

FAO-TURKEY PARTNERSHIP PROGRAMME ON FOOD AND AGRICULTURE (FTPP II)

Capacity Building for Sustainable Fisheries and Aquaculture Management in Central Asia, Azerbaijan and Turkey – FISHCap

Virtual Workshop Report Climate Change Adaptation in Fisheries and Aquaculture 23-24 June 2020

The virtual workshop was formulated under the project “Capacity Building for Sustainable Fisheries and Aquaculture Management in Central Asia (FISHCap): GCP/SEC/013/TUR” implemented under the FAO-Turkey Partnership Programme on Food and Agriculture (FTPP II) funded by the Government of the Republic of Turkey.

The event was organized on 23-24 June 2020 in two sessions in cooperation with the Bogazici University Center for Climate Change and Policy Studies, a research centre conducting interdisciplinary research on the impacts of climate change on regions such as Eastern Mediterranean, Middle East and Central Asia.

The virtual workshop aimed to provide an overview of the status and impacts of climate change on aquaculture and fisheries in Central Asia and the Caucasus and discuss potential adaptation and mitigation activities. The agenda of the workshop is given in the Appendix 1. The virtual workshop was conducted in English and Russian languages with simultaneous interpretation. The event was originally scheduled to be held physically in Istanbul, Turkey on 30-31 March 2020 but postponed due to the COVID-19 pandemic, which has caused substantial delays to the delivery of national and international activities.

The following countries were invited to nominate up to 7 participants: Azerbaijan, Kazakhstan, Kyrgyzstan, Tajikistan, Turkey, Turkmenistan and Uzbekistan. The target audience of the virtual workshop included government staff, decision-makers in fisheries and aquaculture management, academicians and researchers involved in climate change issues as well as fish farmers and representatives of fishers/fish farmers organizations. The workshop was attended by more than 60 experts from the project’s target countries. The list of participants is included in Appendix 2.

Climate change is an increasing global challenge which requires urgent, coordinated, and consistent action. There are several international instruments for combating climate change. Included is the 2015 Paris Climate Agreement, which recognizes the need for effective and progressive responses to the urgent threat of climate change through mitigation and adaptation measures, while taking into account the particular vulnerabilities of food production systems.

Fisheries and aquaculture are important contributors to the food supply, food security and livelihoods at both the local and global levels. Climate change affects fisheries and aquaculture via acidification, changes in sea temperatures and circulation patterns, the frequency and

severity of extreme events, and sea-level rise and associated ecological changes. Both direct and indirect impacts include impacts on targeted populations' range and productivity, habitats and food webs as well as impacts on fishery and aquaculture costs and productivity and fishing community livelihoods and safety. Fish feeding, migration and breeding behaviour will be directly affected and changes in their physical environments will indirectly affect growth, mortality and reproduction.

Inland waters are particularly vulnerable to climate change and in the short term, climate change is anticipated to affect inland fisheries by incremental changes in water temperature, nutrient levels and lower dry season water level. On the other hand, climate change could have both positive or negative impacts on aquaculture, which might arise from direct and indirect effects on the natural resources that aquaculture requires, i.e. land, water, feed, seed and energy. As fisheries play a significant role in providing feed and seed inputs, productivity and profitability of aquaculture systems could also be directly affected by climate change. Thus, dependency on natural resources and exposure to extreme weather events will give rise to the vulnerability of aquaculture-based communities. Climatic changes could lead to increased physiological stress on the cultured stock. This would not only affect productivity but also increase susceptibility to diseases and hence result in higher risks and reduce the profitability of farmers. Climate change is expected to have direct and indirect impacts on aquaculture sector. Significant socio-economic role of aquaculture in terms of job and income generation, as well as food security and economic development, calls the need for a proactive approach for the development of adaptation and mitigation policies towards climate change and aquaculture interactions. Awareness building and understanding perceptions of aquaculture stakeholders regarding the impact of climate change on aquaculture are important pillars of developing adaptation and/or mitigation policies.

Central Asia is particularly vulnerable to climate change. The World Bank has given the highest vulnerability rank to four of the five Central Asian countries among 28 nations of Europe, Caucasus and Central Asia, with the most vulnerable being Tajikistan and Kyrgyzstan¹. The IPCC 4th Assessment Report states that climate change poses serious threats to Central Asia's environment, ecological and socio-economic systems, particularly because of the arid nature of the region (IPCC, 2007).²

A technical cooperation project titled "Strengthening adaptation of Aquaculture and Culture-based Fisheries to Climate Change" was conducted between 2013 and 2015 with the participation of Kazakhstan, Kyrgyzstan, Tajikistan and Uzbekistan. The project generated a regional action plan for managing climate change related risks in aquaculture and culture-based fisheries in the Region. The plan however has not yet been realized.

Technical highlights

The first day of the workshop started with the opening remarks of Mr. Viorel Gutu, Sub-regional Coordinator for Central Asia and FAO Representative in Turkey. V. Gutu stated: "*The FISHCap is one of the significant projects developed and implemented under the FAO–Turkey Partnership Program (FTPP-II). Fisheries and aquaculture sector became the priority area in FPPP and even among the countries across the region. Aquaculture, which is an important sector that globally provides food and income, is extremely vulnerable against climate change, so we need to pay*

¹ Zoï Environment Network, 2009: "Climate Change in Central Asia: A Visual Synthesis.

² Climate Change in Central Asia, A visual synthesis based on official country information from the communications to the UNFCCC, scientific papers and news reports.

attention to its sustainable management and development and resilience to climate change. We need advanced collaboration, policy development and investments in fisheries and aquaculture”.

In continuation, Mr. M. Altuğ Atalay, Director General for Fisheries and Aquaculture of the Turkish Ministry of Agriculture and Forestry, took the floor and outlined key points of consideration, targets and pathways in sustainable development of the sector: *“Especially in the aquaculture sector, it is aimed to culture fish species by developing methods to minimize the vulnerability to climate change for fish species to be cultivated. Adequate conditions for resource saving should be developed; best practice examples should be determined and further applied. Saving resources will affect our aquaculture policy in the future. As of the subject we work with, the effects of climate change on invasive species, local species and carrier species will be determined; and mapping of biodiversity sensitivity of the seas will be improved”.* Finally, Mr. Levent Kurnaz, Professor, İklimbu, delivered a welcome speech underlying the relevance and importance of the topics covered by the workshop to the Central Asia and Caucasus region.

Technical sessions were moderated by Mr. Haydar Fersoy, Senior Fishery Officer, FAO. The main topics discussed on the first day were physical drivers of climate change impacting aquatic ecosystems, climate change impacts on fisheries and aquaculture and on water resources in Central Asia; and the impacts of climate change on inland fisheries. Objectives and expected outputs of the Virtual Workshop were introduced by Mr. Ramazan Çelebi, National Fisheries Expert, FAO.

Mr. Dursun Yıldız, Water Resources Engineer, Hydro Politics Academy, stressed the following projections and threads:

- physical drivers of climate change create significant threats to the species composition and function of aquatic ecosystems;
- as climate change alters ecosystem productivity and species composition, many unforeseen ecological changes are expected;
- these changes may threaten the goods, services and systems that help secure human well-being;
- management priorities should include these merging threat.

Mr. Serik Timirkhanov, Head of Aqua Alliance LLP (Kazakhstan), made a detailed presentation covering the basic geographical and climatic characterization of the region. The presentation also provided information on observed/reported effect of global warming in the Central Asia region:

- increase in water temperature and increase in evaporation;
- increase in total runoff over about half a century (while glaciers melt) and the subsequent complete dependence of runoff on precipitation with unpredictable changes in volume and distribution;
- increase in energy and frequency of adverse events (wind, storm);
- sharp fluctuations in water availability and water temperature in adjacent years.

Mr. Levent Kurnaz briefed the workshop about the work of İklimBU on climate change impacts on water resources in Central Asia and Caucasus region. He also shared with the participants the experience of BU/CORDEX as the domains of Central Asia, under the International Coordinated Regional Climate Downscaling Experiment (CORDEX). Climate change maps showed indicate a clear warming trend in the region over the last decades.

The second day was devoted to the topic of international response to climate change; economic instruments for combating climate change; perception of Turkish aquaculture stakeholders on climate change-aquaculture Interactions; and climate-smart fisheries and aquaculture. The presentations in both sessions were followed up by an open discussion.

Mr. Haydar Fersey, Senior Fishery Officer, FAO and the Lead Technical Officer of the project delivered a presentation on *International action on climate change: International governance instruments for climate change*. He underlined the targets of the international instruments (i.e. The United Nations Framework Convention on Climate Change, Kyoto Protocol, and Paris Agreement) as well as key achievements and challenges of the implementation of these instruments. He underlined the apparent impacts with immediate consequences at an unprecedented level of increasing climate change With these adverse impacts on livelihoods; disasters and extreme weather events such as drought, floods and cyclones and their impact on productive sectors, including fisheries and aquaculture; and 20 warmest years on record over the last 22 years were discussed. Special Report (2018) of the Intergovernmental Panel on Climate Change (IPCC) projects that global warming is likely to reach 1.5°C between 2030 and 2052 if it continues to increase at the current rate. Although Paris Agreement sets out a global framework to limit global warming to between 1.5°C and 2°C, such an international commitment requires urgent action as IPCC scientifically warns that exceeding 1.5°C warming compared to pre-industrial levels will lead to catastrophic consequences as the global average temperature is already more than 1°C higher than the pre-industrial era.

The presentation on Economic instruments for combating climate change was given by Ms. Evetta Zenina, Natural Resources Officer (Climate Change), FAO. The meeting noted the following:

- Adaptation can be planned or autonomous (i.e. spontaneous reaction to environmental change or planned action based on climate-induced changes). Autonomous adaptation in fisheries may be changing the timing or locations of fishing as species arrive earlier/later or shift to new areas. Planned adaptation in fisheries may be research funding for finding species resistant to salinity and temperature fluctuations for aquaculture. Although adaptation is context-specific, there are a number of adaptation activities that can be applied in most fisheries and aquaculture contexts. These include:
 - o Reduction of external stressors on natural systems;
 - o Identification and protection of valuable areas;
 - o Investments in safer harbors and landings, early warning and forecasting systems;
 - o Promotion of disaster risk management;
 - o Capacity building;
 - o Financial mechanisms;
 - o Market-based instruments: price-based or quantity-based;
 - o Monitoring;
 - o International trade.

Ms. Zenina gave detailed information on the FAO Adaptation Toolbox for fisheries and aquaculture which comprises a set of climate adaptation tools and methods recommended and currently available to governments, industries and individual fishers and fish farmers.

Mr. John Jorgensen, Fishery and Aquaculture Officer, FAO, gave a presentation on *Overview of the impacts of climate change on inland fisheries*. He started his presentation by introducing

the FAO Review in 2018, Impacts of climate change on fisheries and aquaculture Synthesis of current knowledge, adaptation and mitigation options (available at: <http://www.fao.org/3/i9705en/i9705en.pdf>). Mr. Jorgensen continued with the explanation of the distribution of the earth's freshwater resources. The impact-way of the climate change on the structure and functioning of aquatic ecosystems such as; pollution, over exploitation, flow, changes in the flood patterns, water abstraction, fragmentation, temperature changes were elaborated detailed with examples. .

Mr. Ferid Rad, Professor, Mersin University Fisheries Faculty, shared his experiences with the Perception of Turkish Aquaculture Stakeholders on Climate Change-Aquaculture Interactions. He gave detailed information on the project findings of Perception of Turkish Aquaculture Stakeholders on Climate Change-Aquaculture Interactions funded from the European Union's Horizon2020 research and innovation programme under grant agreement No678193 (CERES, Climate Change and European Aquatic Resources). Key findings of the project are as follows:

- There is relatively a high level of awareness on CC and aquaculture interaction among Turkish producers;
- Producers regard climate change and its impact on aquaculture as a long-term challenge;
- See the policy and strategy development on CC adaptation measures the responsibility of public authorities;
- There is an urgent need for a proactive approach by public authorities to assess the risks associated with climate change on aquaculture at national level and develop appropriate adaptation and mitigation policies; and
- This requires a "bottom-up" and a co-construction approach through involvement of all aquaculture stakeholders.

The last presentation was on Climate-smart fisheries and aquaculture by Mr. Binhan Ganioglu, Freelance Consultant, Turkey. Mr. Ganioglu presented the Climate-Smart Agriculture Basics produced by FAO and gave detailed information on the ecosystem approach to fisheries (EAF) and the ecosystem approach to aquaculture (EAA) as the approaches to developing climate-smart fisheries and aquaculture.

The workshop noted that climate change is posing considerable risks to aquatic ecosystems, social and economic systems in the Central Asia and Caucasus region as well as in Turkey. Examples of future projections of temperature, precipitation, drought and aridity over these areas were presented by Mr. Levent Kurnaz. He stressed that the lack of long-term historical data in these areas in most cases makes it difficult to make climate change predictions. A need to implement a holistic approach to address climate change at local, national, and regional levels was highlighted. Mr. Fersoy concluded that despite serious challenges, certain opportunities and encouraging signs of increased political commitments and general public awareness about climate change exist in the region.

Situation overview of the impacts of climate change in the Central Asian region

A. Impact of the climate change on water resources

There have been several studies on the impact of climate change on water resources in the Central Asian countries. United States International Development Agency is summarizing the situation as: "*Central Asia is a land-locked region with wide-ranging climate regimes, from arid deserts to mountains with heavy precipitation, contrasts observed both within and across the*

region's individual countries. For example, while much of the Kyrgyz Republic is considered a moderate climate zone, with 70 percent of land above 2000 meters (m) in elevation receiving heavy rainfall, the country overall is also highly drought-prone. By contrast, Tajikistan is mostly subtropical and semi-arid, with half of the country sitting at elevations above 3000 m, while 80 percent of Turkmenistan is flat desert. Generally, across the region, the summers are warm to hot, with mean temperatures ranging from 20°C to 40°C, and winters are moderate to cool, with mean temperatures ranging from -3°C to 20°C. Summer daily maximum temperatures can be as high as 50°C in the deserts, while winter daily minimum temperatures can drop as low as -45°C in some mountainous areas and as low as -18°C in northern parts of the region. Annual average precipitation across highly mountainous Tajikistan is around 500 millimeters (mm), largely during spring and early summer, while Uzbekistan receives less than half as much. Heavy winds are at times prevalent across the region, leading to dust storms in many areas, especially during the months of September and October. Floods and mudflows occur frequently across the region, and droughts are also relatively common (USA AID)³.

Water resources in Central Asian countries are under threat of climate change in the view of increase in water temperature and evaporation; in total runoff over about half a century (while glaciers melt) and the subsequent complete dependence of runoff on precipitation with unpredictable changes in volume and distribution; increase in energy and frequency of adverse events (wind, storm); sharp fluctuations in water availability and water temperature in adjacent years.

The virtual workshop underlined how the climate system works and hydrologists are able to evaluate the impact of changes in climate on water resources. Climate change is expected to exacerbate current stresses on water resources created by population growth; and economic and land-use change. The impact of climate change on water resources in Central Asia is summarized by Punkari et al (2014)⁴: *"The region has two main rivers in Central Asia, the Syr Darya and the Amu Darya, play a prominent role in the region. People depend on their water for domestic use, farmers rely on it for irrigation, and the environment alters if water resources change, and hydropower requires it to supply the region with energy. Besides ongoing economic development with associated changes in water requirements, it is clear that climate change is an additional challenge to the planning and management of water sources. Currently, most water in the region is generated in the upstream mountainous areas. Water flows from smaller streams into bigger streams and finally into the Amu Darya and Syr Darya rivers. Increasing evaporation, increasing water usage, and increasing irrigation needs trigger the environmental instability in the region.*

In Central Asia, mountain snowpack, glaciers, and small ice caps play a crucial role in freshwater availability. The glacial retreat and snow cover reductions observed over recent decades are projected to accelerate throughout the 21st century. The consequences will be a reduction in overall water availability, lower hydropower potential, and changing seasonality of flows in regions supplied by meltwater from the Tien Shan and Pamir mountains. Besides projected changes in precipitation, rising temperatures are an important factor for Central Asia. The large-scale irrigation systems are already suffering from water shortages, and higher temperatures will increase the volume of water required by the irrigated crops. Moreover,

³ Climate Risk Profile Central Asia, Fact Sheet, USA aid, United States International Development Agency

⁴ Punkari, M., Droogers, P., Immerzeel, W., Korhonen, N., Lutz, A., Venäläinen, A., Climate Change and Sustainable Water Management in Central Asia, FCG International, ADB Central and West Asia working paper series, May 2014.

higher temperatures will also have an impact on the natural vegetation, and evaporation from these areas will increase so that less water will be available to flow into the streams and rivers.”

It is also reported in the same study that there are hundreds of proglacial lakes in Central Asia and many of them have been classified as dangerous. Recent ice surges, outbursts of glacier-dammed lakes, and floods by glacial rivers have caused major disasters. The increasing incidence of glacial lake outbursts can be related to climate warming because receding glaciers generate proglacial lakes. Thawing of an ice core in a terminal moraine damming a lake may cause a breach, leading to the sudden release of a mudflow down to the valley. Government institutions in Central Asian countries map and manage emergency situations. Flood protection interventions and early warning systems are needed in areas that are found to be vulnerable to glacial instability and lake outbursts.

Another issue is the flood hazards resulting in glacier melting raised in the virtual workshop. Flood hazards are also alerted in the *Climate Change in Central Asia. A visual synthesis based on official country information from the communications to the UNFCCC, scientific papers and news reports*. The report underlined that the flood hazards should be very carefully for perception in the future. The report summarizes the situation as follows: *“There has been a series of glacial outburst floods in the mountains of Tajikistan, Uzbekistan and Kyrgyzstan, making it even more urgent to monitor these hazards. With glaciers melting, glacial lakes appear every summer in the mountains. Some of them grow significantly and, if contained by unstable moraines, they occasionally burst to release large amounts of water in destructive flash floods, sometimes with serious impacts on life and property. Annually, more than 200 potentially risky glacial lakes appear in the mountainous regions above Almaty and Bishkek cities, around Issyk-Kul Lake and the densely populated Ferghana Valley, and in the narrow Pamir and Hissar-Alai valleys. Experts suggest that this number is likely to grow with climate change. There have already been deadly floods in the past decade, including the Shahimardan (Uzbekistan and Kyrgyzstan, 1998), Dasht (Tajikistan, 2002) and Issyk-Kul (2008). Some large mountain lakes, such as Sarez Lake in Tajikistan which formed in 1911 as the result of a rock slide in the central Pamir Mountains, represent a serious risk. Situated at an altitude of 3,000 meters, the lake is over 60 km long, almost 500 meters deep and contains 17 km³ of water. If there were a new rockslide into the lake there are fears that a high wave could form, and depending on its volume, the season and the location of the slide, this could cause a destructive flood. In spite of declining precipitation, the water level in the lake is increasing, which is likely due to intensified glacier and permafrost melt caused by climate warming. Other lakes, such as Karakul, show similar increases in water level and surface area due to the more intense glacier and permafrost melt and water inflow”.*

In the contrast of remaining part of the region, some cities have been facing dramatical challenges with raising water levels in some glacier lakes when most of the part of the earth experiencing strong water shortage because of the climate change. This threat should be considered in the short term by governments and other international institutions. Effective and implementable measures including to realise the accumulated waters under control should be developed to prevent thousands of communities' safe.

B. Impact of CC on fisheries and aquaculture

The International Panel on Climate Change (IPCC) considers that climate change poses serious threats to Central Asia's environment and ecological and socio-economic systems, particularly because of the region's arid nature (IPCC 2007a,b,c,d). The following summarizes some of the

major conclusions and projected impacts of climate change of relevance to fisheries and aquaculture in CAC countries as given in the 4th IPCC assessment report (IFAD undated): Fishery industries are important in some CAC countries, but overfishing and marine pollution have led to decreased catches. Recent evidence shows that the fishing sector in Central Asia is close to collapse and that climate change will further exacerbate and accelerate this process, affecting mainly the rural poor.

The implications of climate change for global fisheries and aquaculture lastly were explored at the FAO Expert Workshop on Climate Change Implications for Fisheries and Aquaculture, held from 7 to 9 April 2008 in Rome, Italy⁵. It was projected that *“the climate change poses multiple additional risks to fishery-dependent communities that may limit the effectiveness of past adaptive strategies. Adaptation strategies will need to be context and location-specific and to consider both short-term (e.g. increased frequency of severe events) and long-term (e.g. reduced productivity of aquatic ecosystems) impacts. All three levels of adaptation (community, national and regional) will clearly require and benefit from stronger capacity building, through awareness raising on climate change impacts on fisheries and aquaculture, promotion of general education and targeted initiatives in and outside the sector.”*

At its third meeting, held in Baku, Azerbaijan in 2015, the Technical Advisory Committee (TAC) of the Central Asian and Caucasus Regional Fisheries and Aquaculture Commission (CACFish) outlined the very big picture of climate change impacts in the Central Asian and Caucasus region⁶:

- The extreme weather and climate events are increasingly being observed also in the CACFish area.
- There is clear evidence indicating that the geographical distribution of fish stocks, life cycles of fish, and dynamics of aquatic ecosystems at the global level were being affected by climate change, most of which could be attributed to human activities. It was stated that growing evidence points to such changes in the CACFish area.
- Climate change would pose remarkable risks to fisheries and aquaculture in the CACFish area, as indicated by growing numbers of reported climate projections and scenarios. It is known that a significant number of lakes in Asia had considerably shrunk, like the Aral Sea, while some were in danger or had fully disappeared. Evidence indicates unusual water level fluctuations in large water bodies (i.e. Issyk-Kul Lake) and the Caspian Sea.
- The current knowledge on the likely climate change impacts on fisheries and aquaculture in the CACFish area seemed inadequate while uncertainty remained regarding the projected impacts of climate change, particularly on local inland aquatic ecosystems in the CACFish area.

⁵ FAO Fisheries Report No. 870, Report of the FAO Expert Workshop on Climate Change Implications for Fisheries and Aquaculture Rome, 7-9 April 2008

⁶ Report of the Third Meeting of Technical Advisory Committee Meeting for Central Asian and Caucasus Fisheries and Aquaculture Commission. <http://www.fao.org/3/a-i5167b.pdf>

- The challenges are difficult to manage and monitor; and TAC, in this regard, noted the lack of specialized institutional research capacity for interaction between climate change and fisheries”.
- Additionally, TAC noted that climate change could have economic impacts on the fisheries and aquaculture sectors in the region, including the support industry, customers and other stakeholders. However, it was stated that mitigation options and strategies to the direct and indirect climate impacts on inland fisheries and aquaculture, including culture-based fisheries, existed. These included: increased water usage efficiency; usage of recirculation systems in the production systems of aquaculture; innovative technologies; integrated water resource management and planning. In this regard, the development of adaptation and mitigation strategies for climate change preparedness both at national and regional levels were suggested. Taking up the challenges of changes in climate and applying the appropriate strategies could also mean an opportunity for aquaculture in the CACFish Area. Besides the other issues, policy and planning instruments were described as the main areas of focus in terms of preparedness for climate change in fisheries and aquaculture. In this connection, the preparation of wide-level policy and planning documents based on the reliable and best available data were suggested. One of the successfully completed study is the Regional FAO Project titled Strengthening Adaptation of Aquaculture and Culture-based Fisheries to Climate Change, which aimed, among other things, at delivering governance guidelines for preparation of action plans, and to strengthen capacity building in the context of climate change adaptation.

TAC stressed that the Central Asian and Caucasus region had some valuable historical meteorological, hydrological and limnological data, which could be used as input for improved impact evaluation for fisheries and aquaculture. These data were also useful in the development of possible adoption and mitigation options and associated measures. After the Soviet Union collapsed, the ongoing studies on climate change and its impact on fisheries and aquaculture sector were interrupted. As mentioned during the presentations, sharp fluctuations in water and temperature adversely affect planning fish breeding events, on fishing planning. When establishing the terms of the spawning ban on specific dates that do not depend on the timing of the actual spawning of fish, so it causes to fishers lose income.

Regarding the impact of climate change on fish biology (including breeding, spawning season, spawning age, and spawning area), some participants suggested that *“Many studies show that the climate change effects on fish behavior including breeding, spawning season, spawning age, and spawning area which are common measures for policy development of sustainable management inland fisheries and aquaculture. Besides human activities, climate change also determines fishery management policy. Fisheries activities are managed with circulated regulation by the countries. These regulations are mostly prepared with consultation of experts, scientific studies on spawning behaviors by region and by species and other technical data records about the fresh water fishes and other organisms. Determination of spawning behaviors is also essential to prepare a fishery management legislation. It is clear that there is a significant lack of studies conducted in the region about spawning behaviors of economic inland fishes in the region, mainly after the collapse of the Soviet Union. Even in Turkey, most of the data used as scientific evidence dates back to a few decades.. Fisheries associations, cooperatives, or NGOs are requesting to update the fishery regulation in terms of fishing prohibition seasons, fish size, fishing area and fishery equipment due to environmental changing as a result of climate impact. Most of studies and observations of climate activity*

show that most of fresh water organisms in natural or man-made water reservoirs developed new life habits. In this respect, not only in Turkey but also some other Central Asian Countries should update the data profile under a regional study”.

To summarize, it is widely accepted and well perceived that the aquatic resources of the CAC region are projected and observed to be highly affected by gradual and abrupt effects of global climate warming creating increasing pressure on fisheries and aquaculture in the region. A multi-level regional strategy on climate built on the key findings and outcomes of the workshop can be developed.

About the FAO-Turkey Partnership Programme on Food and Agriculture (FTPP II)

The overarching objective of the FAO-Turkey Partnership Programme is to provide support to ensure food security and rural poverty reduction in countries of Central Asia and Caucasus. Established in 2007, the programme benefits from trust fund contributions totaling US\$ 20 million to date, financed by the Government of Turkey, and represented by the Ministry of Agriculture and Forestry. During the first phase of FTPP (2009-2015), 28 projects were implemented in 16 countries. In 2014, Turkey and FAO commenced the second phase of the FTPP under which a range of projects will address the issues of food security and nutrition, agricultural and rural development, protection and management of natural resources, agricultural policies, and food safety, taking into consideration the different experiences key stakeholders and actors including women and youth.

FAO-TURKEY PARTNERSHIP PROGRAMME ON FOOD AND AGRICULTURE (FTPP II)

Appendix 1

PROVISIONAL AGENDA

Tuesday, 23 JUNE 2020

Moderator: Haydar Fersoy, Senior Fishery Officer, FAO

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10:15 - 10:30 **Objectives and expected outputs of the Virtual Workshop**

Ramazan Celebi, National Expert Fisheries, FAO

10:30 - 10:50 **Understanding climate change: Physical drivers impacting aquatic ecosystems**

Dursun Yıldız, Professor, İklimBU

10:50 - 11:10 **Climate change impacts on fisheries and aquaculture in Central Asia**

Serik Timirkhanov, Head of Aqua Alliance LLP (aqua-alliance.kz), Kazakhstan

11:10 - 11:30 **Climate change impacts on water resources in Central Asia and Caucasus region and Experience of BU/CORDEX**

M. Levent Kurnaz, Professor, İklimBU

11:30 - 11:50 **International action on climate change: International governance instruments for climate change**

Haydar Fersoy, Senior Fishery Officer, FAO and the Lead Technical Officer of the project

11:50-12:00 **Question and answers**

Wednesday, 24 JUNE 2020

Moderator: Haydar Fersoy, Senior Fishery and Aquaculture Officer, FAO

10:30 - 11:00	An overview of the impacts of climate change on inland fisheries. John Jorgensen ,Fishery and Aquaculture Officer, FAO
11:00 - 11:30	Perception of Turkish Aquaculture Stakeholders on Climate Change-Aquaculture Interactions Ferid Rad, Professor, Mersin University, Fisheries Faculty, Mersin, Turkey
11:30-12:00	Climate-smart fisheries and aquaculture Binhan Ganioglu, Freelance Consultant, Ankara, Turkey
12:00 - 12:15	Question and answers
12:15 - 12:30	Closure and evaluation Haydar Fersoy, Senior Fishery Officer, FAO and the Lead Technical Officer of the project

FAO-TURKEY PARTNERSHIP PROGRAMME ON FOOD AND AGRICULTURE (FTPP II)

Appendix 2

Participant List

Country	Name /Surname	Institution	Address/Phone
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	Chary Yazdurdyev	Fishery and Aquaculture, Union of Industrialists and Entrepreneurs of Turkmenistan	
	Suwhanmyrat Atayew	"Hazar balyk" Open Joint-Stock Company	
	Nazar Orazow	"Elin balyk" private aquaculture enterprise	
	Kuwwat Abdurahmanow	State Fisheries and Water Supervision Department of the Agency for Economic Risk Protection under the Ministry of Finance and Economy of Turkmenistan	

	Oraz Myradow	State Fisheries and Water Supervision of the Agency for Economic Risk Protection under the Ministry of Finance and Economy of Turkmenistan	
	Hudarbeydi Hajyyev	Department of Agrarian Progresses and World Practices	
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