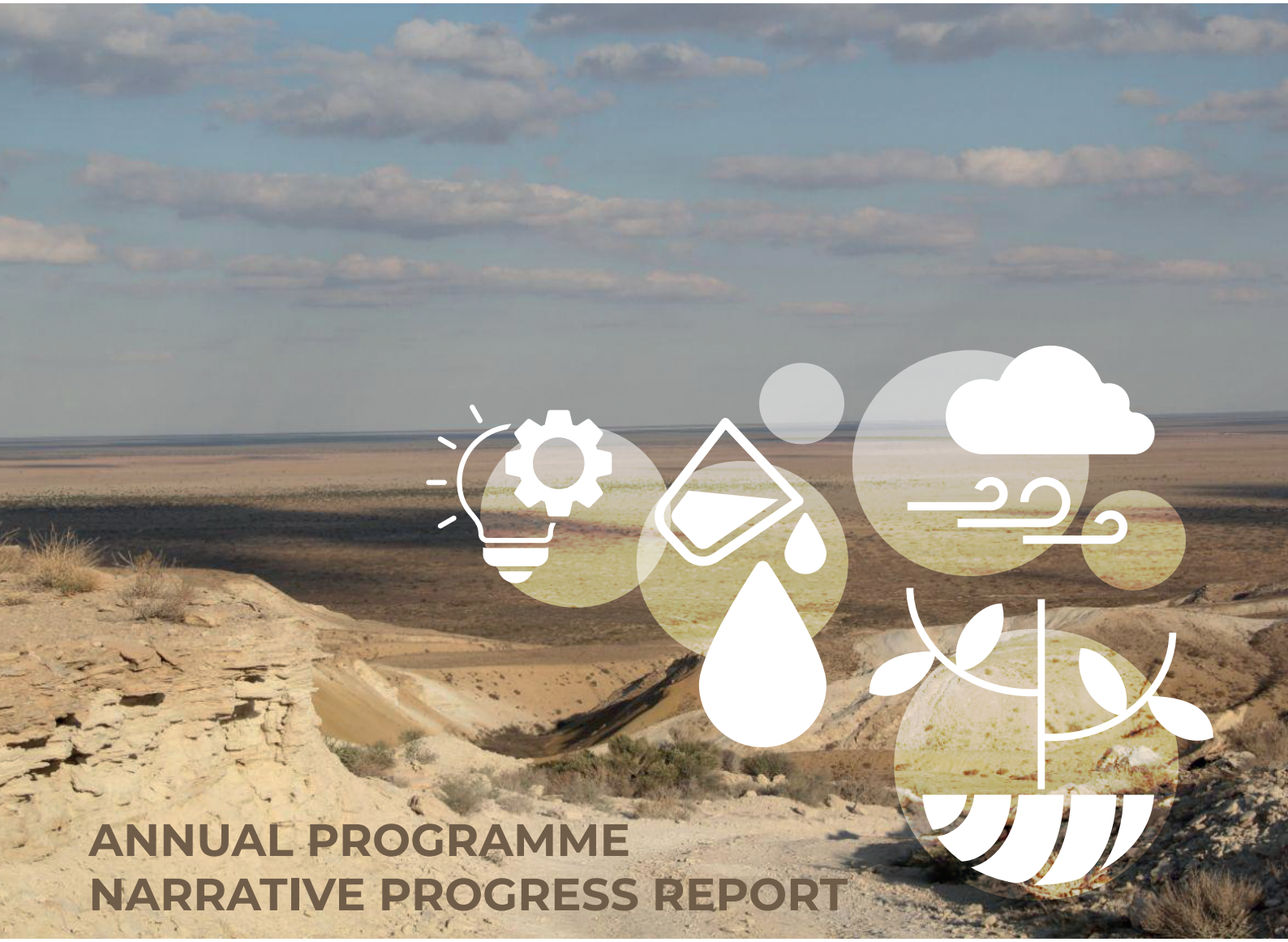
Food and Agriculture Organization of the United Nations

UNDP and FAO Joint Progamme
"Building knowledge and skills of local partners and communities to address environmental insecurities through innovative air, land, and water management solutions in the Aral Sea Region"



# ANNUAL PROGRAMME NARRATIVE PROGRESS REPORT

## Reporting period: 9 July – 31 December 2024

THE SEA IS GONE PEOPLE ARE NOT

UN Multi-Partner Human Security Trust Fund for the Aral Sea Region in Uzbekistan

This Joint Programme is funded by the UN Multi-Partner Human Security Trust Fund for the Aral Sea region in Uzbekistan, wich is generously supported by the Goverment of Uzbekistan, Norway, Finland, the Republic of Korea, the European Union, and Alwaleed Philanthropies

Government of the Republic of Uzbekistan
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| Programme Title & Project Number | Country, Locality(s), Priority Area(s) / Strategic Results |
|---|---|
| • **Programme Title:** UNDP and FAO Joint Progamme "Building knowledge and skills of local partners and communities to address environmental insecurities through innovative air, land, and water management solutions in the Aral Sea Region".<br>• **Programme Number:** 01002834<br>• **MPTF Office Project Reference Number:** 00140724 | **Country/Region:**<br>Uzbekistan, the Republic of Karakalpakstan, Muynak, Kungrad, Takhtakupir districts<br><br>**Priority area/strategic results:**<br>• UNSDCF Priority B – "Inclusive human capital development leading to health, well-being and resilient prosperity" and Outcome 3 - By 2025, youth, women and vulnerable groups benefit from improved access to livelihoods, decent work and expanded opportunities generated by inclusive and equitable economic growth;<br>• UNSDCF Priority C -" Sustainable, climate responsible and resilient development" and Outcome 5 - By 2025, the most at-risk regions and communities of Uzbekistan are more resilient to climate change and disasters, and benefit from increasingly sustainable and gender-sensitive efficient management of natural resources and infrastructure, robust climate action, inclusive environmental governance and protection. |
| **Participating Organization(s)** | **Implementing Partners** |
| Organizations that have received direct funding from the MPTF Office under this programme:<br>• UNDP<br>• FAO | • Ministry of Ecology, Environmental Protection, and Climate Change of the Republic of Uzbekistan<br>• The Ministry of Economy and Finance of the Republic of Uzbekistan<br>• Uzhydromet<br>• The Council of Ministers of the Republic of Karakalpakstan<br>• The Ministry of Water Resources of the Republic of Uzbekistan<br>• The Ministry of Agriculture of the Republic of Karakalpakstan<br>• The International Innovation Centre for the Aral Sea Basin under the Ministry of Ecology of Uzbekistan<br>• The Scientific-Information Center of the Interstate Commission for Water Coordination in Central Asia (SIC ICWC)<br>• The Forestry Committee of Uzbekistan<br>• District Khokimiyats of Muynak, Kungrad and Takhtakupir |
| **Programme/Project Cost (US$)** | **Programme Duration** |
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| **Programme Assessment/Review/Mid-Term Eval.** | **Report Submitted By** |
| Assessment/Review - if applicable please attach<br>Yes **No**<br>Date: dd.mm.yyyy<br><br>Mid-Term Evaluation Report – if applicable please attach<br>Yes **No**<br>Date: dd.mm.yyyy | • Name: Ms. Akiko Fujii<br>• Title: UNDP Resident Representative in Uzbekistan<br>• Participating Organization (Lead): UNDP<br>• Email address: anas.qarman@undp.org |

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# LIST OF KEY ACRONYMS

| | |
|---|---|
| **CDP** | Community Development Plan |
| **COVID-19** | Coronavirus Disease 2019 |
| **FAO** | Food and Agriculture Organization of the United Nations |
| **GIS** | Geographic Information System |
| **GPS** | Global Positioning System |
| **GoU** | Government of Uzbekistan |
| **ICT** | Information and Communication Technology |
| **IICAS** | The International Innovation Centre for the Aral Sea Basin under the Ministry of Ecology of Uzbekistan |
| **IT** | Information Technology |
| **JP** | Joint Programme |
| **MIIT** | Ministry of Investment, Industry and Trade of Uzbekistan |
| **MoA** | Ministry of Agriculture |
| **MoEF** | Ministry of Economy and Finance of Uzbekistan |
| **MOFA** | Ministry of Foreign Affairs |
| **MPHSTF** | UN Multi-Partner Human Security Trust Fund for the Aral Sea region in Uzbekistan |
| **PB** | Project Board |
| **PRA** | Participatory Rural Appraisal |
| **SDG** | Sustainable Development Goal |
| **SIC ICWC** | Scientific Information Center of the Interstate Coordination Water Commission of Central Asia |
| **STEM** | Science, Technology, Engineering, Mathematics |
| **TOR** | Terms of Reference |
| **UNDP** | United Nations Development Programme |
| **UNSDCF** | United Nations Sustainable Development Cooperation Framework |
| **VCC** | Village Council of Citizens |

# EXECUTIVE SUMMARY

The UNDP and FAO Joint Programme (JP), Building knowledge and skills of local partners and communities to address environmental insecurities through innovative air, land, and water management solutions in the Aral Sea Region, made significant progress between July 9th and December 31st, 2024. During this period, the program focused on laying the groundwork for sustainable ecosystem restoration and enhancing community resilience in response to the Aral Sea crisis.

To deepen the understanding of ecosystems and actively engage communities, a comprehensive assessment of ecosystem services was initiated. A national consultant was hired, and surveys and interviews with local stakeholders, including shepherds, were conducted to gather invaluable local knowledge for effective restoration strategies. Additionally, efforts were made to attract eco-volunteers for ecosystem mapping, ensuring long-term community involvement. Furthermore, Tugai forest territories were analyzed, and local pasture usage information was collected.

In developing restoration strategies and building capacity, an international consultant collaborated with key stakeholders, such as the Forestry Agency, to develop an Ecosystem Restoration Guideline. This guideline provides practical strategies for ecosystem recovery and sustainable land management, informed by expert discussions and field visits. Technical support was also extended to forestry departments for establishing nurseries and expanding afforestation efforts. Demonstration plots with oleaster seedlings were established, incorporating innovative water-saving technologies to assess their effectiveness in harsh conditions. Additionally, capacity-building initiatives were prioritized through intensive training courses on Tugai forest improvement, equipping local forestry personnel and university students with sustainable management techniques.

To enhance monitoring and data-driven decision-making, a needs assessment for air quality monitoring was conducted, leading to the selection of priority locations for automatic air quality monitoring systems (AQMS) and the launch of a procurement tender. A comprehensive environmental assessment was carried out across six key districts, focusing on water and soil quality to support informed decision-making in agricultural practices, land use, and environmental protection. Meteorological stations were deployed to monitor climate variables, providing integrated data for ecosystem restoration and climate resilience strategies. Additionally, technical support was provided to the International Innovation Center for the Aral Sea (IICAS) for the procurement of a mobile laboratory to analyze soil composition and monitor sand and dust migration. The tender for contracting the laboratory's delivery was completed, and a vendor was contracted. Furthermore, field research in collaboration with the Academy of Sciences of the Republic of Karakalpakstan was initiated, focusing on sand and dust storms and assessing loss and damage to ecosystem services.

These achievements collectively contribute to the JP's overarching goal of improving ecosystem service management and building community resilience. By integrating scientific expertise with local knowledge and innovative technologies, the program is driving sustainable development in the Aral Sea region. The Joint Programme is funded by the MPHSTF for the Aral Sea region, with generous support from the Governments of Uzbekistan, Norway, Finland, the Republic of Korea, the European Union, Alwaleed Philanthropies, and the Government of the Federal Republic of Germany.

# I. PURPOSE

The ultimate goal is to establish robust environmental quality management and regulatory practices. The programme addresses challenges related to ecosystem degradation, biodiversity loss, climate-induced changes, water scarcity, deforestation, and air pollution in the Aral Sea Region. Through awareness-building, capacity development, practical interventions (equipment installations, demonstration plots), and regulatory frameworks, the project aims to contribute significantly to improve the Region's environmental well-being.

The Programme's goal and objectives are fully aligned with the policies and strategies of the Government of Uzbekistan on the development of the Aral Sea region, including the Presidential Decree on Aral Sea region adopted on July 29, 2021, which includes an action plan of activities by key ministries and agencies in line with the implementation of the special UN Resolution to transform the Aral Sea region into a Zone of Ecological Innovations and Technologies; Cabinet of Minister's degree on Integrated Roadmap for the sustainable development of the Aral Sea region adopted on 25 January 2022, the Government's comprehensive Development Programme for Karakalpakstan for 2020-2023 as well as the Green Transition Strategy adopted in 2019, which outlines the key priorities on green development, covering the Aral Sea region; Resolution of the Cabinet of Ministers Resolution, #31 dated 18th January 2022 on additional measures to create a "Green Cover" — Protective Forests on the Dried-Up bottom of the Aral Sea.

The project seeks to improve the wellbeing of communities affected by the Aral Sea crisis through the following objectives, which fully align with the Multi-Partner Human Security Trust Fund (MPHSTF) Programmatic Framework and Results Matrix as they contribute to addressing the multiple insecurities of people living in one of the most vulnerable districts of Karakalpakstan. The JP has three outcomes:

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**Outcome 1.** Assessment of ecosystem services in the Aral Sea Region to enhance local management practices;

**Outcome 2.** Adopting new approaches in water purification, afforestation, and soil stabilization in the Region (UNDP, FAO).

**Outcome 3.** Promoting integrated air, water, and soil quality monitoring systems to facilitate regulatory practices in the Region.

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The programme's first objective focuses on enhancing community understanding of local ecosystems and their services by aligning with international standards and sharing experiences through field trips, the aim is to address challenges such as limited awareness, insufficient data on ecosystems, and the negative impact of climate change on forestry. The approach ensures an innovative and people-centered strategy, incorporating technology transfer, participatory methods, and a focus

on the specific needs and capacities of local communities. Under this objective, a participatory resource mapping (PRM) approach is applied using local knowledge and experience to analyse geo-referenced information on tugai and pasture ecosystem services. Local communities are involved from the beginning in method selection, application, evaluation, and verification. This "inclusive participatory ES mapping" will be conducted in selected villages in three pilot district sites. The participatory ES mapping can facilitate social learning, provide the foundation for the creation of social and natural capital, and equip the community with sufficient spatial information to improve local ecosystems ecosystem management.

The participatory ES mapping approach can be used as a model to support local and regional decision-making processes and to enhance community-based ecosystem management in other regions of the country and beyond. This initiative will facilitate enhanced policymaking in land management, thereby bolstering regional food security. Community eco volunteers will be selected in pilot districts with further engagement into the assessment process; Moreover, the initiative aims to enhance community understanding of local ecosystems by aligning with international standards and sharing experiences through field trips. It addresses challenges like limited awareness, insufficient ecosystem data, and climate change impacts on forestry. The approach integrates technology transfer, participatory methods, and community-specific needs. Traditional knowledge of pasture enrichment and tugai rehabilitation, combined with improved water management, is key to sustainable practices. Ecosystem restoration empowers communities, fostering responsibility for ecological balance and local livelihoods.

The second objective focuses on adopting new approaches in water purification, afforestation, and soil stabilization in the Region. Firstly, it augments the success stories from previous years in the afforestation efforts of the Government, international partners (including UNDP and FAO) and other stakeholders. Capitalizing on the findings of the series of efforts on the flora and fauna of the dried Aral Seabed, this output aims to establish nurseries in the three target districts with salt resilient plants. In addition, the Programme envisions collaborating with local actors (IICAS and others) to enhance technical capacity to monitor land degradation and salinization in the Region to formulate sand and dust migration models. The Programme will support startup initiatives on soil stabilization such as chlorella, biohumus, zoohumus, buried diffuser technologies as well as establish nurseries specialized in growing drought-resistant plants in pilot communities, based on the results of the science-based expeditions to the dried seabed, that covered the area of 2,7 million hectares of land. Secondly, it centers on the restoration and sustainable management of tugai forest ecosystems. Through a series of activities, including assessments, seminars, workshops, and field trips, the aim is to address challenges related to water shortage, deforestation, and soil degradation. By piloting innovative technologies and practices, this output seeks to contribute to sustainable livelihoods and environmental resilience. This output contributes to the reduction of environmental stress by focusing on sustainable management and

restoration of tugai forest ecosystems. The activities aim to pilot new technologies and approaches. The proposal integrates context-specific solutions, considering the unique conditions of the Aral Sea Region by involving communities in planning and implementation. The focus on technology transfer and partnerships aligns with the call's emphasis on innovation and integrated solutions.

The third objective focuses on facilitating integrated air quality management systems and regulatory practices, as well as enhanced comprehensive environmental quality management and regulatory practices. Integrated Air Quality Management Systems (IAQMS) refer to comprehensive approaches to managing and improving air quality. These systems typically involve a combination of monitoring, assessment, and control measures to address air pollution and protect public health and the environment. The Programme aims to set up automatic air quality monitoring systems in at least eight locations within Karakalpakstan, integrating these systems into the national air quality monitoring network. It will also provide support for a minimum of three community-led startup initiatives that focus on monitoring air, soil, and water, with a special emphasis on the participation of youth, girls, and women. Community eco-volunteers will be engaged in promoting air quality monitoring systems along with project partners. Moreover, data generated from the automatic air monitoring systems will be used to formulate national standards in line with SDG 11 for the Aral Sea Region. The initiative addresses environmental pollution, water resource management, and the link between environmental change, human health, and agriculture. It focuses on improving water, air, and soil quality through enhanced management and regulations, including monitoring networks. The approach integrates technology, community training, and policy recommendations to ensure sustainable solutions. By piloting new technologies and involving communities in planning and implementation, the proposal is innovative, context-specific, and multidimensional. It aligns with the MPHSTF's Theory of Change, emphasizing technology transfer, participatory methods, and cross-sector partnerships for long-term environmental sustainability.

# II. RESULTS

## i) Narrative reporting on results

The JP results achieved for the period 9 July 2024 to 31 December 2024 are presented in this report. The JP geographically focuses on the three pilot districts of Muynak, Kungrad, and Takhtakupir in Karakalpakstan, the most affected areas of the ecological crisis districts in the Aral Sea region. The Joint Programme addresses the crisis caused by the Aral Sea Disaster through improving the practice of managing ecosystem services at the local level, increasing the efficiency and innovations to combat environmental degradation and its ongoing stress on local communities facing multiple vulnerabilities.

During this period, the key activities undertaken contributed to the following outcomes of the project:

Under **Outcome 1,** Participatory ecosystem restoration to enhance community-based tugai and desert pasture ecosystems management (UNDP):

- 3 thematic meetings with the representatives of VCC heads, forestry departments and community members in three target districts were conducted. During the meetings problems of using biological resources in the ecosystem were discussed, as well as measures to be taken to conservate and restore ecosystem services in the pilot districts. Consultations, surveys and discussions with residents of communities were held on existing ecosystem services and the importance of awareness raising campaigns. Survey allowed to find out that the forest ecosystem in the pilot districts consists mainly of turanga, oleaster, tamarisk and shrubs, the turanga population dominates there. The population of the villages are mainly engaged in cattle breeding. Livestock includes sheep, goats and cattle. During the interview, it was found out that local residents use the tamarisk bush (Tamarix laxa) to heat their houses and bake bread, using this wood according to the quota from the district forestry. Valuable tree plantations are protected by forest inspectors. Concept on attraction of eco-volunteers developed for the upcoming project initiatives;
- Forests, pastures and desert territories were visited and analysed in three target districts. Geo-referenced information was obtained for planning future activities within the project.
- A three-month incubation program was organized in partnership with IT Park to enhance the capabilities of youth and women in specific areas such as entrepreneurship and startup development;
- International Consultant from the Chamber of Forest Engineers in Türkiye (OMO), visited Uzbekistan, held meetings with key stakeholders, including the Forestry Agency and its district-level departments. Traveled to Muynak and Kungrad districts to assess opportunities and analyze existing conditions to develop an **Ecosystem Restoration Guideline** to address severe environmental degradation caused by the Aral Sea disaster.

- The Guideline focuses on restoring degraded ecosystems, enhancing biodiversity, and promoting sustainable land management. Stakeholders included the **Forestry Agency of Uzbekistan** and its regional and district-level departments. Meetings facilitated knowledge exchange on regulations, ongoing initiatives, and local challenges.
- As a result, the **Ecosystem Restoration Guideline for the Aral Sea Region** was developed by the Chamber of Forest Engineers in Türkiye (OMO) within the project. This document, now available in Uzbek translation, will be shared with the relevant governmental agencies for practical application.

Under **Outcome 2**, Adopting new approaches in water purification, afforestation, and soil stabilization in the Region (UNDP and FAO), the following results have been achieved:

- Technical support was provided to forestry departments in pilot districts to establish nurseries;
- Preparation work conducted for selection the best initiatives related to chlorella, biohumus, and zoohumus technologies;
- Practical training on Cistanche cultivation organized for 72 households in pilot districts and who were able to increase knowledge and skills on new method of afforestation, soil stabilization and income generation;
- Technical support is being provided to IICAS for procuring a mobile laboratory to analyse soil composition and monitor sand and dust migration in the region;
- In partnership with the Academy of Sciences of the Republic of Karakalpakstan, ongoing field research is investigating sand and dust storms and evaluating the consequential loss and damage to ecosystem services. The findings of this research are scheduled to be presented and discussed at a round table in April 2025;
- Demonstration plots covering 4 hectares featuring oleaster (Elaeagnus angustifolia) were established in Kungrad and Taxtakupir districts to promote sustainable land management and ecosystem restoration in the Aral Sea region.
- A total of 3,200 oleaster seedlings were planted using three different methods — Waterboxx technology, hydrogel planting, and traditional planting — to assess their effectiveness in harsh environmental conditions. Innovative water-saving technologies, including 200 Waterboxxes, were deployed to ensure seedling survival with minimal irrigation.
- Intensive training courses on Tugai forest improvement were conducted in Karakalpakstan by international experts to enhance local forestry capacity where 60 forestry personnel from Kungrad and Taxtakupir, as well as university students, which equipped them with sustainable management techniques for Tugai forests, which plays a crucial role in biodiversity conservation and soil protection. These initiatives aim to inspire local communities and stakeholders to adopt sustainable practices for the long-term restoration of the Aral Sea region.

Under **Outcome 3**, Promoting integrated air, water, and soil quality monitoring systems to facilitate regulatory practices in the Region (UNDP/FAO), the following results were achieved:

- Needs assessment of air quality monitoring systems in the region, covering 27 points in 13 districts of Karakalpakstan was carried out jointly with the expert organization “Davlat Ekologik Sertifikatlashtirish va Standartlashtirish Markazi” (Davekosertifikat) in collaboration with Uzhydromet and the Ministry of Ecology, compatible air quality monitoring systems that align with the existing national monitoring frameworks have been identified;
- 17 priority points (locations) in 10 districts were identified and selected for the installation of the automatic air quality monitoring systems (AQMS) and a Technical Specification for this equipment was developed by an expert organization Davekosertifikat;
- Based on the needs assessment and Technical Specification, a tender has been conducted for the supply, installation and commissioning of the Automatic air quality monitoring systems (AQMS). The AQMS will enhance environmental awareness and public health by providing real-time air pollution data. This empowers communities and authorities to make informed decisions, improving air quality and promoting sustainable development.
- A comprehensive environmental assessment focused on water and soil quality to support ecosystem restoration and sustainable land management was conducted in six key districts of Karakalpakstan: Muynak, Kungrad, Taxtakupir, Chimbay, Amudarya, and Ellikala.
- **Water Analysis.** Evaluated salinity levels, nutrient content, and pollutants (e.g., pesticides, heavy metals). Assessed water suitability for irrigation and aquatic habitat restoration. Data will guide water quality improvement and sustainable water management strategies.
- **Soil Analysis.** Assessed soil composition, fertility, salinity, and contaminants. Determined land potential for agriculture, forestry, and other uses. Findings will support soil conservation, sustainable farming, and land restoration.
- **Climate Monitoring.** Six meteorological stations were installed across the districts. Equipped with advanced sensors to track temperature, precipitation, humidity, wind speed, and solar radiation. Data will support climate-resilient strategies for ecosystem restoration and sustainable development.
- **Outcomes & Impact.** The collected data will help: Identify priority areas for restoration. Develop sustainable land management practices. Monitor and adapt restoration strategies. Build climate resilience and mitigate future environmental challenges.
- This initiative provides a scientific foundation for decision-making, empowering local communities, government agencies, and international partners to work towards a sustainable and prosperous future for the Aral Sea region.

## Outputs:

### Outputs 1.1 Inclusive participatory ecosystem services mapping (UNDP).

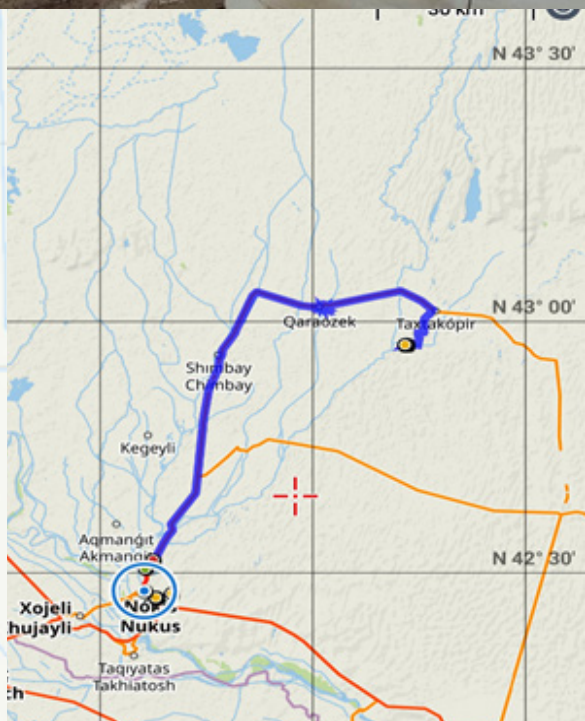
In partnership with forestry departments under the Ministry of Ecology, Environmental Protection and Climate Change of the Republic of Uzbekistan an assessment of ecosystem services in the Aral Sea Region to enhance local management practices has been undertaken.

- 3 thematic meetings with the representatives of VCC heads, forestry departments and community members in three target districts were conducted. Consultations, surveys and discussions with residents of communities were held on existing ecosystem services and the importance of awareness raising campaigns. Necessary activities were held to attract eco-volunteers for the upcoming project initiatives;

Photos 1, 2, 3, 4. Meetings with the representatives of VCC heads, forestry departments and community members in three target districts

- Forests, pastures and desert territories were visited and analysed in three target districts.

Photos 5, 6, 7, 8, 9, 10. Visit to potential sites of the projects. Geo-referenced information was obtained for planning future activities within the project.

- A three-month incubation program was organized in partnership with IT Park to enhance the capabilities of youth and women in specific areas such as entrepreneurship and startup development. 1 startup contest was launched in air, soil and water monitoring systems development;

Photos 11, 12. Incubation program and startup contest launch.


## Output 1.2 Enhanced Ecosystems Services (FAO)

Under this subcomponent Ismail Belen, Chief forestry officer of the Chamber of Forest Engineers in Türkiye (OMO), visited Uzbekistan and had several meetings with actors including the Forestry agency and its district level departments. Jointly with him analysis of conditions of potential sites in Muynak and Kungrad districts conducted.

The objective of the visit and analysis is a development of the Ecosystem Restoration Guideline. This initiative recognizes the urgent need for a structured approach to address the severe environmental degradation impacting the region, stemming from the Aral Sea's disaster. The Guideline aims to provide practical strategies and best practices for restoring degraded ecosystems, enhancing biodiversity, and promoting sustainable land management in this ecologically sensitive area.

Specifically, the stakeholders included the Forestry Agency of Uzbekistan, the primary governmental body responsible for forest management and environmental protection, as well as its regional and district-level departments. These meetings facilitated a crucial exchange of knowledge, expertise, and local insights, allowing Mr. Belen to gain a deeper understanding of the existing regulatory framework, ongoing initiatives, and specific challenges encountered on the ground.

As a result of exploration and analysis, Ecosystem Restoration Guideline for the Aral Sea Region has been developed by the Chamber of Forest Engineers in Türkiye (OMO) within the project.

*Photos 13, 14, 15, 16, 17. Visit of international consultant to potential sites of the projects.*


## Output 2.1. Supporting sustainable afforestation and land revitalizing practices in the Aral Sea Region (UNDP)

Technical support to forestry departments in pilot districts initiated to establish nurseries, scaling up afforestation initiatives.

In collaboration with qualified specialists from OISCA, a three-day practical training on Cistanche cultivation was held, featuring essential techniques for host tree cultivation, afforestation, and parasitic planting.. The goal of the training was to help local families gain new farming skills and provide seasonal employment through Cistanche farming as well as a new method of afforestation and soil stabilization.

Photos 18, 19, 20, 21, 22. Technical support to forestry departments in pilot districts.




Photos 23,24,25,26. Screenshots from trainings in pilot districts.

Technical support is being provided to IICAS for procuring a mobile laboratory to analyse soil composition and monitor sand and dust migration in the region. Delivery of the mobile laboratory is expected by the end of March 2025.

Photos 27. Sample image of mobile loboratory to be provided to IICAS


In collaboration with the Academy of Science of the Republic of Karakalpakstan a field research is organized, focusing on sand and dust storms and assessing loss and damage to ecosystem services. Currently 30% of the work has been completed and final output will be available by the end of March, 2025.

Call for proposals was announced for startups among entrepreneurs in pilot districts with the purpose of supporting and developing entrepreneurial initiatives in pilot districts. As a result, 127 applications were received and will be reviewed on March 14, 2025 where the best initiatives to be selected.

### Output 2.2 Enhanced Integrated Management and Restoration of Tugai Forest Ecosystems for Sustainable Livelihoods and Environmental Resilience (FAO)

To showcase innovative approaches to ecosystem restoration and promote sustainable land management in the Aral Sea region, demonstration plots featuring oleaster (Elaeagnus angustifolia) were established in the Kungrad and Taxtakupir districts. These demonstration plots, carefully designed and implemented, serve as living laboratories, showcasing the effectiveness of different planting techniques and providing valuable learning opportunities for local communities and stakeholders. Each district received a 2-hectare demonstration plot, resulting in a total of 4 hectares dedicated to this initiative.

Photos 28, 29, 30, 31. Planting oleaster with application of waterboxx and traditional methods in pilot districts

Within these plots, a total of 3200 oleaster seedlings were planted, with the objective of demonstrating the potential for this drought-tolerant species to thrive in the harsh environmental conditions of the Aral Sea region. Oleaster was specifically chosen for its ability to withstand drought, improve soil fertility, and provide habitat for wildlife, making it an ideal species for restoration efforts in this degraded ecosystem.

Recognizing the critical importance of water availability in arid and semi-arid environments, a particular emphasis was placed on utilizing innovative water-saving technologies. As part of this innovative approach, 200 Waterboxxes were deployed across the demonstration plots. The Waterboxx is a reusable device that collects rainwater and condensation, providing a continuous supply of water to the seedling during its critical establishment phase. This innovative technology

significantly reduces the need for traditional irrigation, making it a sustainable and cost-effective solution for restoring degraded landscapes.

To rigorously evaluate the effectiveness of different planting methods, three distinct approaches were implemented in the demonstration plots:

1. **Waterboxx Planting:** Oleaster seedlings were planted using the Waterboxx technology, providing a continuous source of water and protection from harsh environmental conditions.
2. **Hydrogel Planting:** Oleaster seedlings were planted with the incorporation of hydrogel, a water-absorbing polymer that helps retain moisture in the soil and reduce the need for frequent watering.
3. **Traditional Planting:** Oleaster seedlings were planted using traditional methods, serving as a control group for comparison with the other two innovative approaches.

By comparing the survival rates, growth rates, and overall performance of the oleaster seedlings under these three different planting methods, the demonstration plots will provide valuable insights into the most effective and sustainable approaches to ecosystem restoration in the Aral Sea region. The data collected from these plots will be used to inform future restoration efforts and guide the selection of appropriate planting techniques for different site conditions.

The establishment of these oleaster demonstration plots represents a significant investment in the future of the Aral Sea region. By showcasing innovative water-saving technologies and demonstrating the potential for drought-tolerant species to thrive in degraded landscapes, these plots serve as a catalyst for change, inspiring local communities and stakeholders to embrace sustainable land management practices and contribute to the restoration of this vital ecosystem. The lessons learned from these demonstration plots will be invaluable in guiding future restoration efforts and ensuring the long-term sustainability of the Aral Sea region.

In addition to that, building upon ongoing efforts to restore the Aral Sea region, a series of intensive training courses focusing on Tugai forest improvement were conducted in Karakalpakstan by a team of international experts[1]. These specialized training sessions aimed to enhance the knowledge and skills of local forestry professionals and build local capacity in the sustainable management and restoration of these vital ecosystems. Tugai forests, characterized by their unique riparian vegetation

1 Aibek Baibulov - Senior project coordinator of biodiversity and climate change in Central Asia WWF Program. Candidate of Science in Biology. Specialization: Geobotanist, GIS, remote sensing data analysis. Current focus: Restoration of riparian tugai forest in South part of Balhash Lake. Analysis of ecosystem, ecological niches.
Anastaisa Mazneva - Currently she works as a small grants manager in the Critical Ecosystems Partnership Fund (CEPF) project in the Mountains of Central Asia biodiversity hotspot, where she manages mainly community-based forest and grassland restoration projects. Two M.Sc. degrees – in Soil Science from the Lomonosov Moscow State University and in Environmental Engineering from the Czech University of Life Sciences. Specialized in sustainable land use, restoration of degraded lands, increasing of soil fertility and soil organic carbon, land use practices contributing to climate adaptation of communities and local biodiversity conservation. Participated in WWF projects in Kazakhstan in vicinity to riparian ecosystems, where she conducted land degradation analysis, analysis of soil data and climate change vulnerability with consequent adaptation plans for local smallholders.

adapted to fluctuating water levels, play a crucial role in maintaining biodiversity, preventing soil erosion, and providing essential ecosystem services in the Aral Sea region. The international experts visited Karakalpkakstan and conducted trainings on Tugai forest improvement in the districts.

*Photos 32, 33. Screenshot pictures from the training in pilot districts*

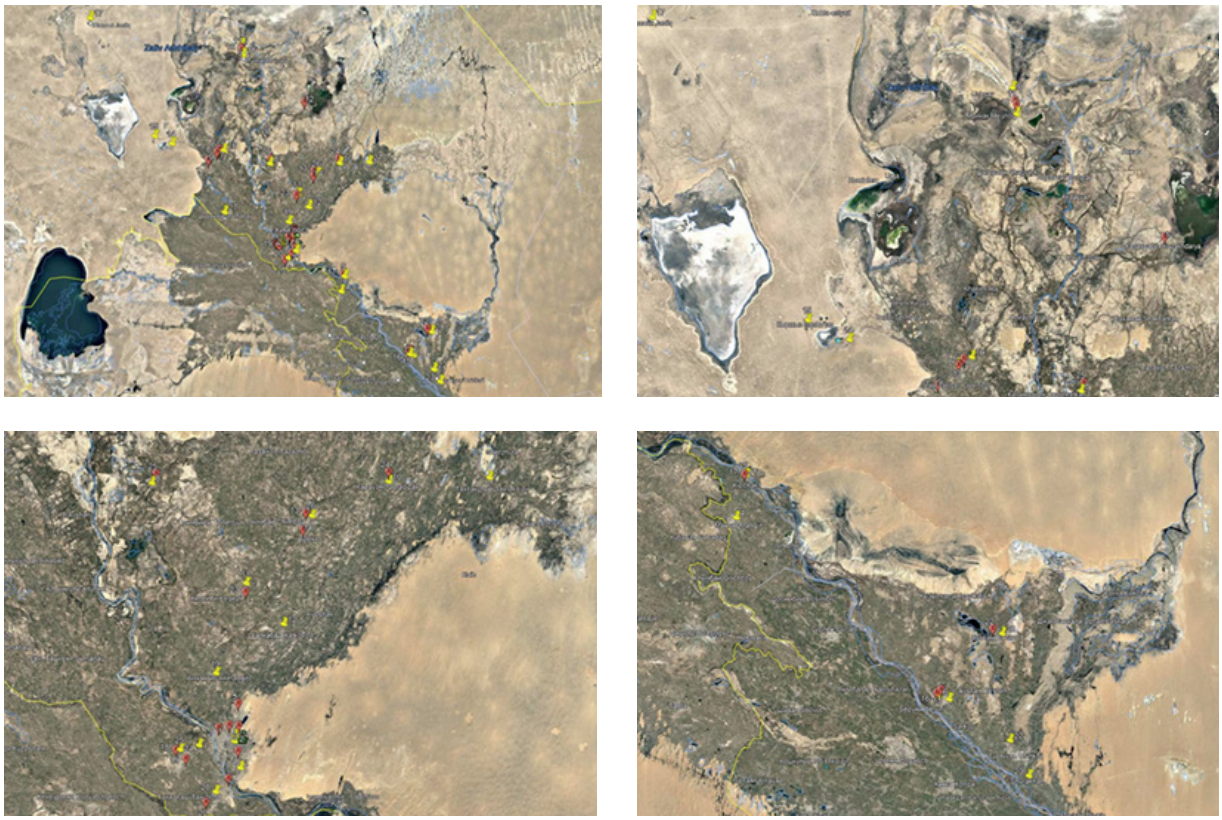
The training courses were designed to reach a diverse group of stakeholders involved in forestry management, including personnel from the Kungrad and Taxtakupir departments of the Forestry Agency, the governmental body responsible for managing forest resources in the region. Recognizing the importance of building local capacity at all levels, the training targeted approximately 60 staff members, ranging from experienced forestry officers to field-level technicians. The inclusion of staff from both Kungrad and Taxtakupir departments ensured that the knowledge gained would be widely disseminated across key regions directly affected by the Aral Sea crisis.

Furthermore, recognizing the critical role of education in fostering long-term sustainability, the training program actively involved students from the forestry faculty of the local University. By providing hands-on training and exposure to cutting-edge techniques, the program aimed to cultivate the next generation of forestry professionals with the skills and knowledge necessary to address the complex challenges facing the Aral Sea region. The participation of these students also facilitated the transfer of knowledge from international experts to local academics, ensuring the sustainability of the training efforts. The content of the training courses encompassed a wide range of topics related to Tugai forest improvement

Photos 34, 35. Screenshot pictures from the training in pilot districts

### Output 3.1 Facilitating Integrated Air Quality Management Systems and Regulatory Practices (UNDP).

Needs assessment of the air quality monitoring systems in Karakalpakstan, covering 27 points 13 districts. The assessment was carried out jointly with expert organization “Davlat Ekologik Sertifikatlashtirish va Standartlashtirish Markazi” (Davekosertifikat) and compatible air quality monitoring systems with existing national monitoring systems have been identified in cooperation with Uzhydromet and the Ministry of Ecology. 17 priority points (locations) in 10 districts were identified and selected for the installation of the automatic air quality monitoring systems (AQMS) and a Technical Specification for this equipment was developed by an expert organization Davekosertifikat. Based on the needs assessment and Technical Specification, a tender has been announced for the supply, installation and commissioning of the Automatic air quality monitoring systems (AQMS).



Photos 36, 37, 38, 39: Screenshots from conducted needs assessment of the AQMS in Karakalpakstan

## Output 3.2 Enhanced Comprehensive Environmental Quality Management and Regulatory Practices (FAO).

To establish a robust foundation for informed decision-making in the Aral Sea region, a comprehensive environmental assessment was conducted, focusing on water and soil quality across six key districts of Karakalpakstan: Muynak, Kungrad, Taxtakupir, Chimbay, Amudarya, and Ellikala. This assessment recognized the critical importance of understanding the current state of these fundamental resources to guide effective ecosystem restoration and promote sustainable land management practices.

The water analysis involved a detailed evaluation of various parameters, including salinity levels, nutrient content, and the presence of pollutants such as pesticides and heavy metals. This investigation aimed to determine the suitability of water resources for diverse uses, ranging from irrigation to the restoration of aquatic habitats. The data collected will inform strategies for improving water quality and ensuring the sustainable management of this precious resource in the face of increasing water scarcity.

Photos 40, 41, 42, 43: Environmental assessment process, focusing on water and soil quality

Recognizing the crucial role of climate in shaping the environment and influencing the success of restoration efforts, a network of six meteorological (meteo) stations was strategically deployed across the six districts. These stations are equipped with advanced sensors to continuously monitor key climate variables, such as temperature, precipitation, humidity, wind speed, and solar radiation. The collected data will provide valuable insights into climate trends, seasonal variations, and extreme weather events, enabling the development of climate-resilient strategies for ecosystem restoration and sustainable development.

The data generated from the water and soil analyses, coupled with the long-term climatic data gathered by the meteo stations, will create a powerful knowledge base for informed decision-making. This information will be instrumental in:

- Identifying priority areas for restoration efforts.
- Developing sustainable land management practices that minimize environmental impacts.

- Monitoring the effectiveness of restoration efforts and adapting strategies as needed.
- Building resilience to climate change and mitigating the impacts of future environmental challenges.

This comprehensive environmental assessment represents a significant commitment to evidence-based decision-making in the Aral Sea region. By providing a clear understanding of the current state of water, soil, and climate resources, this initiative will empower local communities, government agencies, and international partners to work together towards a more sustainable and prosperous future for the region

Photos 44, 45, 46, 47: Screenshots from field works installation of advanced sensors to the meteo stations

## Delays in implementation

Overall, the Joint Programme implemented the majority of its activities timely. However, JP has experienced some delays in the following activities and therefore initiated extension with some amendments of the Programme for 5 months until 31st May, 2025. Extension/Amendment was approved by the decision of the 1st Project Board Meeting dated November 12, 2024 and eventually by the MPHSTF Steering Committee in Dec 2024. Delays occurred in activities within **Objective 1**, particularly Output 1.1. where initially hiring an international consultant was envisioned and it took more time to make negotiations with potential candidates, as a result a local expert was decided to be hired after consultation, noting shortage of time. All work is expected to be in April 2025 and results transferred to the national partner – Ministry of Ecology, Environmental Protection and Climate Change of the Republic of Uzbekistan

Within **Objective 2**, particularly Output 2.1 where development of concept and agreeing with potential beneficiaries for the creation of nurseries to expand afforestation initiatives, planting chistanche with the involvement of communities as well as technical specifications for mobile laboratory equipment for soil analysis required longer time than expected. All work is expected to be completed in April 2025 and transferred to the beneficiaries. Also Output 2.2 required extension where 2 demonstration sites were created to pilot innovative technologies and practices to promote sustainable livelihoods and environmental sustainability, however extension needed for monitoring and transfer of the results of these methods to beneficiaries and partners which are possible only in the spring of 2025.

Within **Objective 3**, particularly in Output 3.1 an assessment of the needs of air quality monitoring systems is carried out and technical characteristics of the required equipment were developed in the reporting period. It required several months to conduct a full-fledged tender for purchase and install the required air quality monitoring system/equipment. Also, events to raise awareness about the air quality monitoring system with the involvement of local volunteers will be organized after the installation of the system itself. In this regard, it was necessary to extend the implementation until May 2025. Also Output 3.2 a water quantity and quality monitoring network has been established by installing 6 stations. It included various parameters, including weather conditions, soil moisture, river and reservoir levels, as well as atmospheric dust, and was used to conduct experiments comparing traditional and regenerative agricultural practices using sensors based on the Free Station. Based on the monitoring results, training materials to be developed and awareness-raising sessions to be organized to disseminate knowledge about the One Health approach and the effects of sand and dust storms. Due to the fact that it takes some time to conduct monitoring and obtain results, it was necessary to extend the implementation until May 2025.

## Challenges:

Within output 1.1 challenges mostly occur connected with weather conditions such as snow and rain, because sites where most of activities should to be implemented are located in tugai forests and deserts where usual vehicles can not or have a restricted access.

**Facilitating Integrated Air Quality Management (IAQM)** systems and regulatory practices faced several challenges, including: conducting effective assessments required specialized knowledge in air quality science, data analysis, and environmental policy; engaging multiple stakeholders, including government agencies, industries, and communities, required effective communication and collaboration, which was difficult to achieve in short period; raising awareness about air quality issues and the benefits of integrated management among the general public was essential, yet often challenging; lack of technical expertise and capacity within regulatory agencies to manage and analyze air quality data limited effective decision-making. Strengthening IAQM requires capacity-building programs for regulatory agencies, stakeholder engagement strategies, and public awareness campaigns.

**Cistanche Cultivation Training & Employment.** Since it is a new initiative adopted by rural people, periodic communication and support will be necessary to ensure long-term adoption and expansion of new farming skills by local families and it is important for rural people to acknowledge that Cistanche harvest can be received after 2-3 years of cultivation. Cistanche cultivation success depends on continuous training, periodic follow-ups, and awareness campaigns highlighting the long-term benefits

**Effectiveness of Restoration Methods.** Uncertainty regarding the success rates of different planting methods (Waterboxx, hydrogel, and traditional planting) in extreme conditions. To improve restoration method effectiveness, pilot studies and adaptive management will identify the most suitable techniques for extreme conditions

**Capacity Building & Knowledge Gaps.** Local forestry personnel and students require continuous training on Tugai forest improvement and sustainable land management. Ensuring long-term knowledge retention and application of trained techniques remains a challenge. Addressing capacity-building gaps involves developing long-term training programs, mentorship initiatives, and practical field-based learning

**Data Collection & Informed Decision-Making.** Environmental assessments require long-term monitoring to understand trends and impacts fully. Establishing meteorological stations is a step forward, but data utilization and integration into policy remain key challenges. Enhancing data collection and informed decision-making requires investment in automated monitoring systems, data integration frameworks, and policy-driven environmental reporting mechanisms.

## Mitigation and adaptation measures taken by the Programme:

JP initiated an extension of its term for 5 months until May 31, 2025 as an adaptation measure which helps JP to mitigate risks of incompletion of envisioned activities. Proper communication with stakeholders and beneficiaries is organized where commonly agreed decision is made to complete efficiently planned activities within extended period.

To mitigate the challenges in facilitating Integrated Air Quality Management (IAQM) systems and regulatory practices measures have been taken, including: a specialized organization was hired that had extensive and first-hand experience in conducting effective assessments with expertise in air quality science, data analysis, and environmental policy; developed a structured framework for engaging multiple stakeholders, including government agencies, industries, and community groups, involving regular meetings that promoted open dialogue, enabling the sharing of ideas, challenges, and potential solutions.

## Lessons learned:

When planning field visits a weather forecast should be taken into consideration in order to fulfill all planned activities on a timely manner.

Engaging a wide range of stakeholders — including government agencies, industry, NGOs, and communities — enhances the legitimacy and effectiveness of air quality management efforts. Stakeholder input helps to identify local concerns and fosters shared ownership of solutions.

Training and educating relevant personnel and stakeholders on air quality issues, regulations, and technologies are essential for successful program implementation. Building local capacity ensures sustainability and enhances community engagement.

Embracing new technologies, such as low-cost sensors and data analytics, can enhance air quality monitoring and management. These technologies can provide real-time data and improve responsiveness to pollution events.

Practical training, such as Cistanche cultivation, provides valuable skills that can boost employment and income generation for rural households. Hands-on engagement helps communities adopt and sustain new farming methods effectively.

Testing multiple planting methods (Waterbox, hydrogel, traditional planting) helps determine the most effective strategies for seedling survival in extreme conditions.

Deploying innovative water-saving solutions (e.g., Waterboxes) significantly reduces irrigation needs while ensuring higher survival rates for seedlings.

## Best practices:

Hands-On Training & Community Engagement. Practical training (e.g., Cistanche cultivation) equips local families with valuable farming skills, creating employment opportunities and promoting sustainable land use. Involving communities in afforestation and soil stabilization ensures long-term adoption and economic benefits.

Multi-Sectoral Collaboration & Innovation Partnering with international experts (e.g.OISCA), research institutions, and local agencies enhances knowledge exchange and adapts global best practices to local conditions. Encouraging entrepreneurship through startup initiatives fosters economic diversification and self-sufficiency in pilot districts.

Testing & Implementing Innovative Planting Techniques by using Waterbox technology, hydrogel planting, and traditional methods in demonstration plots allows for comparative analysis and selection of the most suitable afforestation techniques.

Capacity Building Through Practical Training of 60 forestry personnel and students in Tugai forest improvement strengthens local expertise and ensures sustainable forest management.

To ensure the identified best practices have a broader impact, we propose sharing findings with UN agencies, national ministries, and international organizations through reports, policy briefs, and knowledge-exchange events. Pilot projects will be established in different regions to test adaptability, while collaboration with policymakers will integrate successful methods into national reforestation and climate strategies. Capacity-building initiatives, such as training centers and online modules, will empower local communities and professionals. Additionally, partnerships with the private sector will support sustainable entrepreneurship, and a long-term monitoring framework will track progress, ensuring continuous improvement and scalability.

## Qualitative assessment:

Overall, within the Joint Programme number of objectives planned for 2024 has been achieved. Some results were achieved on time, some results are being achieved. The JP established sound partnerships with key stakeholders at regional, district and grassroot levels, and local communities have been fully engaged in implementing the activities. Through its interventions at every stage, the project promoted gender mainstreaming principles. When organizing initiatives, committees or panels, the project always ensured that the voices of the most vulnerable groups of the population, including those of women, youth and the elderly, were all represented and heard. Since One UN model is a mandatory approach, JP fully promoted it through smooth coordination between UNDP and FAO, in terms of joint planning and implementation of activities.

# ii) INDICATOR-BASED PERFORMANCE ASSESSMENT

| | Achieved Indicator Targets | Reasons for Variance with Planned Target (if any) | Source of Verification |
|---|---|---|---|
| **Outcome 1. The stress on local communities due to the deteriorating environmental situation reduced (UNDP, FAO)** | | | |
| **Indicator:** # of tugai forests with restored ecosystems<br>**Baseline:** N/A<br>**Planned Target for 2024:** 3 | 0 | This indicator will be measured only at the end of the project after completion of all activities. | Monitoring visit reports |
| **Indicator:** % of air quality forecasting efficiency is increased<br>**Baseline:** N/A<br>**Planned Target for 2024:** 10 % | 0 | This indicator will be measured only at the end of the project after completion of all activities. | |
| **Output 1.1. Inclusive participatory ecosystem services mapping.** | | | |
| **IIndicator 1.1.1** # of people (women/men/youth) engaged to ecosystem services mapping exercise<br>**Baseline:** 0<br>**Planned Target for 2024:** 45 | 45 | | Reports, validation workshops and etc. |
| **Indicator 1.1.2 #** area of degraded tugai/pasture/other ecosystems (hectare) covered by participatory mapping<br>**Baseline:** 0<br>**Planned Target for 2024:** 60ha | 60 | | Maps, GIS |
| **Indicator 1.1.3 #** of people (women/men/youth) benefitted from knowledge sharing and capacity building events disaggregated by gender and types of occupation<br>**Baseline:** 0<br>**Planned Target for 2024:** 30 | 0 | Capacity building events are planned for March-April, 2025 | Reports, validation workshops and etc. |
| **Indicator 1.1.4 #** of design of education, communication and outreach materials for various target groups at local, regional and national levels.<br>**Baseline:** 0<br>**Planned Target for 2024:** 1 promo material (social video, leaflets and etc) 100 people | 0 | Promo material development and dissemination is planned for March-April, 2025 | Reports, TV and social network materials etc. |
| **Output 1.2. Enhanced Ecosystem Services (FAO)** | | | |
| **Indicator 1.2.1 #**of guidelines developed for ecosystem restoration, NBS, native trees conservation<br>**Baseline:** 0<br>**Planned Target for 2024:** 2 reports | 2 | | Reports, Records of meetings, workshops, or consultations |
| **Indicator 1.2.2 #** of people who gained access to improved ecosystem services (women/men/youth) with the project support<br>**Baseline:** N/A<br>**Planned Target for 2024:** 150 | 150 | | Expert estimates |

| | Achieved Indicator Targets | Reasons for Variance with Planned Target (if any) | Source of Verification |
|---|---|---|---|
| **Outcome 2. Adopting new approaches in water purification, afforestation, and soil stabilization in the Region (UNDP, FAO).** | | | Reports |
| **Output 2.1.Supporting sustainable afforestation and land revitalizing practices in the Aral Sea Region** | | | Reports, Meetings, Transfer of acts, etc, Research Reports |
| **Indicator 2.1.1** # sand and salt resilient plants nurseries are established in target districts<br>**Baseline:** 3<br>**Planned Target for 2024:** 3 | 6 | | |
| **Indicator 2.1.2** # of land and soil analysis mobile labs are established<br>**Baseline:** N/A<br>**Planned Target for 2024:** 1 | 0 | Contract for procurement of mobile laboratory has been signed and expected to be delivered by the end of March 2025 | |
| **Indicator 2.1.3** # of local farmers and smallholders (women/men/youth) with improved knowledge and skills on sustainable afforestation and pasture management practices<br>**Baseline:** N/A<br>**Planned Target for 2024:** 60 | 72 | | |
| **Indicator 2.1.4 #** of seasonal job places (including women, youth and others) created in planting and maintaining nurseries<br>**Baseline:** N/A<br>**Planned Target for 2024:** 30 | 30 | | |
| **Output 2.2 Enhanced integrated management and restoration of Tugai forest ecosystems for sustainable livelihoods and environmental resilience** | | | Reports, Records of meetings, workshops, or consultations |
| **Indicator 2.2.1** #of participants attending the workshop<br>**Baseline:** 0<br>**Planned Target for 2024:** 40 people | 40 | | |
| **Indicator 2.2.2** #of ha of restored tugai<br>**Baseline:** N/A<br>**Planned Target for 2024:** 4ha | 4ha | | |
| **Indicator 2.2.3** #of Waterboxx installed<br>**Baseline:** 0<br>**Planned Target for 2024:** 200 | 200 | | |
| **Outcome 3. Promoting integrated air, water, and soil quality monitoring systems to facilitate regulatory practices in the Region (UNDP, FAO)** | | | |
| **Output 3.1 Facilitating Integrated Air Quality Management Systems and Regulatory Practices (UNDP)** | | | Reports, Meetings, Act of transfers |
| **Indicator 3.1.1 #**of air quality monitoring systems established integrated to the network of UzHydromet<br>**Baseline:** 1<br>**Planned Target for 2024:** 9 | 0 | The tender has been announced. An assessment is underway. The contract is expected in March, 2025 | |
| **Indicator 3.1.2** # of developed national standards for the air quality in the Aral Sea Region in line with SDG11<br>**Baseline:** 0<br>**Planned Target for 2024:** 1 | 0 | The unified national standard for the Air Quality monitoring system was adopted by the Government and entered into force. | Reports, Meetings, Manuals and guidelines developed |

| | Achieved Indicator Targets | Reasons for Variance with Planned Target (if any) | Source of Verification |
|---|---|---|---|
| **Indicator 3.1.3** # of population in 8 spots are benefited from the air monitoring quality systems<br>**Baseline:** 0<br>**Planned Target for 2024:** 691900 | 0 | The tender has been announced. An assessment is underway. The contract is expected in March, 2025 | Reports, Meetings, Manuals and guidelines developed |
| **Output 3.2 Enhanced Comprehensive Environmental Quality Management and Regulatory Practices (FAO)** | | | |
| **Indicator 3.2.1** #of comprehensive reports generated<br>**Baseline:** 0<br>**Planned Target for 2024:** 2 | 2 | | Reports, Records of meetings, workshops, or consultations |
| **Indicator 3.2.2** #of training materials developed<br>**Baseline:** 0<br>**Planned Target for 2024:** 1 | 1 | | Reports, Records of meetings, workshops, or consultations |
| **Indicator 3.2.3** #of monitoring network stations installed<br>**Baseline:** 0<br>**Planned Target for 2024:** 5 stations | 5 | | Manuals |

# iii) SPECIFIC STORIES

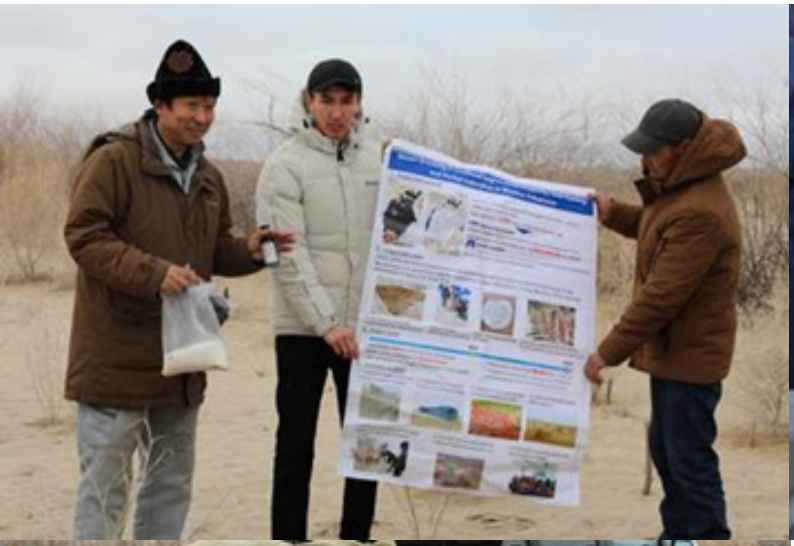
## Cistanche Cultivation in Aral Sea Region: way to boost local agriculture, employment and health

### November 21, 2024

Link: Cistanche Cultivation in Aral Sea Region: way to combat environmental challenges and boost local agriculture, employment

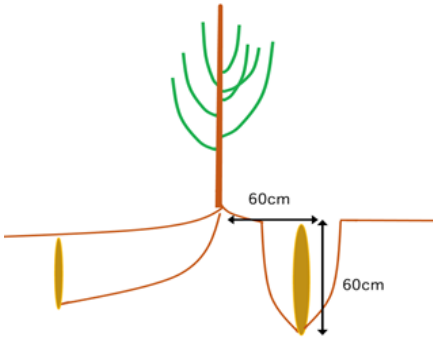
Karakalpakstan, November 21, 2024. In a new effort to tackle the environmental and economic challenges of the Aral Sea region, more than 60 local households in Muynak, Kungrad, and Takhtakupir have completed training on how to grow Cistanche, a hardy desert plant with important health benefits. The training, conducted from November 18-21, 2024, equips these families with the skills necessary to grow Cistanche in their local environment and provides them with seeds to begin cultivation.

Cistanche, a parasitic plant that thrives in arid conditions, is known for its health benefits, particularly in traditional medicine where it is used for boosting energy, improving health and supporting the immune system. Cistanche is distributed from inland China to Inner Mongolia and Central Asia. Cistanche thrives in harsh desert conditions, making it an ideal crop for cultivation in regions like the Aral Sea basin, where environmental conditions are challenging, yet the potential for sustainable agricultural development is high. It is well-suited to desert environments and can grow in poor soil, on shrubs like saxaul and tamarix, and in areas with strong sunlight and little water.



Over three days, qualified specialists from the Japanese Organization for Industrial, Spiritual and Cultural Advancement (OISCA) conducted instruction on artificial cultivation of Cistanche, which include essential techniques for host tree cultivation, afforestation, and parasitic planting. The goal of the training is to help local families gain new farming skills and provide seasonal employment through Cistanche farming. This will help boost the local economy, which is facing environmental challenges.

By adopting Cistanche cultivation, local farmers will not only contribute to the rehabilitation of desert lands but also tap into the lucrative market for medicinal plants. Cistanche has significant potential for export due to its health benefits, providing local families with an opportunity to earn a living through sustainable, environment-friendly farming.




Cultivation of Cistanche with other plant

The cultivation method emphasizes the importance of selecting suitable sites and host plants for Cistanche, which requires minimal soil conditions, with a preference for neutral to slightly alkaline pH (7.5-9) and good drainage. Cistanche thrives in environments with low salinity and can be planted on abandoned or lightly saline land, sandy wastelands, and even areas affected by desertification.

## Key steps in Cistanche cultivation:

**1. Site selection and preparation**

Cistanche thrives in well-drained soils with moderate salinity. Ideal areas for cultivation are those with sandy or lightly saline soils. The land must be leveled and furrows should be created to facilitate proper irrigation. Ensuring good soil drainage is critical for the growth of Cistanche, as waterlogged conditions can hinder its development.

**2. Host tree selection**

Cistanche is a parasitic plant that attaches to specific host species, with Saxaul and Tamarix being the most suitable. The success of Cistanche cultivation heavily depends on the careful selection of healthy, disease-free seedlings of these host trees. These trees should be chosen for their robust growth and ability to support the parasitic relatioship with Cistanche.

**3. Afforestation methods**

The planting of Cistanche begins with selecting first-year saplings of Saxaul or Tamarix, which are then carefully planted in rows. The planting density typically ranges from 1*2 meters to 1*3 meters, depending on the site conditions and afforestation method. The best planting season for Cistanche is from autumn to early spring, as this ensures optimal growth before the hot summer months. Proper afforestation methods are crucial for establishing a thriving environment where Cistanche can parasitize its host plants effectively.

The introduction of this cultivation method also provides seasonal employment, creating work opportunities during the planting and harvesting periods. This initiative is seen as a vital step in addressing the long-term economic challenges faced by the Aral Sea region, which has suffered from ecological degradation and lack of water resources for decades.

The local authorities, in collaboration with agricultural experts and environmental organizations, plan to expand the initiative to other parts of the Aral Sea region.