United Nations Development Programme
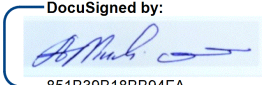
August 1, 2023

Reference Number: 6591

Dear Mr. Zatta

This letter refers to the submission of the Progress Report (APR) for the year 2023 of the project, **'Glaciers and Students: A Scientific Approach to monitor Climate and Glaciers in Pakistan's Mountain Regions to support Hydrogeological Risk Prevention'.** The reporting period of the progress report is from January 2023 till June 2023. The reports include technical and financial progress till June 2023.

We would further like to request AICS to release the third tranche of the project amounting Euro 337,700 as per the signed agreement.

We thank you for your cooperation and continuous support.

Yours sincerely,

DocuSigned by:

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Aliona Niculita
Deputy Resident Representative

Mr. Francesco Zatta
Director
Italian Agency for Development Cooperation
Government of Italy

Glaciers &Students- A scientific-based approach to monitor climate and glaciers in Pakistan's mountain region to support hydrological risk prevention

Summary of progress (01st January- 30th June 2023)

Project Summary Information	
Project Title	Glaciers &Students- A scientific-based approach to monitor climate and glaciers in Pakistan's mountain region to support hydrological risk prevention
Project ID	**00144462**
Project Duration	**18 months**
Location	**Gilgit Baltistan**
CPD/UNSDCF/RPD/SP Outputs	CPD Outcome 3: Climate change resilience and environment Output 3.1. In line with international conventions and national policy frameworks, implementation mechanisms are strengthened to promote, manage and conserve natural resources. Output 3.2. Efficient and sustainable use of fresh marine and terrestrial ecosystems, including the Indus Basin, for resilient communities through interventions for improved health, livelihoods, green economy and clean energy
Gender marker	GEN 1
Implementing Partner	Ev-K2-CNR Italy
Total budget	1,100,000. Euro
Donors (funding sources)	Government of Italy
Budget (annual budget)	696,192.78 Euro (USD 716,247.71)
Expenditure (2023)	274,721.22898 Euro (USD 304,568.99)

The snapshot of major achievements under the project are mentioned below;

OUTPUT 1. Assessment and monitoring system of mountain glaciers and climate improved in Pakistan mountain areas contributing to improved planning and management of water and natural resources including the sustenance of biological diversity and support to local livelihood base.

a. Data Validation and Restoration of Automated Weather Stations

In the reporting period, data till June 2023 was retrieved from 02 out of the 03 AWS installed in 2022. Field visits were done to monitor the AWS installed and all 03 AWS were found to be perfectly working.

- The data retrieved was used to investigate local meteorological patterns and describe the conditions influencing glacier melt.
- Data was also retrieved from ablation stakes at Ghulkin glaciers which showed significant melt.
- 01 AWS was restored at Askole

Current status of AWS Installation and restoration is given below;

Sr. No	Location	Activity	Status
1.	Gulkin	Installation	Completed in 2022
2.	Shisper	Installation	Completed in 2022
3.	Passu	Installation	Completed in 2022
4.	Minapin	Installation	Planned in 2023 (Q3 &Q4)
5.	Upper Hunza	Installation	Planned in 2023 (Q3 &Q4)
6.	Askole	Restoration	Completed in Q2 2023
7.	Concordia	Restoration	Planned in 2023 (Q3 &Q4)
8.	Urdukos	Restoration	Planned in 2023 (Q3 &Q4)

Till date, 03 AWS are installed, and 01 AWS is restored, remaining activities are planned in Q3 and Q4 of 2023.

b. **Glacier Inventory**

- The methodology to acquire satellite data, data elaboration and generation of a first map of glacier outlines had been defined (which involves data downloading, segmentation and processing of glaciers segments).
- Automatic removal of small holes in the polygons and manual correction of the outlines based on high-resolution satellite images from Google Satellite, Bing Maps and Google EarthTM was done to mitigate the risk of errors and produce valid maps.
- A total of 98 glaciers with a total area of 655 km2 were considered under the project for the mapping process.
- The project's activities related to glacier inventory and morphometric analysis are on track. The development of the Pakistan glaciers inventory database is in process, utilizing satellite images and involving the collaboration of Italian and Pakistani students with the support of experts from the universities of Milan and Cagliari
- As value addition, one analysis of microplastics collected on Ghulkin, Passu and Batura was also conducted which identified 154 likely microplastics, 144 of which were fibers.

Output 2: Collaboration and sharing mechanism among Pakistani and international institutions and students strengthened to build capacities for longer term glaciers monitoring through innovative approaches and technologies.

a. **Institutional strengthening of GB-EPA**

- The GB GeoApp was updated with new sections for collecting Points of Interest (POI) including glaciers.
- The back-end system of the app has also been re-engineered in Node.js for enhanced efficiency and functionality.
- The SHARE Geonetwork platform is also undergoing improvement and is being migrated to a dedicated on-premises server at the University of Cagliari to ensure better performance and compatibility.
- Once authenticated on the GEO app, users can geolocate their position and classify the point of interest by defining attributes through a data input form. The app also allows attach images taken using the device's camera in addition to census of glaciers and the definition of their characteristic attributes.

b. **Capacity Building**

- Capacity building of the students, faculty members, and relevant departments was conducted through following activities.
    o Training on Basics of GIS/RS were conducted in Karakorum International University (2-10 May, 2023) and University of Baltistan (15-19 May, 2023). A total of 113 students and faculty members, including 45 females, participated in the trainings.
    o A training program on avalanche prevention and rescue in Gilgit and Naltar (March 6-10, 2023) took place wherein 24 participants attended (including 2 females) from various institutions like Pakistan Air Force (PAF), GB Police, Rescue 1122, Agha Khan Agency for Habitat (AKAH), KIU and UoBs.

- The project progress and achievements were presented at two International Conferences

Note: Detailed reports (Quarter 01 and Quarter 02, 2023) are attached herewith.

United Nations Development Programme
Interim Financial Report to the Italian Min. for Foreign Affairs
As of 30 June 2023

Contributions reference no:
Country: **Pakistan**
Award: **00145454 - PAK_ITAMFA_TPCS_00132208_L**
Project: **00132208 - Glaciers & Students-UNDP-PAK-00132208**
Project status: **On Going**
Fund: **Programme Cost Sharing**

	(in United States dollars)		
	Prior years	**2023**	**Cumulative to 2023**
	(1)	**(2)**	**(3)**
Income/Revenue			
Annual Contributions Revenue[a]	489,579.91	338,502.86	828,082.77
Other Revenue[b]	-	-	-
Transfer to/from other funds	-	-	-
Refunds to donors	-	-	-
Total - Income/Revenue	489,579.91	338,502.86	828,082.77
Expenses			
Staff and other personnel costs	-	-	-
Supplies, commodities, materials	-	-	-
Equipment, vehicle and furniture including depreciation	71,606.28	-	71,606.28
Contractual services	196,553.23	176,743.47	373,296.70
Travel	63,832.50	60,943.65	124,776.15
Transfers and grants to counterparts	-	-	-
General operating and other direct costs	42,515.63	49,607.85	92,123.48
Subtotal	374,507.64	287,294.97	661,802.61
Programme support costs[c]	29,748.31	23,026.89	52,775.20
Total Expenses	404,255.95	310,321.86	714,577.81
Balance[d]	85,323.96	113,504.96	113,504.96
Future Expenses[e]			
Balance of un-depreciated assets & inventory purchased	-	-	-
Commitments	11,188.85	15,592.42	15,592.42
Subtotal	11,188.85	15,592.42	15,592.42
Receivables Past due, less advance receipts[e]			
Less: Contributions receivable from donors	-	-	-
Available Resources[f]	74,135.11	97,912.54	97,912.54
Total Contributions Revenue [g]	1,172,774.91	-	1,172,774.91
Total Contributions Revenue Received [h]	489,579.91	337,950.49	827,530.40
Total Receivables [i]	683,195.00	345,244.51	345,244.51
Deferred Revenue and Advance Receipts [j]	-	-	-

a. Contributions represent recognized revenue based on the payment schedule dates of signed agreements.

b. Other Revenue represents revenue resulting from miscellaneous activities.

c. Programme support (indirect) cost is calculated based on the expenses excluding amounts of foreign exchange gain/loss.

d. Balance in column (2) is inclusive of balance in column (1).

e. Amounts in column (2) are the balances outstanding as of the report date which are included in the available resources. Amounts in column (1) are shown for information purpose only.

f. Balance after future expenses, and contributions receivable from donors (i.e. amounts past due) have been accounted for.

g. Total value of donor contribution as per the signed date of the agreement.

h. Total cash received to-date.

i. Total outstanding amount due from donors, comprising both past due and future due receivables.

j. Contributions that have been received from donors but yet to be recognized as revenue in future years when payment schedules are realized.

This is provisional report and subject to change.

DocuSigned by:

[signature]
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Name: Aliona Niculita

Title:

Deputy Resident Representative

01-Aug-2023

(Date)

GLACIERS & STUDENTS

A SCIENTIFIC-BASED APPROACH TO MONITOR CLIMATE AND GLACIERS IN PAKISTAN'S MOUNTAIN REGIONS TO SUPPORT HYDROGEOLOGICAL RISK PREVENTION

PROJECT PROGRESS REPORT

[January- March 2023]

DONORS

AICS Italian Agency for Development Cooperation

PROJECT INFORMATION

Project ID:	**00144462**
Duration:	**July 2021-December 31, 2023**
CPD Outcome:	**CPD Outcome 3: Climate change resilience and environment**
UNDP Strategic Plan Component:	**Strategic Plan Outcome 3: Resilience built to respond to systemic uncertainty and risk**
Total Budget:	**Euro 1,100,000.**
Annual Budget:	**Euro 696,192.78 (716,247.71 USD)**
Implementing Partner:	**Ev-K2-CNR Italy**
Project Manager:	**Maurizio Gallo**
Responsible Assistant Resident Representative:	Amir Khan Goraya, Assistant Resident Representative, Resilience, Environment and Climate Change Unit

ACRONYMS

AKAH	Aga Khan Agency for the Habitat
AWS	Automatic Weather Station
CKNP	Central Karakoram National Park
DEM	Digital Elevation Model
EPA	Environmental Protection Agency
GB	Gilgit Baltistan
GBDMA	Gilgit Baltistan Disaster Management Authority
GIS	Geographic Information System
ICIMOD	International Centre for Integrated Mountain Development
KIU	Karakoram International University
NDSI	Normalized Difference Snow Index
NDVI	Normalized Difference Vegetation Index
PAF	Pakistan Air Force
QGIS	Quantum Geographic Information System
UNIMI	University of Milan
UOB	University of Baltistan

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TABLE OF CONTENTS

I.   EXECUTIVE SUMMARY

In this quarter of the project (Jan-March 2023), major progress towards data acquisition and validation was made which will be used in development of classified maps. Major activities are listed below;

- Meteorological data from AWSs installed Passu and Shispar glaciers and Borith Lake was retrieved through dedicated field expeditions and were found to be working perfectly. The validated data acquired at the three AWSs (Passu, Shispar and Borith) is now in processing to investigate local meteorological patterns and describing the conditions influencing glacier melt.
- The methodology to acquire satellite data, data elaboration and generation of a first map of glacier outlines has been defined (which involves data downloading, segmentation and processing of glaciers segments).
- During the mapping process and the creation of glacier outlines, there is a possibility of some minor errors due to merging process, inaccurate classification of the segmentation process, and mistakes by the analysts. To produce valid maps and mitigate these errors, the following measures were taken:
  - o An automatic removal of small holes in the polygons
  - o Manual corrections of the outlines based on high resolution satellite images.

These are particularly helpful in case of debris covered glaciers, as they can help identify the terminus more clearly.

- The glacier outlines were manually corrected through high resolution imagery from Google Satellite and Bing Maps, whenever available and available historical imagery from Google Earth^{TM} was used for additional checks. These allow improving the final classification of glaciers especially in cases of heavy debris cover. In basin L8 124, the project has taken in account 98 glaciers with a total area of 655 km^2. Glaciers which are larger in size compared to the previous inventories require special attention can be more hazardous to the local population.

- A five-day training program on Avalanche Prevention and Rescue in Gilgit and Naltar that took place from March 6-10, 2023. The trainers imparted training to 24 participants belonging to various institutions including PAF, GB Police, Rescue 1122, AKAH, KIU and UoBS. The practical part of the training was held at Naltar that famous for its renowned ski resort in Pakistan and world-wide.

II.   RESULTS

A.   OUTPUT 1:

Output 1. Assessment and monitoring system of mountain glaciers and climate improved in Pakistan mountain areas contributing to improved planning and management of water and natural resources including the sustenance of biological diversity and support to local livelihood base.					
Indicator	**Baseline**	**Cumulative target**	**Progress for reporting period (disaggregated data to be used)**	**Cumulative progress (disaggregated data to be used)**	**Comments**
1.2 Number of glacial bodies measured, monitored and documented to monitor changes over time that can provide early warning for natural hazards and contribute in reducing risks faced by mountain communities, particularly women and marginalized groups, in downstream valleys	0	04	04	00	In progress 04 new glacier bodies surveyed, identified and being monitored to be documented
1.3: Update the Pakistan Glacier Inventory	Partial inventory of CKNP glaciers exist (2016)	04 (Update glacier inventory, and Publication of 03 scientific research articles glacier)	01	00	00 (Outline and methodology for development of Glacier inventory drafted)

Source of Evidence:
E1: Validation of acquired field data
E2: Elaboration of field data for each glacier
E3: Planning of field missions on selected glaciers
E4: First classified map
E5: Validation of the first map
E6: Final classified map

Project monitoring reports
E10: Monitoring Report (January to March 2023)
E11: Field Visit Report UNDP (March 2023)

Description of Output level results achieved in first Quarter- 2023:

The data acquired by the AWS at Borith lake, Shispar glacier and Passu glacier was retrieved through dedicated field expeditions by the EvK2-CNR and EPA-GB teams. A mat lab script was set up for validation of the acquired data through dedicated checks for the presence of missing data and the percentage of data acquired by the data logger every hour. The AWSs are functional, and the data appear to be correctly acquired at all stations. The script will be used to validate further data as it keeps being acquired. (E1)

In addition, the validated data acquired at the three AWSs were further processed to investigate local meteorological patterns to describe the conditions influencing glacier melt. Air temperature follows very similar patterns at the stations, with high correlation and expected differences owing to elevation; the same is observed for atmospheric pressure. Larger differences are seen for relative humidity between Shispar and Borith lake AWSs, which are in a different valley, while more consistent patterns are seen in the comparison between Borith and Passu AWSs. The largest differences are observed between Borith and Passu AWSs for wind speed, owing to the katabatic wind effect of the glacier influencing wind speed at Passu AWS, and rainfall, which is affected by the rugged topography of the area. (E2)

As value addition, the analysis of microplastics collected on Ghulkin, Passu and Batura was also conducted to identify 154 likely microplastics, 144 of which were fibres (93.5%). The average concentration on the glacierised was 100 ± 40 MPs/kg dried debris, and the size of microplastics suggests that the primary source is mid- to long range atmospheric transport. (E2)

Under this output planning of glacier research activities for summer 2023 was completed in close collaboration with researchers, who will both continue the work started in summer 2022 and lead new activities according to the planning of the next quarters. It was decided to split the activities in two field missions, which are consequential to one another and involve different researchers, allowing coverage of the whole summer period i.e. Q2 and Q3. (E3)

In generating a glacier inventory of North Pakistan, Sentinel-2 imagery and segmentation are brought under use. The project methodology included several steps, beginning with the mosaicking of low or no-cloud cover Sentinel-2 imagery from the Copernicus website. The processed data were exported in TIFF format and processed in QGIS software. The segmentation algorithm was used to segment the Sentinel-2 imagery into different glacier regions. This study also utilizes the classification method of assigning values to the glacier areas and merging polygons to delineate glacier boundaries. (E4)

During outlining, few error remains a result of artefacts of the merging process, inaccurate classification of the segmentation process itself and errors by the analyst. To correct these

errors, an automatic removal of small holes in the polygons and manual corrections of the outlines based on high resolution satellite images were done. (E5)

Moreover, the manual correction of the glacier outlines was performed through validation against high resolution satellite imagery from Google Satellite and Bing Maps, and using historical imagery as available on Google Earth™. These allow improving the final classification of glaciers especially in cases of heavy debris cover. In basin L8 124, which includes Chogo Lungma glacier, the project has taken in account 98 glaciers with a total area of 655 km². Glaciers which are larger in size compared to the previous inventories require special attention; if the size is confirmed after manual correction, these glaciers can indicate **surging** behavior and therefore are particularly interesting as potentially hazardous for the local population. (E6)

Output 2 Collaboration and sharing mechanisms among Pakistani and international institutions and students strengthened to build capacities for longer term glaciers monitoring through innovative approaches and technologies.					
Indicator	**Baseline**	**Cumulative target**	**Progress for reporting period (disaggregated data to be used)**	**Cumulative progress (disaggregated data to be used)**	**Comments**
2.2 Number of students and faculty members of the local universities in Gilgit-Baltistan trained in glacier inventory and monitoring communities, particularly women and marginalized groups, in downstream valleys	0	100 (End target with 40% female students' participation)	24 Female=2 Male=22	24 Female=2 Male=22	1 Avalanche training was organized and was specific for government and emergency response depts, hence low participation of females was observed
Source of Evidence: E7: Training on Avalanche risk **Project monitoring reports** E10: Monitoring Report (January to March 2023)					

Under this activity, the training covered different aspects of avalanche risks, from the importance of a good monitoring system (in terms of forecasting) to the design of defense structures (such as tunnels or dams) to protect infrastructures, or the use of artificial release in the context of viability or ski-resorts. In fact, an integral protection from avalanches consists of a combination of forecasting and prevention.. The training aimed to train departments that work as first responders and deal with avalanche related calamities. Meanwhile the participant belonging to Rescue 1122, Pakistan Air Force, Gilgit Baltistan tourist police, Aga Khan Agency for Habitat (AKAH), Karakoram International University (KIU), and the University of Baltistan participated in the event. The training was conducted by two renowned Italian experts, Giovanni Songini and Sergio Albanello. (E7)

The overall avalanche training was successfully completed with active participation of participants and the expertise of the trainers. There was a total of six departments from GB, and the number of participants was 24. (E7)

Below is a snapshot of where Glaciers and Students is in relation to its annual targets for outputs

Table 1: Progress against AWP Targets

Pro Doc Indicators	Baseline (As per the Pro Doc)	Annual Targets (As per the AWP)	Planned/ Milestone (reporting period)	Actual (reporting period)	Status/ Comments
1.2 Number of glacial bodies measured, monitored and documented to monitor changes over time that can provide early warning for natural hazards and contribute in reducing risks faced by mountain communities, particularly women and marginalized groups, in downstream valleys	0	04 new glaciers	00	00	00 (Data is retrieved from the 03 AWS installed on identified glacial bodies and is monitored to be documented)
1.3: Update the Pakistan Glacier Inventory	A partial inventory of CKNP glaciers exist (2016)	04 (Update glacier inventory, and Publication of 03 scientific research articles glacier)	00	00	00 (Outline and methodology for

Pro Doc Indicators	Baseline (As per the Pro Doc)	Annual Targets (As per the AWP)	Planned/ Milestone (reporting period)	Actual (reporting period)	Status/ Comments
					development of Glacier inventory drafted)
2.2 Number of students and faculty members of the local universities in Gilgit-Baltistan trained in glacier inventory and monitoring communities, particularly women and marginalized groups, in downstream valleys	0	100	24 Female=2 Male=22	24 Female=2 Male=22	1 Avalanche training was organized and was specific for government and emergency response depts, hence low participation of females

Pro Doc Indicators	Baseline (As per the Pro Doc)	Annual Targets (As per the AWP)	Planned/ Milestone (reporting period)	Actual (reporting period)	Status/ Comments
					was observed

Please do this entire exercise (the narrative and the table) for the rest of the outputs.

All results must include data disaggregated by sex and other paramteres as indicated

Gilgit Baltistan is a mountainous region and home to several glaciers. Climate change and its impact on glaciers are leading to a range of environmental, economic, and social challenges.Glaciers and students project is working to address these challenges through various interventions, including involving students in glacier monitoring and research activities. Such initiatives can provide valuable insights into the changing environment and help develop strategies to mitigate the impact of climate change. As per the AWP, under output 1, six (06) activities (E1, E2, E3, E4, E5, E6) were planned and performed during January to March 2023 period, moreover the activity of Avalanche Risk Prevention and Rescue training (E7) was also carried out successfully in Gilgit and Naltar under output 2.

III.   GENDER AND HUMAN RIGHTS SPECIFIC RESULTS

The project is undertaking following measures to ensure inclusion;

- **Recruiting Female Researchers:** The project has made a deliberate effort to recruit female researchers in the fields of GIS/RS and data science for the project. This helps to provide female students with role models and mentors who can inspire and guide them in their education.
- **Targeting Female Students:** The project targets both male and female students, but there is a particular focus on reaching female students who may face additional barriers to the trainings.

IV.   PARTNERSHIPS

The project has signed MoUs with Gilgit-Baltistan Environmental Protection Agency, Karakoram International University, and University of Baltistan in the reporting period. The partnerships in this project highlight the importance of collaboration and cooperation between different stakeholders in addressing complex challenges such as climate change and its impacts on vulnerable communities. By bringing together the expertise and resources of various organizations, the project aims to maximize its impact and contribute to the sustainable development of Gilgit Baltistan. (E9)

V.   PROJECT RISKS and ISSUES

RISKS (including social and Environmental Risks)

Risk and issues log have been updated in March 2023 and are annexed

VI.   LESSONS LEARNED (Optional for the quarterly reports)

N/A

VII.   FUTURE PLAN

The following activities shall be performed in 2023.

1.1.3 Weather station restoration at Askole and Urdukas

1.1.4 Weather station checking and maintenance

1.2.3a Glacier area change assessment

1.2.8b Field activities on selected glaciers

1.3.7 Final classified map

1.3.8 Morphometric analysis

2.1.2 New release of the GB GeoApp

2.1.3 Requirement analysis for new climate data and metadata publication

2.1.4 Update SHARE Geonetwork Platform

2.1.5 Publication of the new web service with new high-altitude weather stations data

VIII.   SOUTH-SOUTH COOPERATION
N/A

IX.   COMMUNICATIONS
Press releases and media coverage of Avalanche training are attached as E12.

OFFLINE RISK LOG

#	Description	Date Identified	Type	Impact & Probability	COUNTERMEASURES/MNGT. RESPONSE	Owner	Submitted, updated by	Last Update	Status
1	Risk 1: Due to concerned departments and partners (Pakistan Meteorological Department, provincial EPA, Planning and Development, Karakorum International University etc) lack in technical and human resource capacities, if project activities are delayed (Both outputs 1 and 2) and not completed till 2023 then it can lead to the project applying for an extension	May 2020	Organizational	I = 1 P = 3	International experts (Universities of Cagliari and Millan) shall be engaged who have. The GB EPA, met department and local university staff will be closely engaged Glaciology Center established at the Karakoram International University. The data collection will be in the season (March-October) and analysis by the experts and knowledge sharing will be in off-season (November-February) to effectively utilize the time to process information and avoid delays in implementation.	Maurizio Gallo (EvK2CNR-Italy)	Maurizio Gallo (EvK2CNR-Italy)	March 2023	Reducing

| 2 | Risk 2: Due to The installation of Early Warning systems and Glaciology bodies might be in the protected areas (National Parks). If there is negative impact on local ecosystem and biodiversity in the project area

This may lead to delay in implementation of activities under Output 01 (1.1 and 1.2). | May 2020 | Environmental | I = 1 P = 3 | SOPs developed and are being implemented (E8) | Maurizio Gallo (EvK2CNR-Italy) | Maurizio Gallo (EvK2CNR-Italy) | March 2023 | Reducing |
| 3 | Risk 3: Due to natural disaster (land slides, floods etc.), the project team might not be able to access the areas and will cause delays in implementation of Output 1. | May 2020 | Operational | I = 2 P = 3 | Meteorological forecasts will be closely monitored before planning field activities. Close liaison with community and government departments will be maintained before proceeding on field trips. In case of floods, landslides and road closures, the alternate routes shall be adopted and local guides from the nearest project sites shall be involved for maintenance and data collection from Automated Weather | Maurizio Gallo (EvK2CNR-Italy) | Maurizio Gallo (EvK2CNR-Italy) | March 2023 | Reducing |

					Stations. Any damage to AWSs due to heavy snow and winds are being closely monitored and parts have been replaced				
4	Risk 4: Due to COVID-19 or any other pandemic.

The project Staff might not be able to travel and access project areas

It may result in a delay in completing the project interventions (Output 01) | May 2020 | Other (Health) | I = 2
P = 2 | Covid vaccination will be mandatory for all the project staff and personnel involved and they will be bound to abide by the SoPs notified by the GB government.

Work-from-home modalities can be adopted by international/national researchers and alternate personnel might be assigned to do field interventions.

Periodic medical checks are being carried out and all the researchers and support staff are vaccinated.
. | Maurizio Gallo (EvK2CNR-Italy) | Project Maurizio Gallo (EvK2CNR-Italy) | March 2023 | Reducing |

| 6 | Risk 6: Due to bad law and order situation in the project areas

The project staff may not be able to access project areas temporarily (1 to 3 months)

It may lead to security risks for the project personnel and delays in project interventions (Output 01) | June 2020 | Operational | I=1
P=1 | Gilgit Baltistan is a peaceful region but the project document has been shared with GB Home Department for their information and consent. Close liaison is being maintained with security personnel in the region and they are frequently consulted for field activities and movement in the field. Proper formalities for the ex-pats movement e.g. No- Objection Certificates (NOCs) are being fulfilled. Security personnel are hired for the protection of project equipment and property. | Maurizio Gallo (EvK2CNR-Italy) | Maurizio Gallo (EvK2CNR-Italy) | March 2023 | Reducing |
| 7 | Risk 7: Due to technical issues in Automated Weather Stations,

If the Data acquisition from Automated Weather Station is delayed | Oct 2021 | Technical | I=2
P=1 | Field equipment and AWSs are continuously being maintained by IP | Maurizio Gallo (EvK2CNR-Italy) | Maurizio Gallo (EvK2CNR-Italy) | March 2023 | Reducing |

	It will lead to issues in future forecasting (based on the data acquired from Automated Weather Stations) related to Glaciers (flash floods and other potential hazards)								
8	Risk 8: Due to delays in acquiring No Object Certificated from the relevant department The project staff might not be able to access project areas in time It may lead to delay in implementation of project activities under	Oct 2021	Legal / Regulatory	I=2 P=1	NOCS for installation of AWS and project staff movement have been obtained	Maurizio Gallo (EvK2CNR-Italy)	Maurizio Gallo (EvK2CNR-Italy)	March 2023	Reducing

	output 1 for upto 3 months.								
9	Risk 9: Given that the project will involve travel to disaster-prone sites, there is a risk that academic institutions and private sector staff are not paid in accordance with national labour laws and international commitments particularly research	April 2022	Operational/Labour and Working Conditions	I=3 P=3	IP is ensuring that 1: selection criteria of research projects/research students /vendor is transparent and without gender/ethnicity/religious bias 2. research/survey teams are with proper safety gear/equipment 3. research/survey teams are given training on prevention on disaster risk and sexual exploitation and abuse and harassment	Maurizio Gallo (EvK2CNR-Italy)	Maurizio Gallo (EvK2CNR-Italy)	March 2023	Reducing

	students who are not considered as employees. Also working conditions may not be feasible for these students and private sector staff to travel to the glacial sites. (SES Risk 7)								
10	Risk 10: The IP does not have a clear mechanism for its staff, partners, contractors, beneficiaries to report grievances relating to PSEA/SH	April 2022	Technical	I=3 P=3	1. EvK2CNR is in process of updating its HR manual clearly articulating the process for Sexual exploitation/abuse related grievance redress mechanism at their workplace. 2. EvK2CNR shall take undertaken from partners, contractors are aware of their obligations towards ensuring sexual exploitation, abuse, harassment policies, procedures are understood and adhered with for the implementation of UNDP funded activities. 3. EvK2CNR has planned to conduct trainings for its staff, partners, contractors on PSEA/SH in June 2023.	Maurizio Gallo (EvK2CNR-Italy)	Maurizio Gallo (EvK2CNR-Italy)	March 2023	Reducing

					4. EvK2CNR will report to UNDP any PSEA/SH complain it receives from downstream beneficiaries, communities, research students working on UNDP projects				
11	Risk 11: It has been noted in the micro assessment report for IP that there is no comprehensive conflict of interest policy in place. In the absence of this policy there is a risk that true value for money from contracts cannot be obtained.	April 2022	Operational	I=2 P=3	Conflict of interest disclaimer is being signed off by all evaluation panel members for all procurement cases.	Maurizio Gallo (EvK2CNR-Italy)	Maurizio Gallo (EvK2CNR-Italy)	March 2023	Reducing

PHOTOS

QUARTERLY PROJECT PROGRESS REPORT

GLACIERS &STUDENTS- A SCIENTIFIC-BASED APPROACH TO MONITOR CLIMATE AND GLACIERS IN PAKISTAN'S MOUNTAIN REGION TO SUPPORT HYDROLOGICAL RISK PREVENTION

APRIL –JUNE 2023

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Project Summary Information	
Project Title	Glaciers &Students- A scientific-based approach to monitor climate and glaciers in Pakistan's mountain region to support hydrological risk prevention
Project ID	00144462
Project Duration	18 months
Location	Gilgit Baltistan
CPD/UNSDCF/RPD/SP Outputs	CPD Outcome 3: Climate change resilience and environment Output 3.1. In line with international conventions and national policy frameworks, implementation mechanisms are strengthened to promote, manage and conserve natural resources Output 3.2. Efficient and sustainable use of fresh marine and terrestrial ecosystems, including the Indus Basin, for resilient communities through interventions for improved health, livelihoods, green economy and clean energy
Gender marker	GEN 1
Digitalization marker	NA
Implementing Partner	Ev-K2-CNR Italy
Total budget	1,100,000. Euro
Donors (funding sources)	AICS Italian Agency for Development Cooperation
Budget (annual budget)	696,192.78 Euro (USD 716,247.71)
Project Manager name:	Maurizio Gallo, EvK2CNR Italy

Executive Summary

The Glaciers and Students Project Activities are on track. A snapshot of progress in the reporting period is as under;

- The 03 AWS installed in 2022 were monitored during reporting period and found to be working properly. The AWS were installed at Passu, Shisper and Ghulkin Glaciers.
- The data retrieval from the installed AWS in 2022 was conducted in the reporting period. The data retrieval from two out of three AWS was successful. The automated weather stations at Passu and Lake Borith were found to be functioning properly and data till June 2023 was retrieved from these AWS. However, due to the significant water flow from a nearby river, it was not possible to retrieve data from the Shispar weather stations. The ablation stakes on Ghulkin glacier also revealed a significant melt. The data retrieval from last AWS except one i.e. at Shispar which was due to significant water flow from nearby river. The data retrieval activity for this AWS is planned in Q3 of 2023. locatioon track
- Identification of AWS site for restoration was completed in 2022 and AWS at Askole was restored in the reporting period with making necessary arrangements to make it functional
- Identification of ablation stakes installed in 2022 was successful.
- Meteorological data computed through these AWS indicated changes in temperature, wind speed, atmospheric pressure and relative humidity.
- The project's activities related to **glacier inventory** and morphometric analysis are on track. The development of the Pakistan glaciers inventory database is in process, utilizing satellite images and involving the collaboration of Italian and Pakistani students with the support of experts from the universities of Milan and Cagliari.
- The GB GeoApp has been updated with new sections for collecting points of interest, including glaciers, and the back-end system has been re-engineered in Node.js for enhanced efficiency and functionality. The SHARE Geonetwork Platform is undergoing improvement and migration to a dedicated on-premises server at the University of Cagliari, ensuring better performance and compatibility.
- Under the activities of Glacier Inventory, eight (08) days of training (2nd May- 10 May, 2023) were held in KIU, and five days of training (15 May- 19 May 2023) were held in UoBs in collaboration with the concerned universities to train students on GIS-RS from basics. Approximately 113 students and faculty members participated in these training events. The trainer was PHD scholar from Milan University Italy.

Progress Review

a) Key results achieved

The key results achieved in the reporting period are as under;

- Monitoring of the installed AWS in 2022 and data retrieval till June 2023
- Restoration of One AWS at Askole
- Advancement in developing draft of Pakistan Glacier Inventory
- The project progress and achievements were presented at two International Conferences

- Two trainings were conducted, engaging 113 students and faculty members under various activities
- Updating of GeoApp as per AWP 2023
- Continued collaboration between Italian and Pakistani Universities

b) Output progress

Output statement	Baselines Value type	Indicators	Annual Targets	End of the project target	Status: On-track/ off-track / complete	Means of verifications and comment to substantiate the selected response
OUTPUT 1. Assessment and monitoring system of mountain glaciers and climate improved in Pakistan mountain areas contributing to improved planning and management of water and natural resources including the sustenance of biological diversity and support to local livelihood base.	03 number of AWS existing	1.1. Number of climate monitoring stations in glacier region established and maintained to provide data on changing climate patterns for use by MET Deptt and other concerned	**05 (Restoration of 03 AWS in Baltoro region** **Installation of 02 new AWS in Biafo and Minapin regions)**	08 AWS (05 installed and 03 improved)	On-track	Quarterly field visits, surveys and assessment reports. Newly installed AWS. Data retrieved from newly installed AWS.
	0	1.2. Number of glacial bodies measured, monitored and documented to monitor	04 glaciers and glacial bodies monitored and studied	04 glaciers and glacial bodies monitored and studied	On track	Field visits, surveys and assessments reports

Output statement	Baselines Value type	Indicators	Annual Targets	End of the project target	Status: On-track/ off-track / complete	Means of verifications and comment to substantiate the selected response
		changes over time				
	Partial inventory of CKNP glaciers exist	1.3. Update the Pakistan Glacier Inventory	Update (01) Pakistan glacier inventory and (03) other scientific research articles published	01 Pakistan glacier inventory and 03 scientific research publications	On track	Site visits and expert reviews Draft of Glacier Inventory is under development 02 articles abstract were presented in the 02 international scientific conferences (E5)

Description of Output level results achieved in Second Quarter of 2023:

Project team of three members, (including 02 technical experts and monitoring personnel), visited the Askole and Urdukas sites as part of the Glaciers and Students project. The purpose of the visit was to assess the condition of the Automatic Weather Stations (AWS) installed at these locations before project implementation and restore them. During the reporting period, the technical team of Ev-K2-CNR assessed the condition of the Askole AWS based on previous findings of 2022. Furthermore, Ev-K2-CNR also received a response from CKNP officials deputed at Askole in April 2023 that data logger and wind wane of the AWS are not working.

The team observed that the steel fence surrounding the AWS was intact, indicating some level of protection but AWS was nonfunctional. To make the AWS functional, the missing and nonfunctional components were replaced with new ones such as a new battery, a new solar panel, wind wane and memory card of the data logger. **E1**

Data retrieval was carried out in June 2023, allowing to capture data from March to June 2021 for Borith and Passu AWSs, while this was not possible at Shispar glacier, and will have to be

postponed for the next mission in Summer 2023. The AWSs are in optimal condition and show no sign of damage so far. The recorded meteorological data show the rising temperatures from March to June, but also evidence of the presence of cold conditions as late as early May 2023, with a rapid increase since then. Wind speed was particularly strong on Passu Glacier, much higher than at Borith Lake. This highlights the importance of this AWS to capture local conditions at Passu Glacier. The correlation between air temperature, atmospheric pressure and relative humidity at the stations is very high, supporting the use of one station in case of malfunctioning of the other to reconstruct these parameters. **E2**

The project performed a comparison of glacier outlines in the newly created inventory (2022 data) and the CKNP glacier inventory from 2010 to investigate patterns of glacier change in the Karakorum region. In the example of Hispar basin, the only changes observed are caused by the different datasets used and different glacier interpretations by the analysts, as the glacier tongues show little to now change over the years. The project further performed a comparison with the GAMDAM glacier inventory (data from 1997), also showing general stability of glacier area in the Hispar basin, with no change on the glacier tongues (except for the surge of Gharesa glacier) and little changes in the upper elevation regions. **E3**

During June 2023, field activities were also carried out on Passu, Ghulkin and Shispar glaciers for weather station maintenance and ablation stakes installed in September 2022. The Weather stations installed at Passu and lake Borith were perfectly functional, while it was not possible to retrieve the data from Shispar weather stations owing to the amount of water flow from a nearby river which could not be passed. The search for the ablation stakes allowed the projectto identify the stakes on the Ghulkin glacier which indicated a melt of more than 7m since September 2022 at some locations and a movement of the ice of about 100 m. **E4**.

The overview of location-wise AWS activity is as under;

Sr. No	Location	Activity	Status
1.	**Gulkin**	Installation	Completed in 2022
2.	**Shisper**	Installation	Completed in 2022
3.	**Passu**	Installation	Completed in 2022
4.	**Minapin**	Installation	Planned in 2023
5.	**Upper Hunza**	Installation	Planned in 2023
6.	**Askole**	Restoration	Completed in Q2 2023
7.	**Concordia**	Restoration	Planned in 2023
8.	**Urdukos**	Restoration	Planned in 2023

The development of classified maps is based on the recognition of the glaciers using the satellite images of Sentinel-2. During the reporting period, the working group was in concluding phase of delimitation of the glaciers. At the same time, verification is being carried out. The Italian and Pakistani students are working with the support of the experts at the universities of Milan and Cagliari. **E5**.

The morphometric analysis focused on extracting the glacier's parameters, using the final maps. The realization of this final glacier database including area, elevation, slope, aspect, length etc.,

will be developed according to international standards. In this period, the analysis of the already done glacier boundaries was used to decide which will be the main information that could be useful to understand the glacier evolution and dynamic. The inventory is realized in a GIS environment, so, the information will be extracted automatically and will constitute the basic data for subsequent elaborations and comparisons between the behaviors of the glaciers in the different basins. **E6**.

Output statement	Baselines Value type	Indicators	Annual Targets	End of the project target	Status: On-track/ off-track / complete	Means of verifications and comment to substantiate the selected response
Output 2 Collaboration and sharing mechanism among Pakistani and international institutions and students strengthened to build capacities for longer term glaciers monitoring through innovative approaches and technologies.	0 number of systematic web-based GIS data arching and sharing mechanism exist	2.1. Web based GIS climate and glaciers data archiving and sharing system developed and maintained to enable knowledge and data sharing among the authorities responsible e.g. Met Deptt, Disaster Management Authorities, Agriculture Deptt, Water Mgt. Deptt & EPA at GB and national level.	1 number of systematic web-based GIS data archiving and sharing mechanism exist.	systematic web-based GIS data archiving and sharing mechanism developed	On track	Quarterly report. Data, georeferenced maps, trend and scenarios are being processed to be available through the information system.
	0	2.2: Number of students and faculty members of the local universities in Gilgit-	50 (Students and faculty members have received trainings)	100 (End target with 40% female students' participation n)	On Track	GIS/RS surveys and training The training reports are developed

5

Output statement	Baselines Value type	Indicators	Annual Targets	End of the project target	Status: On-track/ off-track / complete	Means of verifications and comment to substantiate the selected response
		Baltistan trained in glacier inventory and monitoring				for each session

Description of Output level results achieved in Second Quarter- 2023:

The GB Geoapp has been updated with a new section for collecting points of interest. Once authenticated on the app, users can geolocate their position and classify the point of interest by defining attributes through a data input form. The app also allows attach images taken using the device's camera in addition to census of glaciers and the definition of their characteristic attributes. The app is built with the Ionic framework, which is based on Angular and Cordova, and relies on backend services in Java. **E7**.

The 2.1.3, 21.4 and 2.1.5 activities are dedicated to the storage and web publication of the new climate data that will be acquired by the new AWS stations. The system is already populated. The current environment on the production system is available through a cloud service. With this project, the project has planned the system migration to a dedicated on-premise server located at the University of Cagliari. The new server has been acquired and installed, which is more performant than the cloud system: the new machine is equipped with an Intel® Xeon® Silver 4314 2.4G CPU, 64GB RDIMM of memory and 2.4TB 10K RPM drives. A virtual environment has been prepared and we're currently checking and debugging software updates and compatibility with new versions. **E8**, **E9, E10.**

Apart from these activities, GIS and RIS training sessions for students and faculty members of KIU and UOBs were organized in May 2023. The "Glaciers and Students" training proved to be a comprehensive and enriching learning experience for the participants. They gained in-depth knowledge about glaciers, their characteristics, and the importance of monitoring them for understanding climate change and its impacts. The training equipped them with practical skills in satellite remote sensing, including accessing and analyzing satellite imagery using software tools like SNAP and QGIS. Participants were able to apply spectral-based classifications and object-based image analysis techniques to study glaciers effectively. The training successfully fostered collaboration among participants from different academic institutions and departments, creating a platform for future interdisciplinary research and the exchange of ideas. Total 113 participants attended the trainings (45 females) **E11**.

Communications, visibility, and partnerships

Partnerships*:*

Partnerships are made with the concerned government institutions of GB as well as with the academia of the region. This includes both universities of KIU and the University of Baltistan. Mainly the interventions are made with the following institutions in the implementation of Project G&S:

- GB-EPA
- KIU
- University of Baltistan
- GBDMA
- Forest, Wildlife and Environment GB
- Planning Department Gilgit Baltistan

Communication

The communication and visibility of the project activities are highly important so as to highlight the contribution and role of donor agency, executing agency as well as the implementing partner. In doing so, press releases are sent out to the newspapers. Furthermore, social media is also used to post news and updates on the official pages of EvK2CNR Pakistan, GB EPA, KIU and the University of Baltistan.

The news updates, URLs and other visibility material focusing on the fourth-quarter activities are annexed as **E12**.

Project risks and mitigation measures

- PSEA policy has been developed and shared, BODs meeting is awaited the approval
- The timely availability of the funds according to the planned quarter activities is a big concern and this could hamper the project activity and progress. For the project field activities, there is a small window of the summer season and this should be exploited as much as possible.

Project Risk Log **E13**.

Lessons Learned

 N/A.

Way Forward

The activities will be executed as per AWP of 2023.

Annexures

E1 Weather station restoration at Askole and Urdukas

E2 Weather station checking and maintenance

E3 Glacier area change assessment

E4 Field activities on selected glaciers

E5 Final classified map

E6 1.3.8 Morphometric analysis

E7 Publication of the new web service with new high-altitude weather stations data

E8 New release of the GB GeoApp

E9 Requirement analysis for new climate data and metadata publication

E10 Update SHARE Geonetwork Platform

E11 GIS & RIS training sessions for KIU and UOBS

E12 Communication and visibility

E13 Project risk log

E14 Standard Operating Procedures (SOPs) to reduce the impact on glaciers

E15 Protection against sexual exploitation and abuse and sexual harassment policy

E16 Monitoring Report