monitoring stations have been equipped with automated recorders and solar photovoltaic panels. All of the installed hydrological and meteorological stations provide automated observations

24 hours a day.

Data will be widely shared with local communities.

Community-based early warning systems have been piloted with the close involvement of community members in the Turyanchay river basin. The Early Warning System provides advance notice of a likely flood with a

1-2+ hour warning.

Installation works in Mingachevir water reservoir meteorological station

©UNDP Azerbaijan/2015

The high-altitude monitoring station established by the project collects rainfall data and sends it to the central database managed by the Ministry of Emergency Situations in Baku. If a certain intensity of rainfall is recorded, then a warning text message is sent to two to five focal point individuals in each village, who then activate the wider person-to-person text message communication network. The project procured and installed emergency sirens in two locations. The project also procured 'First Responder Emergency Tool Kits' as a part of the Early Warning Systems initiation, and distributed these in target communities. These include items such as chainsaws and safety equipment that can be used for clearing roads of downed trees and other debris.

The Early Warning System faced its first real-life test on June 8th, 2017 in the Gabala region, and the First Responder Emergency Tool Kits provided by the project proved their worth. As described by one local project participant, there was a short, but severe summer storm:

> **…it was short, only 5 minutes, but many houses were damaged by trees falling on them, up to 200 trees fell. And even elderly people said they hadn't seen such a thing in their lifetime. Equipment provided by the project helped us to eliminate the consequences of this storm. It was such a storm that my phone was wet and I couldn't contact anybody. We had consulted and planned that in the case of such a storm we would organise. So we put on our rubber boots, and got equipment, and called MoES and they said they couldn't come, the road was blocked, and within 4 hours we managed to unblock the road and restore traffic. And thank goodness there was no loss of life. Therefore would like to extend my gratitude to the project on behalf of our villagers'.**

Over time, plans call for forming a regional stakeholder committee and developing a basin-wide, climate-resilient water management plan. Key elements will encompass detailed flood management strategies, as well as structural and non-structural measures to deal with flood risks.

CASE STUDY 19: TRANSBOUNDARY COOPERATION ON ADAPTATION TO CLIMATE CHANGE IN CHU AND TALAS RIVER BASINS IN KAZAKHSTAN AND KYRGYZSTAN

Project Title:	**Enabling Transboundary Cooperation and Integrated Water Resources Management in the Chu and Talas River Basins**
Implementing Partner:	UNECE, UNOPS
Project Budget:	US$7 million (GEF: US$1 million, co-financing US$ 6 million)
Period:	2015-2018
LOCATION	Chu and Talas River Basins in Kazakhstan and Kyrgyzstan
Beneficiaries:	2.4 million people living in the Chu and Talas river basins

Kyrgyzstan rice fields

©Natalia Olofinskaya/UNDP Kyrgyzstan

Korghalgyn, Kazakhstan Nature Reserve

©Patrizia Cocca/GEF

Kyrgyzstan irrigation channel

©Natalia Olofinskaya/UNDP Kyrgyzstan

PROJECT SUMMARY

Objective:	To strengthen transboundary co-operation and promote integrated water resources management in the Chu and Talas River Basins in Kazakhstan and Kyrgyzstan.
Background:	Climate change is causing accelerated melting of glaciers and snowfields, resulting in increased frequency and intensity of mudflows and landslides in valleys, as well as riverbed deformation during floods.
Strategy:	The project is structured around three interrelated components: (i) a Transboundary Diagnostic Analysis (TDA) including climate scenario analyses to inform adaptive integrated management of the Chu-Talas shared water resources; (ii) Building the foundation for broadened and improved bilateral water co-operation; and (iii) Strengthening capacity of water resources monitoring in the Chu and Talas River Basins.
Key results:	As part of the TDA process, climate change scenarios were developed and discussed, seminars and trainings on climate change adaptation were completed.

The Chu and Talas basins, shared by Kazakhstan and Kyrgyzstan, are located in the northern part of the Tien Shan Mountains and are characterised by a broad diversity of geographic zones such as alpine and mountain-steppe (Kyrgyzstan), as well as mountain-steppe, desert-steppe and desert zones (Kazakhstan). Over 2.4 million people reside in the transboundary Chu and Talas Basins.

Demonstration in barley field, Tunuk village of Suusamyr valley, Kyrgyzstan

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Key causes of depletion and degradation of aquatic ecosystems in the Chu and Talas basins include intensive exploitation of natural watercourses, pollution, deforestation, and unregulated mining activities. Climate change is causing accelerated melting of glaciers and snowfields. Climate change impacts include increased mudflows and landslides in the valleys, and riverbed deformation during floods.

The GEF project built upon the outcomes of an earlier international project implemented through a partnership of UNDP, UNECE, and OSCE in the framework of the Environment and Security Initiative (ENVSEC) 'Strengthening cooperation on adaptation to climate change in transboundary basins of the Chu and Talas Rivers', with support from the Government of Finland and the European Union.

Micro hydro power supplies for Medical Unit in Nookat District of Osh Province. In construction. April, 2013.

©UNDP Europe and CIS/2013

Riding horses in the pasture near Almaty, Kazakhstan, June 2016.

©Patrizia Cocca/GEF

The GEF project developed Transboundary Diagnostic Analysis (TDA) for the Chu-Talas river basins, which was approved by Chu-Talas Water Commission in 2016. Considerations based on Water Scenarios, on climate variability and change, and surface-groundwater interactions were included into the TDA. UNECE provided expertise to develop a climate change chapter of TDA with scenarios for surface water resources for two basins. A report containing an assessment of present conditions for surface and groundwater quantity and quality monitoring, including recommendations for a harmonised monitoring system, was delivered.

Local governments and other stakeholders in both basins were not prepared to adequately respond to the possible social, economic and environmental implications and risks associated with the transboundary nature of the water resources of the basins, particularly given increased climate variability and change. Two national seminars on adaptation to climate change and a regional training on adaptation to climate change were included to the Capacity Building Programme, which was implemented throughout 2017.

Examining sustainable agriculture near Korgalzhyn village, Kazakhstan. Emblematic of the socio- economic development of the region.

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Conclusion

As the world faces unprecedented challenges caused by climate change and rapidly growing exposure to disaster risks, the communities and economies of the countries of Europe and Central Asia are becoming increasingly vulnerable. Climate change has already been manifesting itself through more frequent and intense droughts, floods, and other extreme weather events that are predicted to worsen over time. These complex and interconnected challenges threaten to derail social and economic gains, extend tensions over the access to water and natural resources, exacerbate environmental issues, hinder efforts to reduce Greenhouse Gas Emissions, adversely impact people's health, well-being, and livelihoods, and slow ongoing progress towards a more peaceful and stable region.

With countries across the region racing to fulfill their commitments to the 2030 Agenda for Sustainable Development and Paris Agreement, the United Nations Development System, national and local governments, donors, and other partners should focus on mainstreaming and accelerating the work of climate change adaptation actions in the region through continued and sustained capacity building, technology transfer, policy support, creative financing opportunities, and integrated approaches.

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This publication highlights the efforts undertaken by ECA countries over the past decade with the support of the United Nations Development Programme, vertical funds, bilateral funds, and other important actors to extract key programmatic lessons to facilitate the development, scaling up, mainstreaming, and acceleration of future climate change adaptation projects and programmes in agriculture, food security, water resources, adaptation planning, and disaster risk reduction.

This new generation of projects will be rooted in UNDP's strategic vision 'to help countries achieve sustainable development in peace, with poverty eradicated and inequalities and exclusion reduced significantly'. [57] Guided by national ownership, using national systems and improved national capacities, these projects and programmes will come together to reach goals on climate action, food security, equality, and more.

With the right enabling environments, and continued financial support from vertical funds, bilateral funds, and the private sector, this work will ensure the well-being, voice, and participation of those previously left behind, while at the same time protecting and promoting universal economic, political, social, civil, and cultural rights.

As the lessons learned from pilot initiatives coalesce with improved evidence and data on climate change, a number of recommendations arise to mainstream and accelerate this support.[58]

57 UNDP Strategic Plan, 2018-2021 (zero draft). DP/2017/CRP.2 http://www.undp.org/content/undp/en/home/executive-board/documents-for-sessions/adv2017-annual.html, para. 42.

58 Ibid., para. 43.

RECOMMENDATIONS TO IMPROVE CLIMATE ACTIONS IN ECA

The time to act is now. Governments in the region, with support from the UN Development System, as well as public and private finance and know-how, need to mainstream and accelerate climate actions across the region.

Adapting to climate change requires engagement with a diverse and inclusive group of stakeholders that is multi-sectoral, and extends across ethnic groups, age groups, gender groups, economic groups, and cultural groups to ensure no one is left behind.

Effective adaptation needs to draw from traditional practices and expand on innovative ideas.

Climate change is not a series of individual, linear challenges, it requires interlinked, reactive, adaptive, and holistic approaches to solve.

Capacities need to be developed on local, regional, and national levels to plan for climate change, adapt to climate change, and protect future gains from the impacts it brings.

New technologies – such as blockchain, cloud computing, as well as leap-frogged innovations such as automatic weather stations and mobile banking - will be essential.

The scaling up of climate information and early warning systems will improve evidence-based decision making, support productivity on and off the farm, and protect lives and livelihoods threatened by slow-onset events as well as increases in fast-acting destructive storms.

Cross-country and regional co-operation will improve the scale, adoption rate, sustainability and transfer of knowledge, technologies, best practices, and policies.

To protect our people from climate change, and build climate resilient economies and societies, we need to also protect our planet, and a continued focus on ecosystem-based approaches and improved environmental policy making will be key.

Volcanoes of Kamchatka in eruption

©UNDP Russia/2009

Policy support and efforts to improve climate governance remain an essential tool to improve planning, operationalisation, and sustainability of climate actions in the region.

On the local and regional levels, improved governance should be applied to improve market linkages, strengthen local natural resource management practices, improve climate-resilient farming and business practices, and apply a new way of thinking to change traditional approaches and practices.

The private sector needs to be actively engaged as the primary driver, financier and delivery partner for climate resilience. Small and Medium Enterprises will be key for this support.

Public-sector finance alone is not enough. Blended finance, private-sector finance, and other creative financial mechanisms should be explored and expanded.

By taking proactive, rather than reactive, stances to Disaster Risk Reduction, countries in ECA will limit losses to infrastructure and productive assets, protect lives and livelihoods, and perpetuate a virtuous cycle that paves the way to future peace and prosperity.

Climate change mitigation and adaptation are intrinsically interlinked. Improved human, social, and economic development will improve the abilities of countries in ECA to reach carbon emission targets, environmental protections, and adaptation goals outlined in Nationally Determined Contributions to the Paris Agreement and 2030 Agenda for Sustainable Development.

ANNEX 1. LIST OF SELECTED CLIMATE CHANGE ADAPTATION PROJECTS IN EUROPE AND CENTRAL ASIA

Project Title	Budget US$	Donors	Beneficiary Country	Duration
Identification and Implementation of Adaptation Response Measures in the Drini - Mati River Deltas	980,000	GEF	Albania	2009-2013
Mitigation of climate change risks of rural communities through improved local development planning	500,000	Sweden, UNDP	Armenia	2013-2015
Support to national disaster preparedness		USA, UNDP	Armenia	2003-2016
Adaptation to climate change impacts in mountain forest ecosystems of Armenia	900,00	GEF	Armenia	2009-2013
Mainstreaming Sustainable Land and Forest Management in Dry Mountain Landscapes	2,977,169	GEF	Armenia	2015-2019
Clima East: Ecosystem-based approaches to climate change	1,389,610	EU	Azerbaijan	20013-2016
Integrating Climate Change Risks into Water and Flood Management by Vulnerable Mountainous Communities in the Greater Caucasus Region	2,700,000	SCCF	Azerbaijan	2012-2017
Clima East: Sustainable management of peatlands	1,295,321	EU	Belarus	2013-2016
Technology transfer for climate resilient flood management in Vrbas River Basin	5,000,000	SCCF	BIH	2014-2019
Developing Climate Resilient Flood and Flash Flood Management Practices to Protect Vulnerable Communities in Georgia	4,900,000	Adaptation Fund	Georgia	2012-2017
Support to Agricultural Development in Adjara Autonomous Republic	4,324,580	EU	Georgia	2013-2016
Sustainable Pastures Management	1,388,588	EU	Georgia	2013-2016
Scaling-up Multi-Hazard Early Warning System and the Use of Climate Information in Georgia	27,054,000	Green Climate Fund	Georgia	2018-2025
Agricultural Development and Livelihoods Enchantments in Abkhazia	924,998	Turkey, UNDP	Georgia	2014-2016

This table includes a list of selected UNDP projects featured in this publication, indicating the years of implementation and core international technical assistance investment

Project Title	Budget US$	Donors	Beneficiary Country	Duration
Strengthening DRR Capacities	525,000	UNDP	Georgia	2015-2016
Lake Balaton Integrated Vulnerability Assessment, Early Warning and Adaptation Strategies Project	4,000,000	GEF	Hungary	2005-2008
Climate Resilience of Kazakhstan Wheat and Central Asia Food Security	1,000,000	USA, UNDP	Kazakhstan	2012-2014
Improving the climate resilience of Kazakhstan Wheat	1,925,217	USAID	Kazakhstan	2014-2016
Support to National Adaptation in Moldova	970,013	Austria	Moldova	2013-2016
Clima East: Ecosystem-based adaptation and mitigation	694,805	EU	Moldova	2013-2016
Disaster and climate Risk reduction	500,000	UNDP	Moldova	2013-2016
Climate Risk Managment in Central Asia	5,952,000	OSCE, EU, UNDP, Finland	Regional	2010-2015
Increasing urban resilience by use of Information Communication Technology (ICT) for mainstreaming disaster and climate risk reduction in Armenia, FYR Macedonia and Moldova	227,000	UNDP	Regional	2014-2016
Sustaining Agriculutral Diversity in the face of climate change in Tajikistan	1,567,564	GEF	Tajikistan	2009-2015
Sustainable Forest Management in Context of Water Use	345,909	UK, UNDP	Turkey	2012-2015
Addressing climate change risks to farming systems in Turkmenistan by improving water management practice at national and community levels	2,929,000	Adaptation Fund	Turkmenistan	2012-2017
Supporting Climate Resilient Livelihoods in Agricultural Communities in Drought-Prone Areas of Turkmenistan	3,046,347	SCCF	Turkmenistan	2016-2021
Clima East: Conservation and Sustainable use of peatlands	2,287,429	EU	Ukraine	2013-2016
Developing climate resilience of farming communities in the drought prone parts of Uzbekistan	4,990,878	Adaptation Fund	Uzbekistan	2014-2019

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