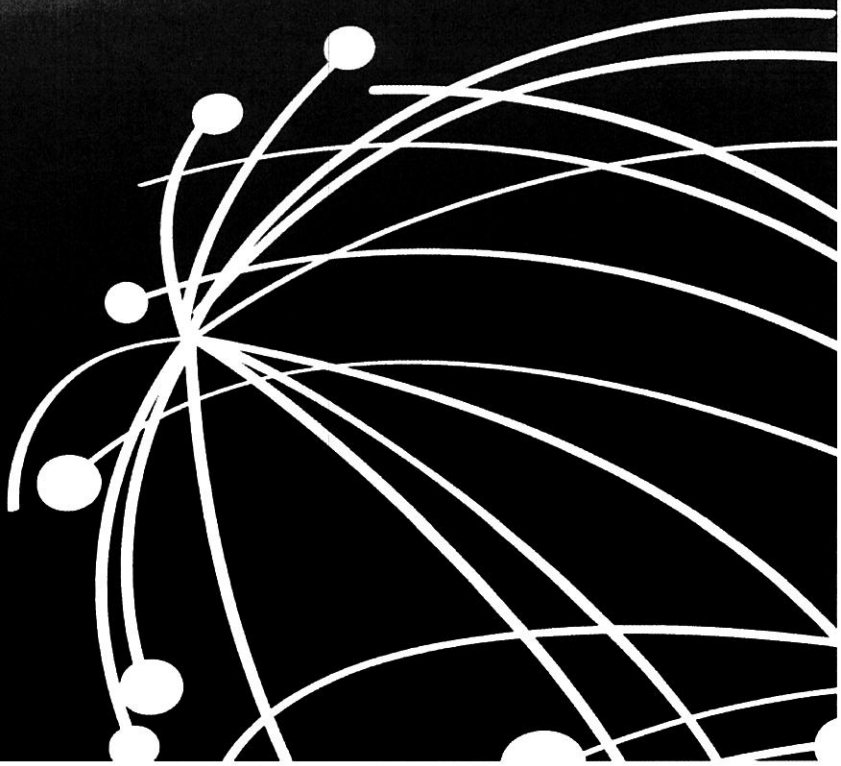
Updated on 24 April 2024

GBON National Gap Analysis Tajikistan

Systematic Observations Financing Facility



Weather and climate data for resilience

WEATHER CLIMATE WATER

Screening of the National Gap Analysis (NGA) of Tajikistan

WMO Technical Authority screens the GBON National Gap Analysis to ensure consistency with the GBON regulations and provides feedback for revisions as needed. *The screening of the NGA is conducted according to the SOFF Operational Guidance Handbook, version: 04.07.2023 and the provisions in Decision 5.7 of the SOFF Steering Committee.*

Following iterations with the peer advisor and beneficiary country, WMO Technical Authority confirms that the National Gap Analysis is consistent with GBON regulations. While the WMO GBON Global Gap Analysis identified the need for 4 surface stations and 1 upper air station over land to meet the GBON horizontal requirement, the **WMO Technical Authority confirms the NGA results which indicate the need for 8 surface land stations and 2 upper air stations based on specific national circumstances.**

Date: 11 March 2025

Signature:

Albert Fischer

Director, WIGOS Branch, Infrastructure Department, WMO

GBON National Gap Analysis Report
Tajikistan

Beneficiary Country Focal Point and Institute	**Mr. Abdullo Habibullo QURBONZODA** Director of Agency for Hydrometeorology the Committee of Environmental protection under the government of the Republic of Tajikistan email: office@meteo.tj
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1. Country information from the GBON Global Gap Analysis

Please provide in this Table the country information as provided by the WMO Global GBON Gap Analysis.

Table I. WMO GBON Gap Analysis (June 2023). Situation of the GBON observation network in the WMO Global gap Analysis document (June 2023)

A. GBON horizontal resolution requirements	B. Target	C. Reporting to req. [1]	D. Gap to improve	E. Gap new	F. Gap total
Surface stations Standard density[2] 200 km	4	0	4	0	4
Upper-air stations over land Standard density[2] 500km	1	0	1	0	1

[1] The rationale for classifying surface and upper-air stations as reporting is based on the WIGOS Data Quality Monitoring System (WDQMS) for the chosen time period (WMO GBON Global Gap analysis, June 2023). Stations with data availability more than 80% on at least 80% of days, are considered as reporting. Other listed stations are counted as having the possibility to be improved.

[2] For SIDS, for the WMO GBON Global Gap Analysis in June 2023, the EEZ area has been added to the total surface area which is the basis for the target number of stations. The standard density requirements for SIDS have been calculated with 500 km for surface stations and 1000 km for upper-air stations.

2. Analysis of existing GBON stations and their status against GBON requirements

Table II. Assessment of existent stations per their operational status and network ownership

GBON Requirements	Existing observation stations (# of stations)			
	NMHS network		Third-party network	
	Reporting to req. [3]	To improve	Reporting to req. [21]	To improve
Surface land stations Standard density [4] 200km Variables: SLP, T, H, W, P, SD	**0**	**8**	**0**	**0**
Upper-air stations operated from land Horizontal resolution[4]: 500km Vertical resolution: 100m, up to 30 hPa Variables: T, H, W	**0**	**2**	**0**	**0**
Surface marine stations in Exclusive Economic Zones:[7] 500 km Variables: SLP, SST	**N/A (Tajikistan is a landlocked country)**			
Upper-air stations operated in Exclusive Economic Zones:[5] 1000 km Vertical resolution: 100m, up to 30 hPa Variables: T, H, W				

Table III. Assessment of existing GBON stations per station characteristics. Station type: S: Surface, UA: Upper-Air; M: Marine; Owner of the station: NMHS or name of third-party; GBON variables: SLP: Atmospheric pressure; T: Temperature; H: Humidity; W: wind; P: Precipitation; SD: Snow depth; SST: Sea surface temperature; Reporting cycle: Number of observation reports exchanged internationally per day (0-24); GBON compliance: weather the station is GBON compliant or not (see GBON guide on compliance criteria).

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[3] The rationale for classifying surface and upper-air stations as reporting is based on the WIGOS Data Quality Monitoring System (WDQMS) for the chosen time period (WMO GBON Global Gap analysis, June 2023). Stations with data availability more than 80% on at least 80% of days, are considered as reporting. Other listed stations are counted as having the possibility to be improved.

[4] For SIDS, for the WMO GBON Global Gap Analysis in June 2023, the EEZ area has been added to the total surface area which is the basis for the target number of stations. The standard density requirements for SIDS have been calculated with 500 km for surface stations and 1000 km for upper-air stations.

[5] Although GBON marine stations and stations in EEZ are not part of initial SOFF scope, peer advisors are encouraged to analyse in this step when considered relevant e.g. SIDS, the status of current marine stations for future GBON marine observations investments.

Station name	Station type (S/UA/M [6])	Owner (NMHS /3rd party)	Funding source	GBON variable measured							Reporting cycle (obs/day)	GBON Compliant (Y/N)
				SLP	T	H	W	P	SD	SST		
Anzobskiy pereval	S	NHMS	Government	x	x	x	x	x	x	-	8/day	No
Dushanbe	S	NHMS	Government	x	x	x	x	x	x	-	8/day	No
Dangara	S	NHMS	Government	x	x	x	x	x	x	-	8/day	No
Darvaz	S	NHMS	Government	x	x	x	x	x	x	-	8/day	No
Dehavz	S	NHMS	Government	x	x	x	x	x	x	-	8/day	No
Isambay	S	NHMS	Government	x	x	x	x	x	x	-	8/day	No
Ishkashim	S	NHMS	Government	x	x	x	x	x	x	-	8/day	No
Iskanderkul	S	NHMS	Government	x	x	x	x	x	x	-	8/day	No
Istaravshan	S	NHMS	Government	x	x	x	x	x	x	-	8/day	No
Irkht	S	NHMS	Government	x	x	x	x	x	x	-	8/day	No
Kayrakumskoy vodokhranilishe	S	NHMS	Government	x	x	x	x	x	x	-	8/day	No
Khovaling	S	NHMS	Government	x	x	x	x	x	x	-	8/day	No
Khorog	S	NHMS	Government	x	x	x	x	x	x	-	8/day	No
Khujand	S	NHMS	Government	x	x	x	x	x	x	-	8/day	No
Karakul	S	NHMS	Government	x	x	x	x	x	x	-	8/day	No
Kurgan-Tyube(Khatlon)	S	NHMS	Government	x	x	x	x	x	x	-	8/day	No
Lakhsh	S	NHMS	Government	x	x	x	x	x	x	-	8/day	No
Pendzhikent	S	NHMS	Government	x	x	x	x	x	x	-	8/day	No

[6] Please see guidance on marine stations in Section 2 on Scope.

Pyandzh	S	NHMS	Goverment	x	x	x	x	x	x	-	8/day	No
Rushan	S	NHMS	Goverment	x	x	x	x	x	x	-	8/day	No
Murgab	S	NHMS	Goverment	x	x	x	x	x	x	-	8/day	No
Madrushkat	S	NHMS	Goverment	x	x	x	x	x	x	-	8/day	No
Parhkar	S	NHMS	Goverment	x	x	x	x	x	x	-	8/day	No
Rasht	S	NHMS	Goverment	x	x	x	x	x	x	-	8/day	No
Shahkristanskiy pereval	S	NHMS	Goverment	x	x	x	x	x	x	-	8/day	No
Sanglok	S	NHMS	Goverment	x	x	x	x	x	x	-	8/day	No
Dushanbe(airport)	S	3rd party	Goverment	x	x	x	x	x	x	-	48/day	No
Khujand(airport)	S	3rd party	Goverment	x	x	x	x	x	x	-	48/day	No

3. Results of the GBON National Gap Analysis

The Basic Observing Network (GBON) Gap Analysis for Tajikistan, in alignment with the GBON standards, reveals a significant opportunity for enhancing the country's meteorological observation capabilities. The assessment compares the WMO-provided targets with the current status and characteristics of the existing stations, leading to strategic recommendations for national improvements.

Surface Land Stations:

Presently, none of the stations within the country's borders are GBON compliant. The National Hydrometeorological Service (NHMS) oversees a network of 26 surface stations (Table III), and an additional two stations are operated by third-party networks at major airports. While the NHMS stations maintain the requisite standard density of one station per 200 km, they do not fulfill the GBON observing cycle requirement, with measurements taken only 8 times per day instead of the required 24. Therefore, despite the sufficient standard density of the NHMS network, the reporting frequency remains the primary gap. Conversely, the airport stations conduct half-hourly observations, thus well-aligning with the GBON observing cycle; however, the station data is not shared through the GTS network. The reason for not sharing the data remains currently unknown as the stations are not owned and operated by the Tajikhydromet. However, utilizing these as a part of the GBON network in Tajikistan will be carefully analyzed and considered when drafting the national contribution plan.

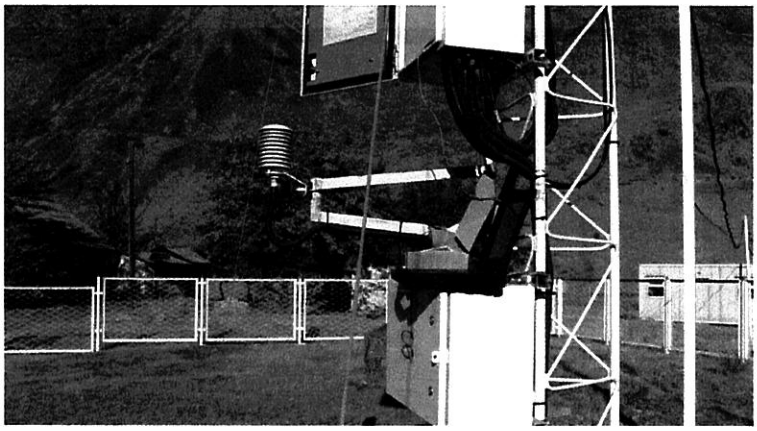

Figure 1 Surface Land Station in Darvoz

The WMO Global GBON analysis target for Tajikistan specifies the need for 4 surface stations to meet its compliance criteria. Although the GBON requirements are met with 4 stations in theory (area of Tajikistan 143 100 km^2 divided by 40 000 km^2 (density of 200x200km network) = 3,5 stations), in practice the GBON target of 4 surface stations is insufficient for comprehensive national coverage due to the geographical distribution of the country; Even if 4 stations are upgraded to full GBON compliance, the standard density of one station per 200 km will not be met across the entire country. Moreover, there are two other factors that are in favor of upgrading of additional stations: Due to the mountainous terrain and geography of Tajikistan, it is mandatory to include additional stations to measure the required variables reliably. Furthermore, there is already an existing network of 26 stations, with relatively new equipment and upgrading of additional stations would lead to significant quick-win opportunities in Tajikistan.

Therefore, we advocate for a revised target of 8 NHMS surface stations to ensure both hourly reporting and adequate spatial coverage, as illustrated in Figure 4. This figure demonstrates how an expanded network of 8 strategically positioned stations can fulfill the GBON standard density, thus providing a more robust and representative meteorological monitoring system for Tajikistan. Utilizing the third-party network observation stations as a part of the GBON network will be also considered when drafting the national contribution plan.

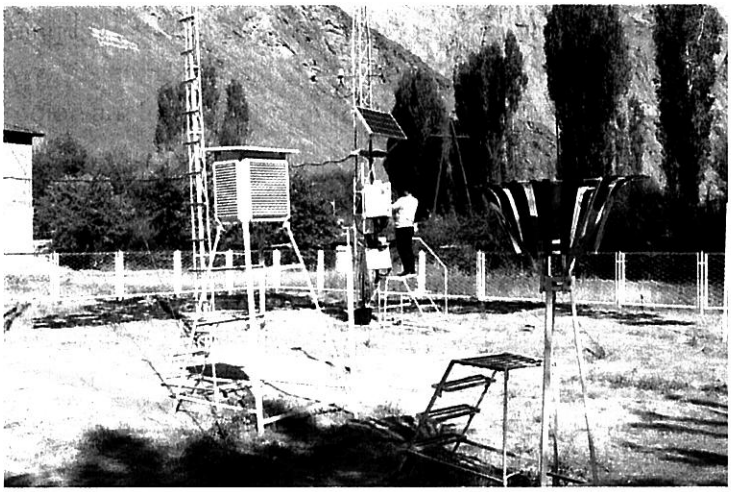

Figure 2 Surface Land Station in Khorog

Upper-Air Stations:

The WMO Global GBON Gap analysis target for Tajikistan is one upper-air station with a standard density of one station per 500 km. Our national capability assessment indicates the absence of any existing upper-air stations, necessitating the establishment of new infrastructure to meet this target. (It must be noted that there are two sounding stations in the Wigos register form Tajikistan, Dushanbe and Khorog, however there are no sounding activities or equipment in place). While installing one new upper-air station will comply with the GBON reporting cycle requirement (twice daily observations), it will not suffice for the density standard (Tajikistan is over 700 km wide in maximum distance). Moreover, the Central Asia is severely suffering from the lack of upper air sounding stations. There aren't any sounding stations operational in Neighboring countries of Kyrgyzstan, Uzbekistan, Turkmenistan, or Afghanistan and the nearest operational stations in the region are found from Taraz, Kazakhstan (over 220 km north of Tajikistan) and Minfeng, China (over 670 km east of Tajikistan). Moreover, in the directions of south and west the situation is even more appalling; The nearest sounding sites are with the distance of over 1700 km (Mahachkala) and 1750 km (Muscat) respectively.

To rectify this, we propose the installation of two upper-air stations: one in the city of Dushanbe and another in the city of Khorog. This configuration will enable coverage for both the western and eastern parts of the country, as depicted in Figure 5. This approach meets the GBON density requirements and ensures that the upper-air observation network is both resilient and comprehensive in Tajikistan. Moreover, it would also improve the situation in the whole Central Asian region. It must be highlighted that the sounding sites already exist in the Wigos register and therefore they are indicated as "improved" stations. However, there are no activities or equipment in place, and in practice these should be considered as new stations what it comes to the actual procedures when operationalizing the stations.

Conclusion and Way Forward:

Our findings suggest that while there is a pathway to improve existing surface stations and initiate new upper-air stations to reach GBON compliance, the targets must be strategically revised to ensure national requirements are met. The proposed expansion from 4 to 8 surface stations and

from 1 to 2 upper-air stations presents a significant but necessary enhancement to Tajikistan's contribution to the global and especially to the regional meteorological observation framework. Table V will delineate the list of proposed stations, setting the foundation for a targeted and informed upgrade of Tajikistan's GBON network.

Table IV. Results of the GBON national gap analysis. SLP: Atmospheric pressure; T: Temperature; H: Humidity; W: wind; P: Precipitation; SD: Snow depth; SST: Sea surface temperature.

GBON requirements	GBON target (# of stations)	GBON Compliant stations (#)	Stations gap	
			To improve	New
Surface land stations Standard density[7] 200km Variables: SLP, T, H, W, SD Observing cycle: 1h	4	0	**8**	**0**
Upper-air stations operated from land Standard density[7] 500km Vertical resolution: 100m, up to 30 hpa Variables: T, H, W Observing cycle: twice a day	1	0		**2**
Surface marine stations in Exclusive Economic Zones:[8] Density 500 km Variables: SLP, SST Observing cycle: 1h	N/A (Landlocked country)			
Upper-air stations operated in Exclusive Economic Zones:[9] Density 1000 km Vertical resolution: 100 m, up to 30 hPa Variables: T, H, W Observing cycle: twice a day				

[7] For SIDS, for the WMO GBON Global Gap Analysis in June 2023, the EEZ area has been added to the total surface area which is the basis for the target number of stations. The standard density requirements for SIDS have been calculated with 500 km for surface stations and 1000 km for upper-air stations.

[8] Although GBON marine stations are not part of initial SOFF scope, peer advisors are encouraged to analyse in this step when considered relevant e.g. SIDS, the need for future GBON marine observations investments according to the GBON requirements.

[9] Although GBON marine stations are not part of initial SOFF scope, peer advisors are encouraged to analyse in this step when considered relevant e.g. SIDS, the need for future GBON marine observations investments according to the GBON requirements.

3.1 Recommended existing surface and upper-air to be designated to GBON

Table V. Recommended existing surface, upper-air and marine stations to be designated to GBON.

Station name	Station type (S/UA/M[11])
Iskanderkul	S
Khudzhand	S
Kurgan-Tyube(Khatlon)	S
Khorog	S
Karakul	S
Lakhsh	S
Murgab	S
Rasht	S
Dushanbe	UA
Khorog	UA

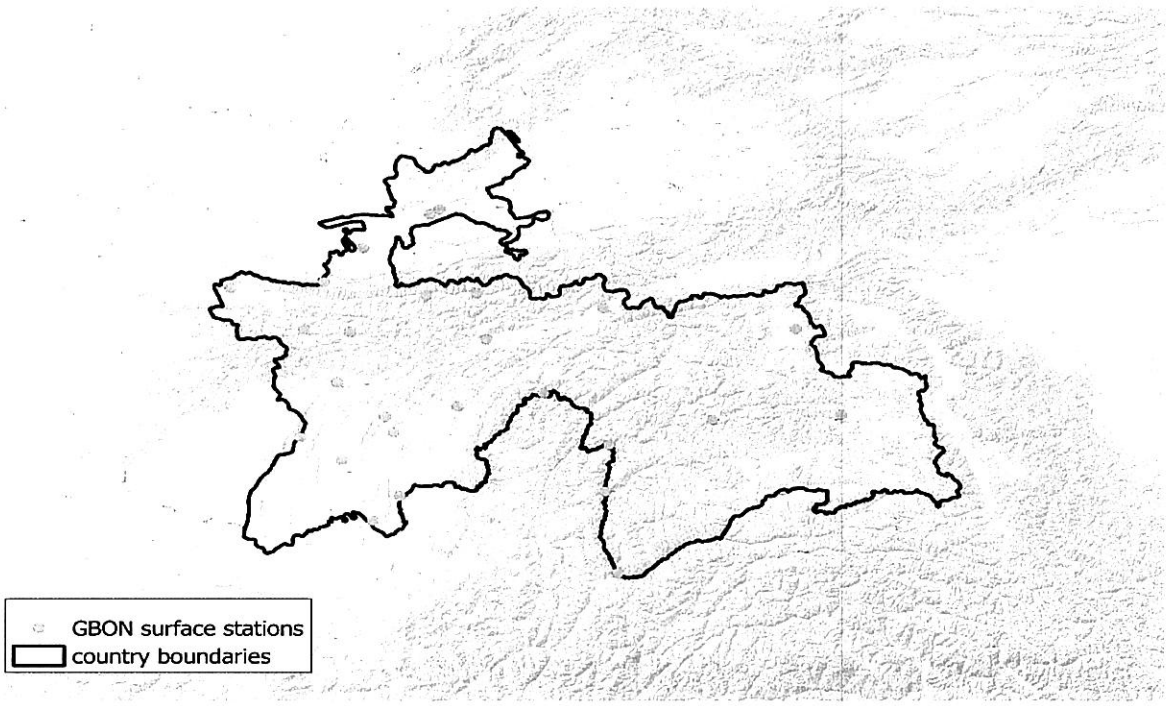

Figure 3: Location of existing GBON surface stations in Tajikistan

[10] Although GBON marine stations are not part of initial SOFF scope, peer advisors are encouraged to analyse in this step when considered relevant e.g., SIDS, the need for future GBON marine observations investments according to the GBON requirements.

[11] Please see guidance on marine stations in Section 2 on Scope.

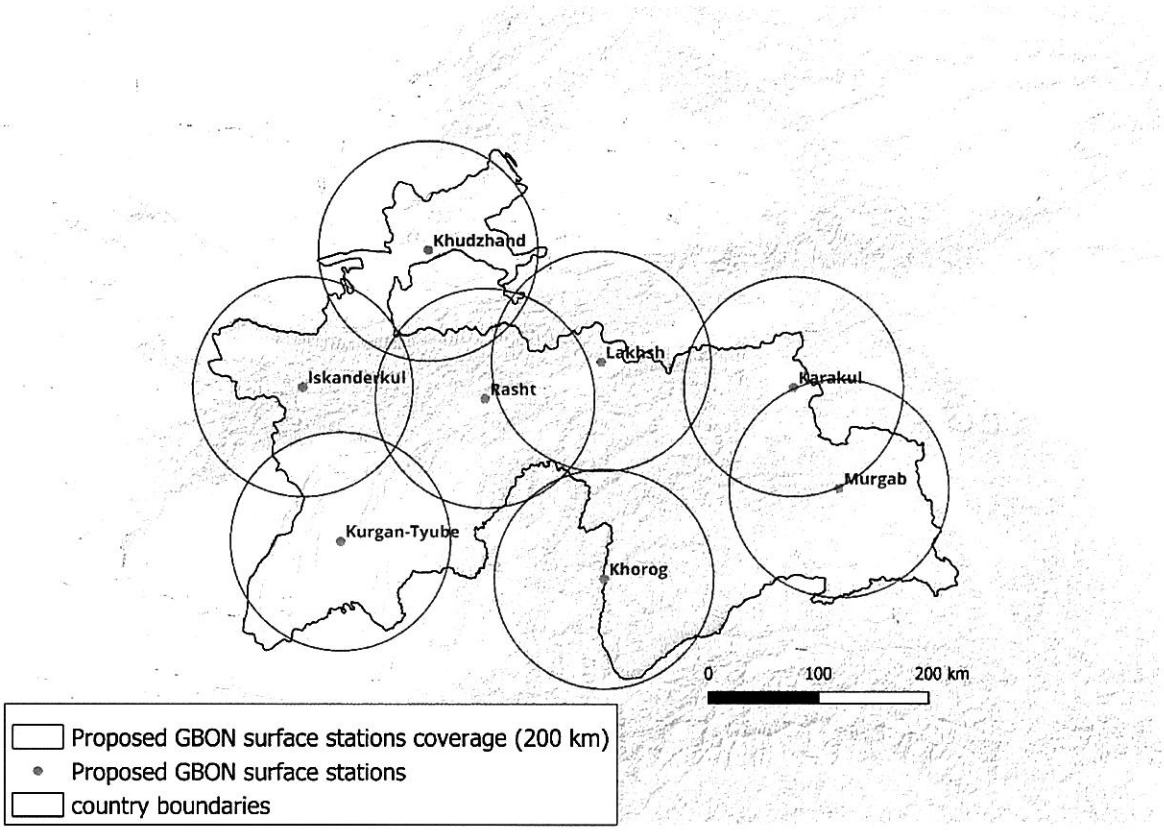

Figure 4: Map of proposed GBON surface stations coverage

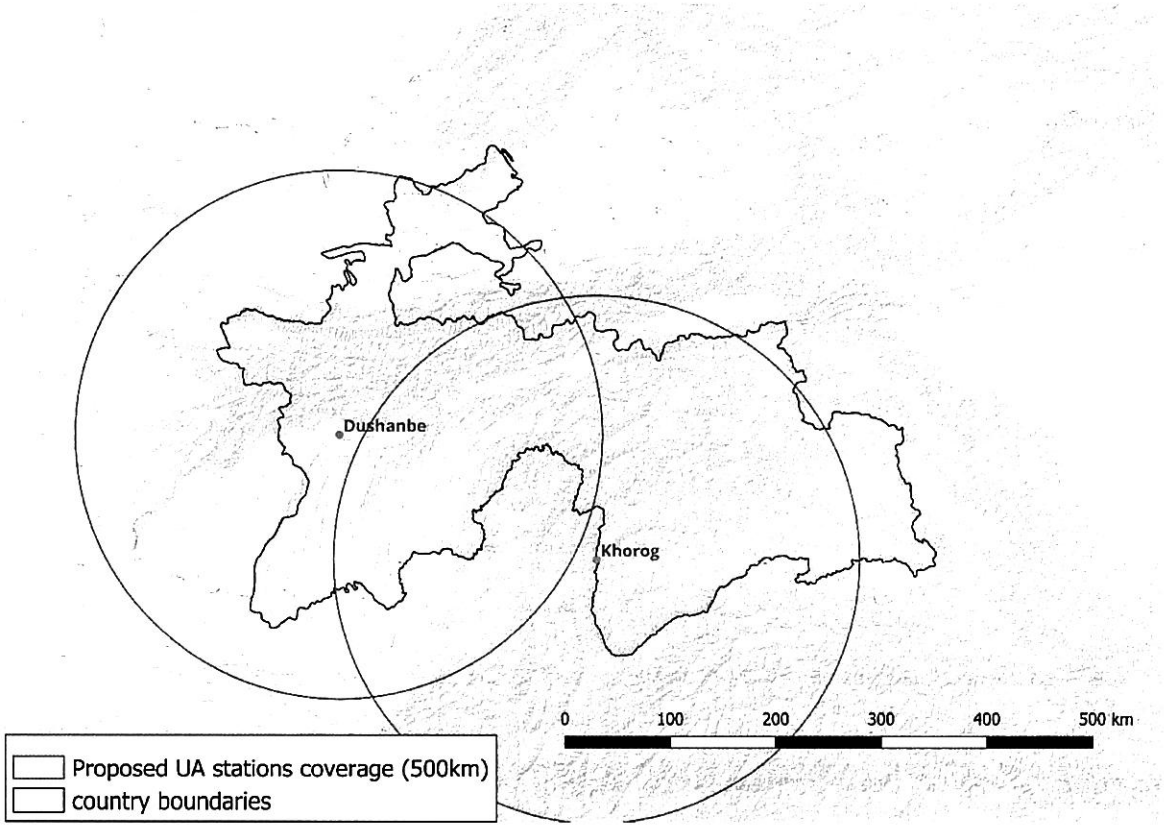

Figure 5: Map of proposed UA stations coverage

4. Report completion signatures

Peer Advisor signature 
WMO Technical Authority screening signature 
Beneficiary Country signature