

## Annex 2f

# Hydro-Met Observation Stations Inventory

to the GCF Funding Proposal (Simplified Approval Process)

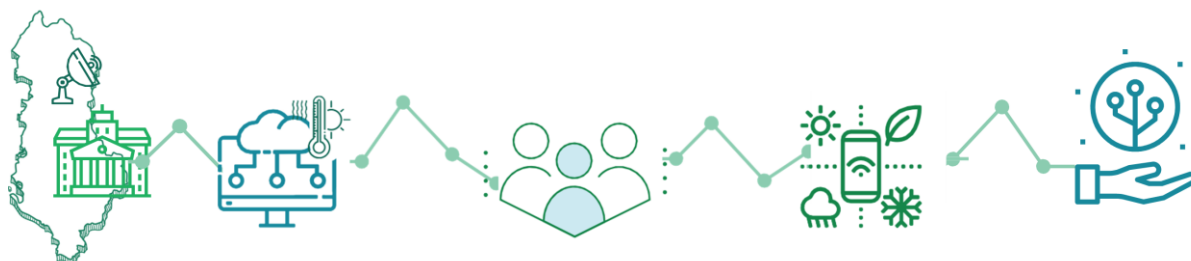
*ALBAdapt – Climate Services for a Resilient Albania*

14 January 2023

Version 1

Submitted by:

Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH



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## Abbreviations and Acronyms

DCM	Decision of Council of Ministers
FS	Feasibility Study
GPS	Global positioning system
ID	Identification
IGEO	Institute of Geoscience
IGWE	Institute of Geosciences and Energy, Water, and Environment
NHMS	National Meteorological and Hydrometeorological Service
VDF	Vodafone
WB	World Bank
ZAMG	Zentralanstalt für Meteorologie und Geodynamik

## 1. Introduction

The responsible institution for hydrometeorological services in Albania is the Institute of Geosciences and Energy, Water, and Environment (IGEWE), lately referred as Institute of Geoscience (IGEO) as per the order of the Minister of Education and Sciences <sup>1</sup>.

IGEO is entrusted with a multifaceted mission that encompasses scientific research, comprehensive education for students and emerging scientists, and the dissemination of knowledge and technology. Operating on a national scale, IGEO specializes in a diverse range of fields, including seismology, hydrometeorology, natural resource management, geo-risk assessment, geoengineering, geoinformation systems, climate studies, and environmental research. Its overarching mission is to advance knowledge through rigorous research, provide extensive educational opportunities, and contribute significantly to the nation's understanding and effective management of critical issues within the realms of geosciences and environmental sciences.

Besides teaching and research, IGEO's mandate encompasses the examination and ongoing surveillance of hydrometeorological occurrences, the timely communication of natural risk information to state agencies responsible for civil emergencies and the general public. IGEO holds official endorsement from the World Meteorological Organization (WMO) as Albania's National Meteorological and Hydrometeorological Service (NHMS)<sup>2</sup> and its director is the permanent representative of Albania to the WMO.

The saga of institutional reforms and the institution association with the University has on one side strengthened the academic and research aspect of it but, at the same time, lead to national network degradation and lack of qualitative and timely data provision along with the loss of technicians. Therefore the monitoring, maintenance and measuring visits to the stations have abridged substantially over the last decade. The overview on the network along with the institutional memory weakened with the time as the staff either left the institute or retired. Sporadic visits to a limited number of stations were done mostly project driven leading to a deterioration of the knowledge and correct information about the status quo of the hydro-met network in the country.

In order to have a clear picture and status quo of the national monitoring network, in the frame of ALBAdapt feasibility study preparation, IGEO undertook an inventory of all hydrometeorological stations, including the wells monitoring the underground water monitoring, looking at the physical and functional condition of the equipment of network. With the support of GIZ, for about three months IGEO staff visited 211 stations and documented the actual situation of the stations using a unified data sheet specifically prepared for the inventory<sup>3</sup>.

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<sup>1</sup> Minister order No. 371, dated 28.07.2011 "On the establishment of the Institute of Geosciences and Energy, Water, and Environment (IGEWE/IGJEUM), at the Polytechnic University of Tirana".

<sup>2</sup> Decision of Council of Ministers (DCM) No. 94, dated 22.02.2023 "For the approval of National Strategy for Risk Mitigation from Disasters 2023-2030 and Action Plan".

<sup>3</sup> The document compiling datasheets and stations is available upon request

## 2. Objectives of the Report

The assignment aimed at creating an updated and accurate overview of the number of the hydrological & meteorological stations in the country, the location along with the updated contact details for the observers and well as their conditions.

The main objectives of this inventory were to:

- Do a full inventory and the respective operating condition of the hydrometeorological stations;
- Develop the updated map of monitoring points for the existing hydrological and meteorological stations;
- Provide recommendations to the ALBAdapt team for the improvement of hydrometeorological stations and monitoring network.

*Photograph 1: Hydrological station, Erzeni, Ibe<sup>4</sup>*



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<sup>4</sup> Please note that all photographs, figures and tables contained in this annex stem from the IGEO monitoring team and will not be referenced hereafter to avoid duplication.

### 3. Methodology

The methodology of the inventory was a mix of desk work comprising the development of the data sheet template, digitalisation of the filled data sheets for each visited station, production of maps for hydrological and meteorological stations with verified georeferenced and station identification (ID), the interpretation of the results along with field trips to all 211 existing stations all over the country.

A group of nine IGEO staff was designated to perform the field assignment as following:

*Table 1: Overview of project collaborators and staff of meteorological and hydrometeorological departments*

Project collaborators	Staff of Meteorological and Hydrological Departments
Working group 1 (composed of 3 IGEO staff)	2 research staff/ agrometeorologists + 1 hydrologist working on: Preparation of the assignment aims and methodology, station sheets, itinerary of the field monitoring.
Working group 2 (composed of 3 IGEO staff)	1 hydrologist + 1 IT + 1 research staff/ agrometeorologists working on: filling in station sheets, field visits, recommendations and proposal for the investments needed in the network as well as contributing to this summary report.
Working group 2 (composed of 3 IGEO staff)	1 research staff/ agrometeorologists + 2 hydrologist working on filling in station sheets, field visits, recommendations and proposal for the investments needed in the network as well as contributing to this summary report.

Through the field visits the condition of the station as a whole in terms of the condition of the instruments, sensors, meteorological cages, their physical condition for continuity of the data measurement process, the surrounding of the station and the constructions in its vicinity were assessed.

Special attention was devoted to assessing the measurements performed by the observer and the testing of the alternative observer, the recording of the notes kept by the observer in the diary & annual register, keeping track of data for quick communication (telephone/e-mail, etc.), problems encountered by observers, material-based supply, the supply of materials (observation diaries, annual register, etc.), how the mail service was after there were problems in receiving diaries from certain locations, etc.

For each station the coordinates with global positioning systems (GPS) were measured and verified and photos and videos of the station were taken. The working groups identified problems, difficulties, shortcomings, and opportunities to improve the work by preparing a station sheet with photos and with the relevant coordinates of the measurement site which was used to design the respective maps with geolocations.

#### 4. Outlook of the inventory

The station sheet is designed to provide an overall picture of the status quo of the station, updated information that could help the improvement of the communication with the observers, as well as the need for improvement/ investment/ repair or relocation of the station. The first part of the data sheet is digitalised and analysed for the purpose of the Feasibility Study (FS), while the second part is used by the project team to better inform the planned investment in the funding proposal.

During the field expeditions several checks were performed such as:

- Assessment of the condition of the station;
- Control of equipment at the station;
- Measurement and verification of coordinates with GPS;
- Photographic record of the station;
- Control of the terrain;
- Communication with observers.

In addition, the following aspects have been considered and assessed:

- Verifying the status of the land/ area/ protected area in which the station is situated;
- Checking the accuracy of the measurements performed by the observer, through a direct test, after verifying the recorded data;
- Verifying the annual register, its condition as well as the consistency of the data recorded in the diaries that are sent to the respective IGEO departments.

*Photograph 2: Hydrological station, Skavice*



The types of stations and the overall number of national monitoring system is displayed in Table 2.

*Table 2: Type and number of national monitoring systems*

Type of the station	Number
Meteorological	100
Hydrological	111
Ground water monitoring/ wells	17
Agrometeorological stations	12



For the purpose of this inventory only hydrological and meteorological stations were visited, and datasheets recorded respectively: as per the findings of the visit-based inventory, Albania has 100 meteorological stations and 111 hydrological stations<sup>5</sup>. As an immediate result of this assignment, the number of the hydrometeorological stations inventoried differs from the number of stations IGEO has on paper. The reasons for this discordance vary from the dysfunctionality of a station, to its vandalization, deterioration of the station, migration of the observer and stations left with no monitoring etc.

The sections below show a summary of the findings from the inventory done.

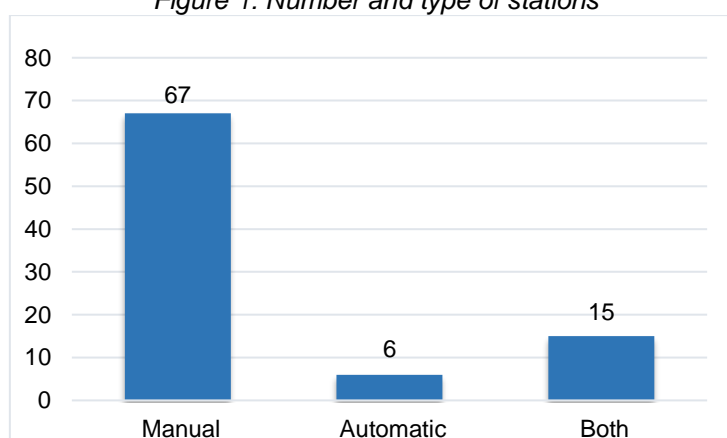
A general observation and note to this summary report is that the conditions of the hydrological and meteorological stations fall short of the WMO standards for functional stations. For all manual and automatic meteorological stations calibration and replacement or repair of the sensors is needed. The same holds true for the hydrological sensors. For the last 10 years IGEO did not undertake regular field visits, monitoring trips and maintenance of the stations due to the lack of funds from the institute. Calibration of sensors and of each station was also not performed during the last decade.

#### 4.1 Current situation of the Meteorological Network

From 100 reported stations from the institute only 88 meteorological stations were found in terrain and therefore 88 data sheet records are part of this inventory. From a typology point of view 80% of the stations (or in 82 locations) manual stations are observed and inventoried, while 20% of them (or in 21 location) automatic stations are inventoried.

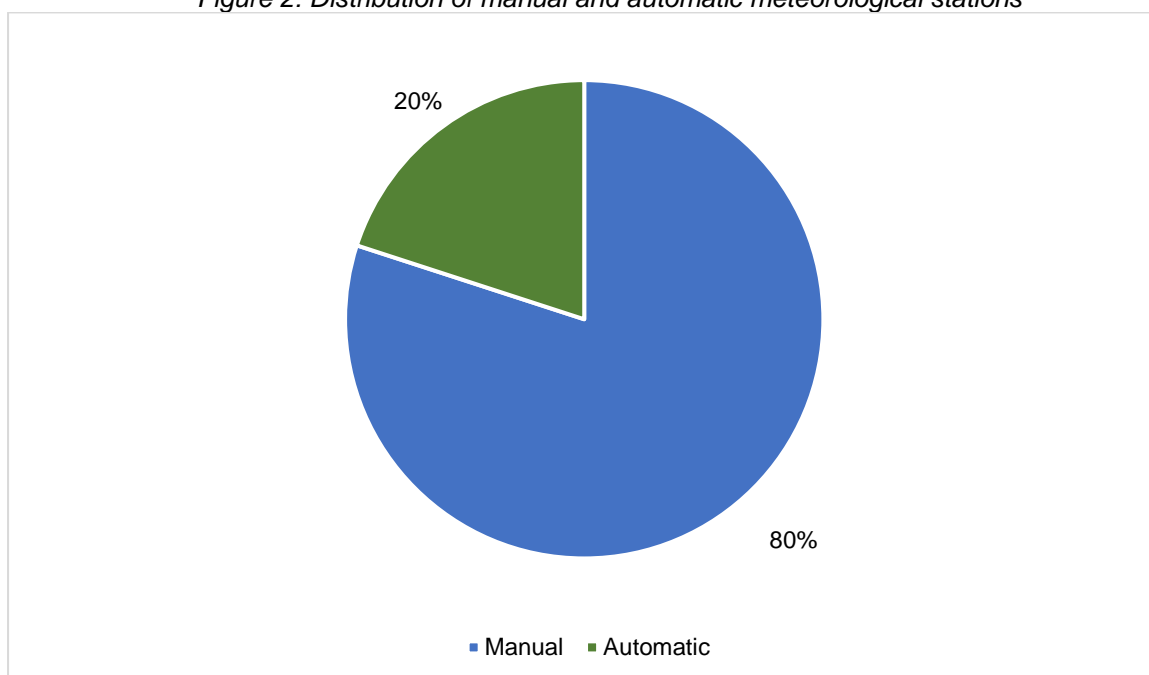
Upon closer examination, it can be seen that only six stations are automatic. 15 locations have both automatic and manual stations while 67 of them are only manual. **Error! Reference source not found.** below represents a more presents of the number and type of stations and Figure 2 their distribution in percent.

Figure 1: Number and type of stations



<sup>5</sup> A compilation of all datasheets is available upon request.

Figure 2: Distribution of manual and automatic meteorological stations



As reported in the station data sheets, existing sensors (mostly three to five/ each automatic station) need calibration and repair. Out of 67 Manual stations (all of them have one to three sensors mostly temperature thermometers and rain gauges), 24% of them need refurbishment/ total replacement of the sensors, while 76% of them need calibration and reparation.

Almost the same situation stands also for the joint typology of the stations. The automatic ones need calibration and repair, while for the b ones 27% need total replacement and 73% need calibration and reparation.

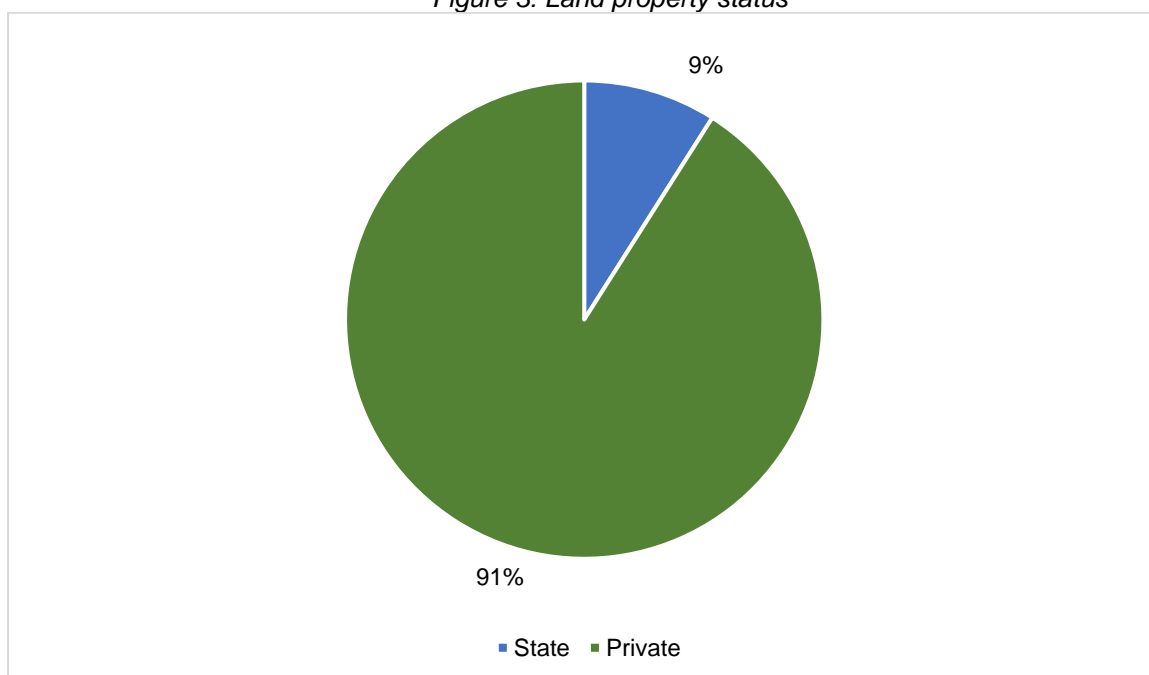
For all 88 stations, contact details of observers were updated<sup>6</sup> and willingness to continue performing the observation tasks was evaluated. Out of 88 locations, only in five locations or 6% of the observers did not want to continue performing this obligation. The other 94% were keen and willing to continue performing this task and most of them considered it as a service for the community and family tradition, even though the compensation they get from the state is minimal. Nonetheless, all of them recommended to:

- Replace and modernise the sensors;
- Regular maintenance and inspection of manual and automatic stations form IGEO technicians;
- Supply with basic materials for data recording, like register, diary, and other stationaries; and
- Training on how to use of new instruments data recording from the stations, training for alternate observers (usually another family member).

Another element checked and analysed is the land property status. 91% of the inventoried meteorological stations are located in private land (mostly on the garden of the observer), while only 8% of the stations are located in a state-owned land(see Figure 3). It should be acknowledged that in both cases the ground situation is characterized of extensive vegetation, shrubs, and trees nearby

<sup>6</sup> List of contact details of the observers for meteorological stations updated and available through IGEO and GIZ project staff

Figure 3: Land property status

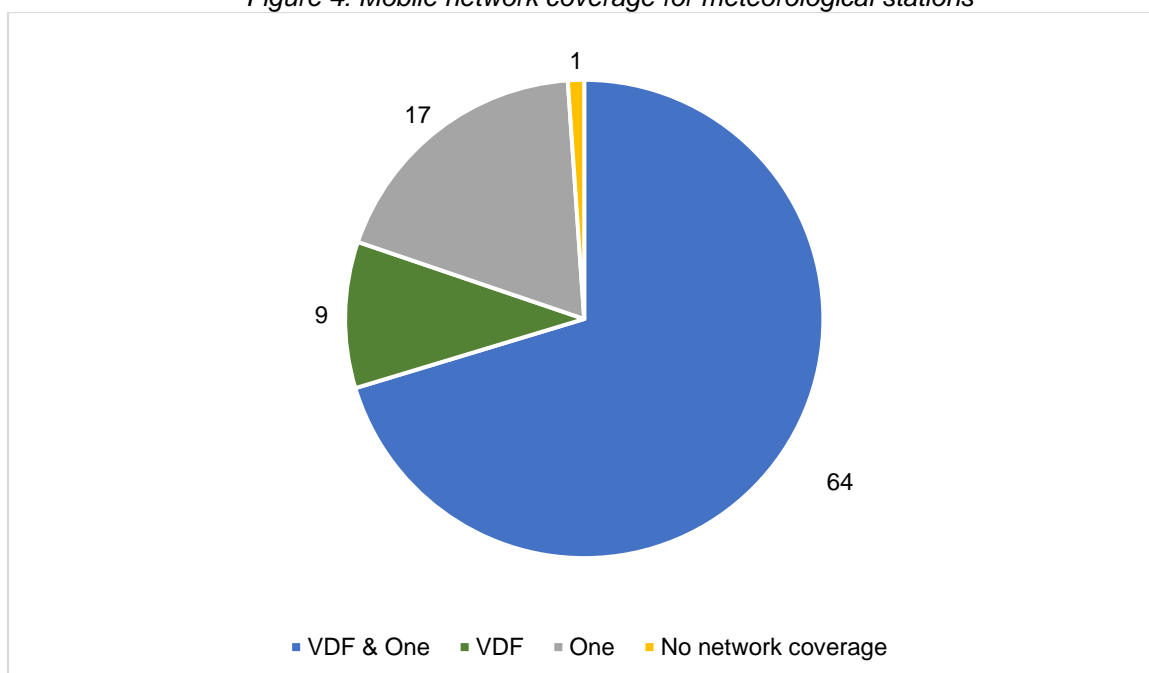


Mobile network coverage of the station's location were also recorded for all 88 locations regardless of the type of station. This is an information valuable for the potential modernisation and upgrade of the station from manual to automatic one.

There are two mobile networks available in the country, Vodafone (VDF) and One (both mobile telecommunications companies). Most of the existing locations (64) are covered with telecommunication means by both companies, while one location is not covered by any of the existing mobile networks in the country.

Figure 4 below provides the coverage of stations / service provider.

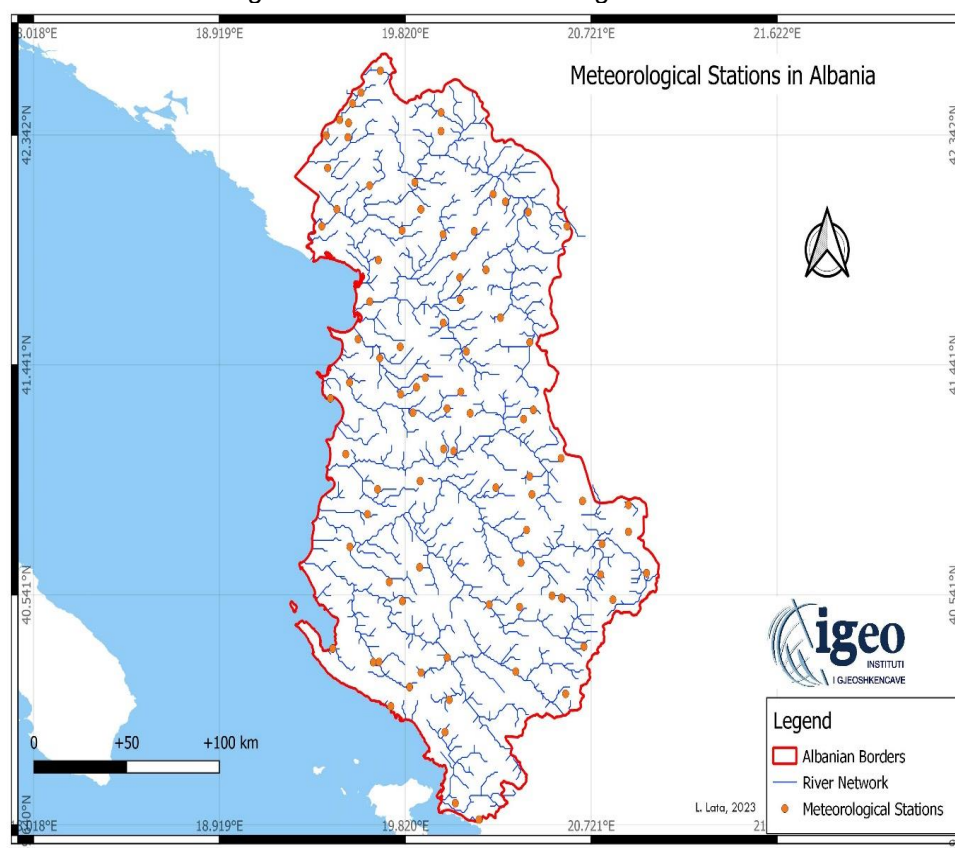
Figure 4: Mobile network coverage for meteorological stations



Additional information regarding access to road, access to power, history of data recording/ station, existing of fencing of stations, protection status of the land where station is situated etc., are collected as part of inventory and can be used either by IGEO or by ALBAdapt project staff during the implementation of the project.

Based on the stations geo-references collected during the inventory assignment, a map with location of the meteorological stations is prepared as below.

*Figure 5: Location of meteorological stations*



## 4.2 Current Situation of the Hydrological Network

108 hydrological stations resulted existing from the field expedition out of 111 station visited from IGEO and as such 108 station sheets were filled, part of this inventory.

*Figure 6: Number and type of hydrological stations*

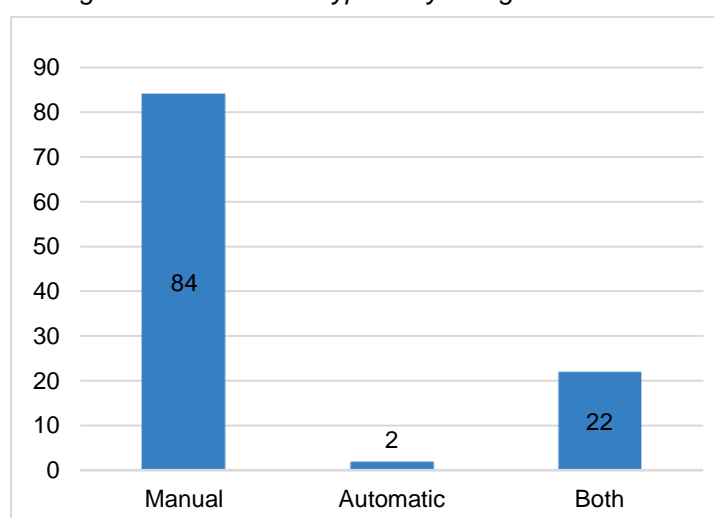
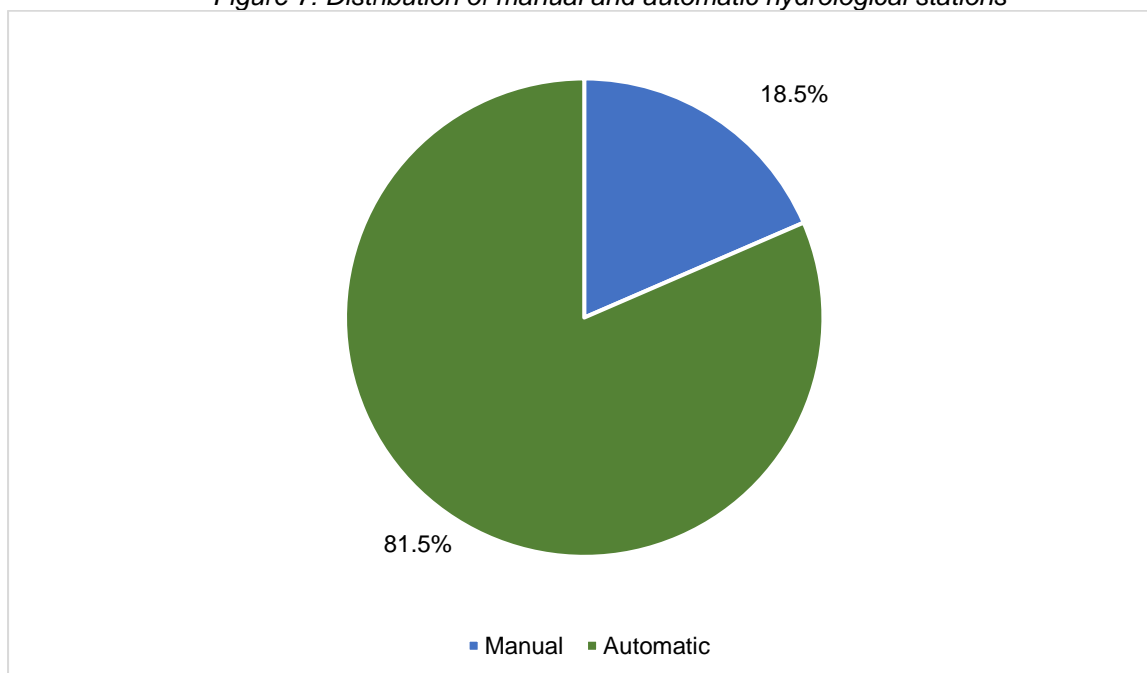


Figure 7 shows that 81.5% of the stations (or identified in 106 locations) are manual stations, whereas 18.5% (or identified in 24 locations) are automatic ones.

In addition, 22 stations were identified (in respective locations) that are both manual and automatic.

Figure 7: Distribution of manual and automatic hydrological stations



Technical staff of IGEO assessed the existing sensors per each station and it resulted either automatic, manual or the category both of stations, all need calibration and repair of the sensors. Only three stations need to be totally changed.

More specifically out of 59 of manual station (all of them have one sensor that measure water level), 73% need calibration, whereas 23 % need to be replaced. The automatic ones need calibration and repair, while for both category 5% need total replacement, 9% change of the station and 86% need calibration and reparation.

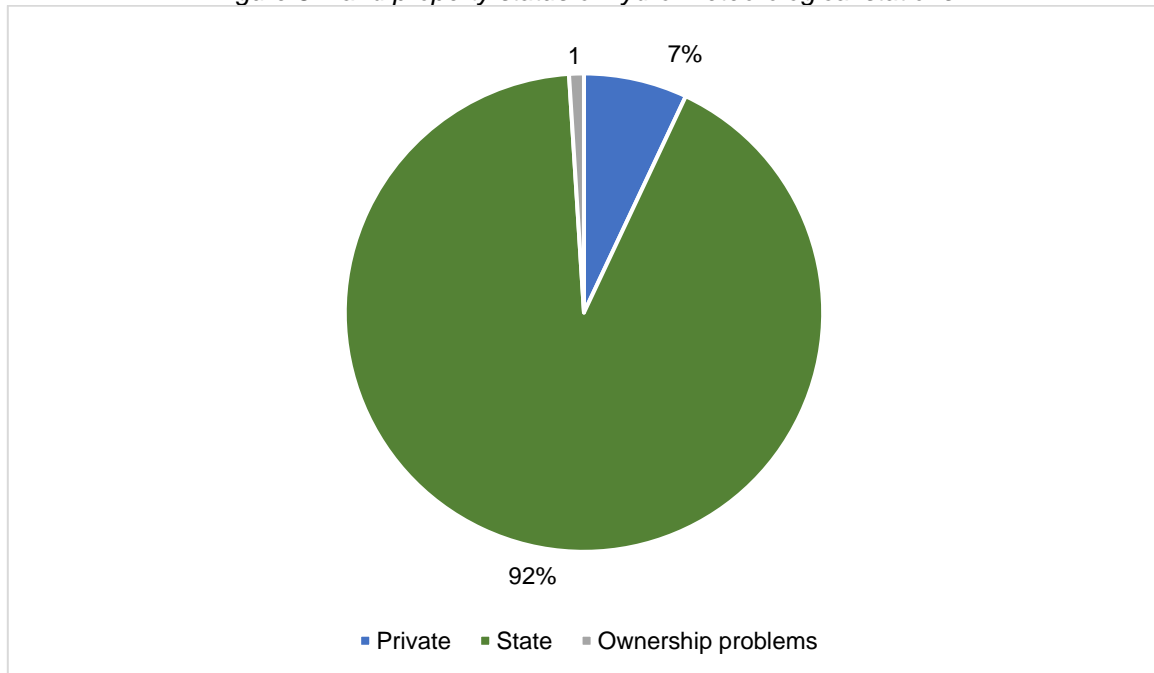
Another important part of the inventory was discussion with the observers and an estimation of the work done, difficulties encountered and needs for improving the work. For all 108 locations, contact details of observers<sup>7</sup> were updated. Out of 108 locations, only in seven locations or 6.5% of the observers did not want to continue performing this obligation. The other 93.5% would like to keep working, recording and transmitting data from the hydrological stations as a family tradition, even though the compensation they get from the state is minimal.

Other key elements were assessed through field inspections such land property status and mobile network coverage.

For the first one it resulted that 92% of hydrological stations are located a state land, while in a private land are placed only 7 % of the hydrological stations as shown in Figure 9 below.

<sup>7</sup> List of contact details of the observers for hydro stations updated and available through IGEO and GIZ project staff

Figure 8: Land property status of hydro-meteorological stations



For the second element, knowing the fact that data recorded are important to be transmitted, technical staff also assessed the mobile network coverage for all 108 locations regardless of the type of station. As mentioned before, this information is valuable for the potential modernisation and upgrade of the station from manual to automatic ones.

Figure 9: Mobile network coverage for meteorological stations

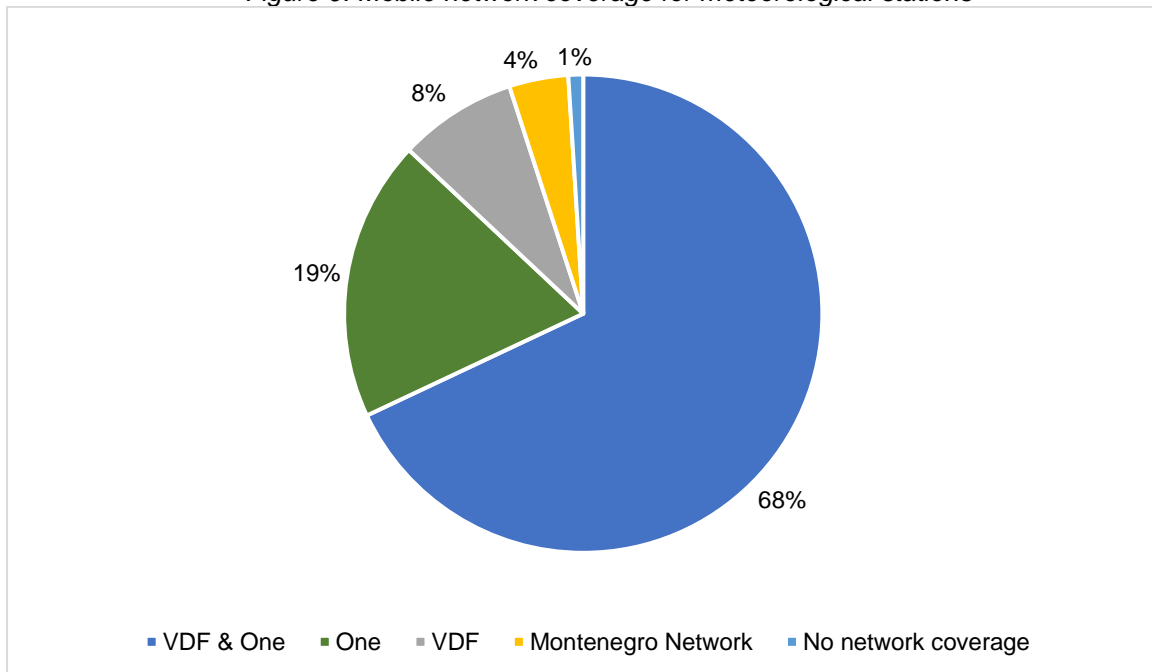


Figure 9 shows that 68 % of the locations where stations are placed/installed, it is covered by both operators Vodafone Albania and One.

Besides, there also areas, in 19% of the locations, which are reached only by ONE operator and other 8% of the areas are reached by Vodafone.

The data sheets per each individual station contain information regarding access to road, access to power, history of data recording/ station, existing of fencing of stations, protection status of the land where station is situated, etc.

All the information recorded in data sheets as part of inventory and can be used either by IGEO or by ALBAdapt project staff during the implementation of the project.

Based on the stations' geo-references collected during the inventory assignment, a map with location of the hydrological stations is prepared below.

*Figure 10: Location of hydrological stations in Albania*



## 5. Conclusions and Recommendations

### 5.1 General Conclusions

The number of hydrometeorological stations in the country has been decreasing over the last 30 years. In 2005, the national meteorological network consisted of 135 meteorological sites, while as a result of this inventory only 83 meteorological stations were confirmed. Out of 207 hydrological stations in 1990, 102 stations are documented in June 2023 as part of this inventory. Regular water flow measurement has been decreasing constantly from the regime change until 2008. With the reforms this activity has been almost completely interrupted, due to the lack of technical-hydrologist staff and the institution's very limited budget<sup>8</sup>.

As a general observation and note to this summary report, the conditions of the hydrological and meteorological stations falls far behind the WMO standards for functional stations. For all manual and automatic meteorological stations, calibration and replacement or repair of the sensors is needed. The same stands for the hydrological sensors. There has been a tentative of modernising and upgrading the network from manual to automatic stations, supported by donor funding, which did not lead to improved data collection, nor increase of number of stations/places where the measurements are done. For the last 10 years IGEO did not undertake regular field visits, monitoring trips and maintenance of the stations due to the lack of funds from the institute. Calibration of sensors/each station is also not performed during the last decade.

It should be noted that the meteorological and hydrological annual book have not been published. after 1989

### 5.2 Recommendations about Meteorological stations

Based on the results from the inventory and specific station data sheets as well as findings from several projects/ donors' analysis (like World Bank (WB), Zentralanstalt für Meteorologie und Geodynamik (ZAMG), Pro-news, GIZ) the following recommendations are set forth.

#### 5.2.1 Recommendation #1

→ Prioritization of stations in the country meteorological network by going through an in-depth scientific analysis to determine the measurement locations of a modernized network. This prioritization can serve the future investment in the network.

Below is a summary of some of the main criteria for the selection of meteorological stations. These criteria's are published on the official website of the WMO and are also published at different times by local scientific institutions.

The criteria for selection are related to:

- The mission of a meteorological station is to carry out observations in a certain area by being placed in that geographical location, with physical-geographical and climatic conditions that are most representative of the area in question;
- Criteria of continuity of observation series. Many of the meteorological stations have been closed for various reasons. Placing a new meteorological station in the same place restarts the series with new meteorological data and enables a set of scientific and operational activities in the field of meteorology;
- Criteria of the density for the number of meteorological measurement sites per unit area (with about 100/km<sup>2</sup>/station), referring to domestic and foreign scientific publications officially recognized by the WMO;
- Criteria of complete monitoring of climatic zones and sub-zones which complete the climatic regionalization of Albania;
- Criteria of meteorological monitoring of areas of special importance for national security such as cities, agricultural areas, river basins, hydropower plants, etc.

Three categories of priority meteorological stations proposed are as follow:

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<sup>8</sup> Assessment Report on the Establishment of Institutional and Regulatory Platform for Governance and Functioning (IRP) of the National Water Resources Cadaster in Albania.



- The stations under **category 1** are the main priority points which are proposed to be equipped with automatic stations with a full cycle of climatic elements;
- Stations under **category 2** are meteorological stations with a smaller range of elements than the first category, just the main elements, air temperature, wind;
- Stations in **category 3** are pluviometric stations which are used only for measuring the amount of rain and snow.

Stations of the first category proposed by IGEO are 76 meteorological stations that close the climatic cycle of meteorological monitoring.

## 5.2.2 Recommendation #2

→ Provision of new automatic meteorological stations.

The reasoning for this proposal comes from the fact that Meteorological Diary (DM4) stations (in the table below) are manual weather stations that are still existent and currently provide data for 6 parameters (but the quality of data is of concern due to the lack of calibration of the sensors for a long time). These manual stations are installed around 1960s-90s for the purpose of measuring up to 32 parameters including thermometers of the earth's surface.

These stations are very important because the way they are distributed makes it possible to provide data that represent all zones and sub zones of climate change in Albania. Thus, they become a priority for the meteorological network and in order to increase the quality of data as well as reporting data in real time, it is of utmost need to install new automatic meteorological stations in the same location as manual ones. Please note that refurbishing of the manual stations for the same location is also considered important to ensure a smooth transition from manual to real time collection of the data.

*Table 3: Location overview of meteorological stations*

#	ID	X	Y	H
1	Durrës	41.31035	19.45758	0
2	Elbasan	41.11023	20.08666	123
3	Ersekë	40.33733	20.67947	1022
4	Fier	40.7275	19.56276	15
6	Gorre	40.90408	19.67675	6
7	Himarë	40.10347	19.75024	30
8	Kryevindh	41.09181	19.53152	129
9	Kukës	42.03972	20.41556	361
10	Korçë	40.61408	20.77781	873
11	Lezhë	41.78607	19.64608	31
12	Përmet	40.23626	20.3517	241
13	Pogradec	40.90153	20.65563	701
14	Poliçan	40.60643	20.10066	255
15	Pukë	42.04698	19.8961	784
16	Qafshul	41.21327	20.38075	980
17	Rrëshen	41.76764	19.87675	89
18	Sheqeras	40.73944	20.77306	819
19	Sukth i ri	41.37016	19.55144	13
20	Tiranë	41.32636	19.82202	110
21	Voskopojë	40.52848	20.57758	1251
22	Xarrë	39.72718	20.05986	43
23	Cërnicë	42.35814	20.07773	347

## 5.3 Recommendations about Hydrological Stations

Based on the results from the inventory and specific station data sheets as well as findings from several projects/ donors analysis (like WB, ZAMG, Pro-news, GIZ) the following recommendations are made.

### 5.3.1 Recommendation #3

→ Prioritizing the hydrological network by defining the measurement locations for a modernized network.

Some of the main criteria referring to the WMO standards and the standards set by the local scientific research institutions for the selection of hydrological stations are presented below. Stations of the first category proposed are 46 hydrometric stations and the criteria for the selection of hydrometric measuring are generally related to the most complete monitoring of the levels of the river network in Albania. Referring to the WMO standards and the standards set by the local scientific research institutions the basic criteria are:

- Monitoring of incoming flows in the territory of Albania. This criteria enables continuous monitoring of how much water enters the territory of Albania through rivers and streams. Through these stations, the incoming flow in our country is analysed.
- Continuous monitoring of watersheds. The modernization of the stations in the entire course of the rivers brings the possibility of accurate analyses of the progress of their course.
- Optimizing the location of new and current measurements in specific points (mainly the middle course of rivers) in which the rise in river levels provides direct information that the flow will bring the risk of flooding in areas (residential, agricultural lands) that are located in the lower banks.
- Monitoring the flows in the river discharges which are mainly in the west of the territory. Through this distribution it is possible to analyse a water balance for our country, knowing how much water leaves the Albanian territory.

### 5.3.2 Recommendation #4

→ Provision of new automatic hydrological stations

Stations of the first category proposed are 46 hydrometric stations that realizes and complete the monitoring of the levels of the river network in Albania. These priority stations are hydrological stations that directly measure flows and water levels and provide data in real time to IGEO. These stations must also have manual hydrometers at the same locations.

With the data collected hydrologists make predictions and decisions concerning water level, flood activity and impact as well as provide early warning for floods and information on water balance for all water catchment basins. Table 4 provides a list of proposed new hydrological stations.

*Table 4: List of proposed new hydrological stations*

#	Stations	N	E
1	Sukth Vendas	41.52569	19.61839
2	Fushe Kruje	41.47932	19.71895
3	Ura e Gjoles	41.46736	19.69167
4	Shupal	41.40153	19.90831
5	Ndroq	41.26462	19.66041
6	Sallmonaj	41.36103	19.54918
7	Bovilla	41.44541	19.86689
8	Shkumbini Paper	41.04983	19.95656
9	Shkumbini Ura E Polisit	41.16369	20.23022
10	Shkumbini Rogozhine	41.06396	19.65146
11	Mati Shoshaj	41.60753	20.02847
12	Mati Milot	41.69922	19.726
13	Ulez	41.67996	19.89381

14	Shkopet	41.69129	19.83093
15	Uraka Uraka	41.6915	19.99903
16	Liqeni Shkodres Shiroke	42.05956	19.454778
17	Buna Dajc	41.98625	19.414167
18	Gomsiqe Gomsiqe	41.97934	19.645232
19	Kiri Rasek	42.11462	19.574984
20	Perroi Vermoshit	42.5876	19.719513
21	Drini Bacallek	42.0425	19.491917
22	Buna Shkoder	42.05056	19.491972
23	Pr. Lepushesh Vermosh	42.565	19.734876
24	Cemi Bashkuar Tamare	42.44314	19.539694
25	Buna F. cimentos	42.03928	19.48275
26	Drini I Zi Kovashice	41.59683	20.441111
27	Vau i Dejes	42.0151	19.6359
28	Komani	42.1078	19.8257
29	Fierze	42.2489	20.0444
30	Valona-Gri	42.3163	20.0579
31	Prespa e Vogel	40.68063	20.994436
32	Pogradec	40.9077	20.651026
33	Prespa e Madhe	40.7873	20.907464
34	Drini i Lezhes-Lezhe	41.78046	19.642188
35	Breg-Lumi	42.30414	19.7965
36	Lekbibaj	42.28816	19.939581
37	Vjosa Carshove	40.11226	20.54017
38	Vjosa Permet	40.24047	20.3535
39	Drinosi Ura e Leklit	40.25931	20.05553
40	Vjosa Memaliaj	40.35189	19.97278
41	Dorez	40.39245	19.80675
42	Shushica Vodice	40.41633	19.58258
43	Vjosa Mifol	40.63444	19.46081
44	Kalasa Tatzat	39.9916	19.9767
45	Bistrica cuke	39.84709	20.02531
46	Pavla Bogas	39.72115	20.13307

### 5.3.3 Recommendation #5

→ Integrating recommendations for the observers

Observers play a key role in observation, measurement, collection, recording, and transmission of hydro - meteo parameters and information on various atmospheric phenomena.

94% of observers in hydro-meteo stations were keen and willing to continue performing this task and most of them considered it as a service for the community and family tradition, even though the compensation they get from the state is minimal.

Nonetheless, all of them provided the following recommendations:

- Replace and modernise the sensors;
- Regular maintenance and inspection of manual and automatic stations form IGEO technicians;
- Supply with basic materials for data recording, like register, diary, and other stationaries.

These measures will increase the quality of data collected from the observers and ensure real time data transmission to the Hydromet Institute. IGEO experts, as a result of the discussions with the observers during field expeditions, recommend that observers need training on how to use new instruments for data recording from the stations and training for alternate observers (usually another family member).

*Photograph 3: Hydrological station, Uji i ftohte, Tepelene*



*Photograph 4: Meteorological station, Dardhe, Korce*



## **6. Working Group Members**

The inventory was conducted by staff of IGEO divided in 3 working groups and supported by GIZ staff members as presented below:

### Intervention design group:

Dr.Elvin Çomo

M.Sc.Gazmir Çela

M. Sc. Ing. Anira Gjoni

Dr. Liljana Lata

### Group I- field inspection:

Dr. Azem Bardhi

Mirela DVORANI

### Group II- field inspection:

M.Sc. Arben Radheshi

Almir GJATA

### Group III- field inspection:

Dr. Astrit Shatro

M.Sc. Indrit Rexhepi

### GIZ support Team:

Merita Meksi

Emi Kaduku

Rrezearta Ago

Vlorlinda Daja

Mario Xani

Inventory Team leader: Dr.Azem BARDHI

Approved by: Prof.Dr.Ylber MUCEKU, Director of IGEO

## Appendices

### Appendix 1: List of Hydro-meteorological stations inventoried

Hydrological stations					Meteorological stations				
#	Name	ID of the station	Latitude	Longitude	#	Name	ID of the station	Latitude	Longitude
1	Lake Ohrid-Pogradec	021DR100	40° 54' 29"	20° 39' 06"	1	Pogradec	ALXX2546	40°54'0" N	20°40'45" E
2	Adriatic Sea – Shengjin (Port)	040BU100	41° 48' 28"	19° 35' 06"	2	Korçë	ALXX0005	40°44'22" N	20°46'24" E
3	Drini Lezhe	001DR160	41° 46' 49"	19° 38' 38"	3	Sheqeras	ALXX2603	40°44'21.99" N	20°46'23.02" E
4	Stream of Manatia Lezhe	009MA010	41° 46' 16"	19° 39' 38"	4	Ersekë	ALXX2373	40°20'14" N	20°41'09" E
5	Stream of Gomsiqe - Gomsiqe	001DR330	42°01'03"	19°41'48"	5	Bilisht	ALXX2314	40°37'30.92" N	20°59'21.78" E
6	Drini Bahcallek	001DR150	42° 02' 33"	19° 29' 03"	6	Gorricë e Madhe	ALXX2394	40°53'34.41" N	20°54'5.35" E
7	Buna Shkoder	000BU010	42° 03' 02"	19° 29' 31"	7	Voskopojë	ALXX2603	40°69'33" N	20°51'57" E
8	Buna Fabrika e Cimentos	000BU020	42°02'21"	19°28'58"	8	Dardhë	ALXX0155	40°31'17.03" N	20°49'35.07" E
9	Buna Dajc	000BU040	04°59'06"	19°24'56"	9	Shtyllë	ALXX0155 Same ID as Meteo Dardhe	40°32'12.65" N	20°31'53.98" E
10	Lake Shkodra - Shiroke	020BU100	42° 03' 34"	19° 27' 16"	10	Vithkuq	ALXX0086	40°31'34" N	20°34'57" E
11	(Puset) Wells Shkodra	n/a	42° 03' 33"	19° 29' 31"	11	Kardhiq	ALXX2031	40°12'04" N	20°22'87" E
12	Kiri Prekal	001DR360	42°10'29"	19°42'42"	12	Konispol	ALXX4028	39°66'11" N	20°17'09" E
13	Kiri Rasek	001DR390	42°07'26"	19°36'15"	13	Leskovik	ALXX2470	40°09'09" N	20°35'49" E
14	The sources of Vrake	010BU100	41°08'40"	19°32'43"	14	Liqenas	ALXX2473	40°47'15" N	20°54'07" E
15	Sources of Rrjollit Koplik	010BU200	41°15'05"	19°35'51"	15	Nivicë	ALXX4095	40°14'08" N	19°53'48" E
16	River Cemi i Vuklit Tamare	000BU060	42°27'17"	19°33'40"	16	Përmet	ALXX2184	40°14'23" N	20°21'21" E
17	River Cemi Bashkuar Tamare	000BU060	42°27'17"	19°33'40"	17	Tepelenë	ALXX2251	40°29'67" N	20°01'82" E

Hydrological stations					Meteorological stations				
18	The stream of Vermosh	009DN010	42°34'59"	19°44'47"	18	Vergo	ALXX4176	40°00'09" N	20°00'45" E
19	Stream of Lepusha Vermosh	009DN030	42°34'50"	19°44'39"	19	Xarrë	ALXX4191	39°43'27" N	20°03'45" E
20	Perroi i Serriqes Ngull II	001DR480	42°05'53"	20°13'33"	20	Shënkoll	ALXX1419	44°41'22" N	19°38'53" E
21	Stream of Orgjostit Orgjost	001DB030	42°02'32"	20°35'07"	21	Kallmet	ALXX0936	41°51'09"	19°41'22"
22	Stream of Kruma Gecaj	001DR170	42°11'46"	20°24'26"	22	Buna Dajc	ALXX2717	04°59'06"	19°24'56"
23	Bushtrica Sopot Tropoje	001VA060	42°22'14"	20°07'14"	23	Ura e Shtrenjte	ALXX3618	42°08'38"	19°38'50"
24	River Valbona Dragobi	001VA010	42°25'48"	19°59'35"	24	Dushman	ALXX3245	42°09'24"	19°52'00"
25	River Valbona B.Curri	001VA020	42°21'14"	19°05'43"	25	Vrith	ALXX3638	41°33'11"	19°54'19"
26	Curraj i Poshtem - Lekbibaj	001DR270	42°17'50"	19°56'33"	26	Koplik	ALXX3242	42°12'46"	19°26'37"
27	Stream of Seta Arres	001DZ120	41°44'14"	20°18'04"	27	Hot	ALXX0637	42°20'25"	19°26'13"
28	Mati Klos	002MT010	42°34'59"	19°44'47"	28	Selce	ALXX2596	42°30'30"	19°36'20"
29	Stream of Darsi Klos	002MT150	41°30'17"	20°04'02"	29	Boga	ALXX3184	42°24'05"	19°30'07"
30	Mati Shoshaj	002MT020	41°36'27"	20°01'40"	30	Rapsh	ALXX3548	42°23'22"	19°32'43"
31	Spring of Shuteri	010MT100	41°41'44"	20°00'27"	31	Vermosh	ALXX3627	42°35'39"	19°41'58"
32	Uraka Bruc	002MT140	41°41'38"	20°00'36"	32	Gojan	ALXX3273	41°57'39"	20°00'58"
33	Zalli i Bulqizes Sofracan	001DZ090	41°31'43"	20°25'41"	33	Puke	ALXX3534	42°03'03"	19°53'46"
34	Drini i Zi Topojan	001DZ010	41°34'49"	20°26'42"	34	Kalimash	ALXX2784	42°04'45"	20°18'18"
35	Drini i Zi Skavice	001DZ040	41°35'48"	20°26'27"	35	Korthpule	ALXX3357	41°58'06"	19°48'16"
36	Stream Muhurra Muhur	001DZ110	41°40'37"	20°19'59"	36	Kukes	ALXX2784	42°03'17"	20°25'07"
37	Stream of Verdova in Pogradec (1 Maji)	001DZ060	40° 54' 06"	20° 40' 21"	37	Selishte	ALXX0776	41°37'35"	20°16'53"
38	Stream Gorica in Pogradec	001DZ061	40°54' 17"	20°39' 40"	38	Shishtavec	ALXX2879	41°59'06"	20°36'16"

Hydrological stations					Meteorological stations				
39	Sources of Tushemisht - Pogradec	011DZ100	40°54' 11"	20°43' 16"	39	Cernice B. Curri	ALXX2758	42°21'26"	19°59'35"
40	Sources of Drilon - Pogradec	011DZ200	40°54' 07"	20°42' 49"	40	Dragobi	ALXX2723	42°25'50"	19°59'37"
41	Wells - Geshtenjas	No specific code	40°52' 21"	20°40' 53"	41	Macukull	ALXX0700	42°42'09"	20°04'68"
42	Stream of Dunaveci - Drithas	006DV120	40°42' 22"	20°44' 30"	42	Shupenze	ALXX0793	41°32'08"	19°25'29"
43	Devolli Miras	006DV010	40°30' 17"	20°55' 20"	43	Ballsh	ALXX1549	40°35'27" N	19°44'33" E
44	Tren – Micro Prespa Lake	026DV200	40°41' 00"	20°59' 51"	44	Belsh	ALXX1055	40°58'70" N	19°53'32" E
45	Pustec – Lake of Macro Prespa	026DV100	40°47' 24"	20°54' 31"	45	Bishnica	ALXX2316	40°56'02" N	20°26'02" E
46	Pustec Osumi Leshnje	006OS010	40°31' 35"	20°36' 50"	46	Brataj	ALXX3945	40°16'34" N	19°39'55" E
47	Osumi Qafzeze	006OS020	40°26' 13"	20°38' 01"	47	Brataj ETG	ETG 012	40°16'39" N	19°40'93" E
48	Vjosa Carshove	007VJ020	40°06' 46"	20°32' 24"	48	Çorovodë	ALXX0427	40°30'07" N	20°13'36" E
49	Vjosa Permet	007VJ050	40°14' 26"	20°21' 13"	49	Dajt fshat	ALXX3699	41°23'28" N	19°55'02" E
50	Drinos – Ura Leklit	007DI030	40°15' 33"	20°03' 19"	50	Dajt rezervuar	ALXX3699	41°21'14" N	19°52'27" E
51	Uji i Ftohte - Tepelene	017VJ100	40°15' 02"	20°03' 55"	51	Dushar	ALXX2370	40°40'01" N	20°22'52" E
52	Stream Kardhiqi – Palokaster	007DI050	40°09' 47"	20°05' 52"	52	Elbasan	ALXX1133	41°05'73" N	20°03'17" E
53	Drinos - Gjirokaster	007DI010	40°05' 08"	20°39' 40"	53	Fier	ALXX1623	40°43'42" N	19°33'06" E
54	Syri Kalter Spring	017BS100	39°55' 25"	20°11' 33"	54	Fushë Krujë automatic Davis station	n/a	41°28'04" N	19°41'47" E
55	Stream Krongji - Sarande	008BS010	39°55' 30"	20°11' 34"	55	Fratar	ALXX1632	40°01'07" N	19°57'34" E
56	Kalasa Tatzat	008KL010	40°10' 50"	19°56' 18"	56	Fushë Lurë	n/a	41°48'49" N	20°12'40" E
57	Bistrica Cuke	008BS050	39°50' 16"	20°02' 27"	57	Gorre	ALXX1656	40°51'23" N	19°38'14" E
58	Lake Butrinti - Manastir	028SU100	39°48' 45"	20°00' 52"	58	Grabova e Sipërme	ALXX1179	40°47'40" N	20°24'28" E
59	Lake Butrinti - Channel	028SU100	39°48' 45"	20°00' 52"	59	Himarë	ALXX0058	40°06'12" N	19°31'53" E



Hydrological stations					Meteorological stations				
60	Ion Sea – Saranda (Port)	028SU100	39°52' 21"	19°59' 24"	60	Jaronisht	ALXX1219	40°57'37" N	20°15'34" E
61	Vjosa Memaliaj	007VJ100	40°21' 06"	19°58' 23"	61	Killojka	ALXX3764	41°16'13" N	20°01'21" E
62	Vjosa Pocem	007VJ110	40°29' 37"	19°43' 41"	62	Kruja	ALXX0916	41°30'43" N	19°47'44" E
63	Burimet e Guakut Skrapar	016OS100	40°30'52"	20°14'08"	63	Kryevidh	ALXX3775	40°05'30" N	19°31'53" E
64	Devolli Kokël	006DV090	40°46'45"	20°17'34"	64	Kuç	ALXX2455	40°10'45" N	19°50'27" E
65	Devolli Lozhan	006DV060	40°46'45"	20°17'34"	65	Kurbnesh	ALXX3019	41°47'02" N	20°05'04" E
66	Erzeni Ibë	004ER030	41°14'08"	19°55'17"	66	Likmetaj	ALXX0960	41°32'32" N	19°35'29" E
67	Erzeni Ndroq	004ER050	41°15'53"	19°39'37"	67	Lushnje	ALXX1766	40°57'14"	19°41'08"
68	Fan i vogël, Ndërfan	002FA080	41°47'08"	19°53'30"	68	Orikum	ALXX0025	40°19'47" N	19°28'06" E
69	Fan, Vau i Shkjezës	002FA010	41°47'10"	19°49'02"	69	Petrela	ALXX3834	41°15'15" N	19°51'26" E
70	Gjanica Fier	006GA040	40°43'30"	19°33'33"	70	Petresh	ALXX1356	41°06'42" N	20°00'23" E
71	Gjanica Panahor	006GA010	40°36'12"	19°46'04"	71	Port Durrës	ALXX0011	41°18'08" N	19°07'19" E
72	Gostima Fushë Buall	005SH230	41°06'31"	20°11'20"	72	Potom	ALXX0370	40°29'34" N	20°22'27" E
73	Ishmi Sukth Vendas	003IS020	41°31'32"	19°37'08"	73	Qafshul	ALXX0370	41°13'44" N	20°23'37" E
74	Përroi Kushës	005SH170	41°01'51"	20°01'57"	74	Qarrishta	ALXX1377	41°15'51" N	20°26'27" E
75	Laguna e Nartës	057SU100	40°31'04"	19°24'13"	75	Rrajcë	ALXX1385	41°04'32" N	20°34'22" E
76	Lana Shkozë	003GO070	41°19'57"	19°50'38"	76	Shëngjergj	ALXX1869	41°20'09" N	20°05'22" E
77	Lumi i Tiranës Shupal	003GO020	41°24'04"	19°55'33"	77	Shmil	ALXX1429	41°15'06" N	20°08'04" E
78	Mati Milot	002MT090	41°41'59"	19°43'32"	78	Sinjë	ALXX0424	40°38'55" N	19°52'83" E
79	Gjola F.Krujë	003GO010	41°08'22"	19°41'31"	79	Stravaj	ALXX2623	41°00'15" N	20°25'21" E
80	Vjosa Mifol	007VJ130	40°38'04"	19°27'40"	80	Sukth i Ri	ALXX1026	41°22'21" N	19°33'01" E
81	Zeza F-Kruje	003GO140	41°28'25"	19°43'15"	81	Tamare	ALXX3601	42° 27' 54,512" N	19° 33' 52.88" E
82	Laguna Orikum	057SU200	40°19'18"	19°26'15"	82	Burrel	ALXX3534	41°36'21"	20°00'156"
83	Osumi Berat	006OS070	40°42'12"	19°56'58"	83	Mashterkor	ALXX3045	41°52'36"	20°04'32"
84	Osumi Corovodë	ETG CODE 038	40° 30' 03"	20° 13' 29"	84	Tirana	AL0002	41° 19' 36" N	19° 47' 53" E
85	Osumi Ura Vajgurore	006OS080	40°46'18"	19°52'35"	85	Petkaj Shemeria Kukes	ALXX0377	42°06'37"	20°14'23"
86	Përroi i Corovodës	006OS090	40°30'26"	20°13'37"	86	Dodgson	ALXX2955	41° 57' 54"	20° 9' 16"
87	Porti Durrës	044ER100	41°18'08"	19°07'29"	87	Mati fshat Klos	No data	41°29'39"	20°06'58"

Hydrological stations					Meteorological stations				
88	Puset e Tiranës	No ID	41°21'26"	19°49'37"	88	Fshati i paqes	N/A	42°03'04"	19°29' 19"
89	Puset Elbasan	No ID	41°07'66"	20°05'15"					
90	Gradishte Lushnje	No ID	40°53'11"	19°35'12"					
91	Qarishta Dorëz	005RP030	41°13'04"	20°18'11"					
92	Seman Mbrostar	006SE040	40°45'03"	19°34'40"					
93	Seman Ura Kuçit	006SE010	40°50'41"	19°48'18"					
94	Shkumbini Librazhd	005SH030	41°10'38"	20°18'53"					
95	Shkumbini Paper	005SH080	41°03'07"	19°56'35"					
96	Shkumbini Rogozhine	005SH120	40°03'47"	19°38'45"					
97	Shushica Vodicë	007SU030	40°25'00"	19°34'55"					
98	Shkumbini Slabinjë	005SH010	40°57'40"	20°30'51"					
99	Triport Vlorë	047SU100	40°30'52"	19°23'37"					
100	Shkumbini Ura e Polisit	005SH040	41°09'41"	20°13'49"					
101	Zall i Torrës	005SH200	41°01'05"	20°30'06"					
102	Drini i zi Kovashice	001DZ020	41°35'48"	20°26'27"					
103	Puset Koplik	No ID	42°12'35"	19°25'41"					
104	Hec Fierze	No ID	42°14'57"	20°02'38"					
105	Hec Koman	No ID	42°06'28"	19°49'31"					
106	Hec Vau i dejes	No ID	42°00'54"	19°38'08"					
107	Stream Belaj	001DB040	42°03'02"	20°30'59"					
108	Stream Gorrica Pogradec	001DZ061	40° 54' 17"	20° 39' 40"					

## **Appendix 2: Filled in Station Sheet**

This appendix contains two randomly selected filled out stations sheets.

## Station sheet

Name of the station: Buna Dajc

Type of the station:	Manual	Automatic
Hydrological	+	+
Meteorological		
Radar		
Other???		

General information	
Station ID ( if not available agree on a nomenclature and mark it accordingly in the map)	Hydrology station code 000BU040
Geographic position	Lat. 4°59'06" Long. 19°24'56"
Description about on the site	The automatic station is located near the Pashk Kopeshti house, on the left side of the Buna river. It is installed in the building owned by IGEO.
Access to the site	The main road to Dajc passes about 300 m between private houses until it reaches the station.
Elevation (above sea level)	6.50 m
Operational Status	The automatic and manual station is in operation.
Observer	The materials are sent regularly. He has many years of experience. He does this job very well and wants to continue.
State of manual data provided by Observer	Data recording is done manually by the observer in the monthly diaries and in the annual register. (The level is measured in the hydrometer twice a day).
Land	State
Mobile network coverage	Vodafone and One
Access to power	The cabin is powered. The invoice is paid by IGEO.

Existing sensors/ station technical details																									
Parameter/ Station ID 2	Data acquisition Marrja e të dhënave																Data telimetry								
Xxx (Meteo)	P <sub>U</sub>	P <sub>A</sub>	P <sub>M</sub>	T° <sub>A</sub>	<sup>W</sup> SD	M <sub>B</sub>	H <sub>M</sub>	S <sub>W</sub>	S <sub>D</sub>	R <sub>D</sub>	S <sub>H</sub>	E <sub>A</sub>	C <sub>H</sub>	CO <sub>2</sub>	SM	ST	SP	<sup>V</sup> TR	P <sub>B</sub>	DL	GSM	GPRS	SMS	FTP	HTTP
Buna Dajc (Hydro)	H <sub>P</sub>	H <sub>R</sub>	T° <sub>W</sub>	T° <sub>A</sub>	LCD	DO	pH	EC	TSS	NH <sub>3</sub>	NO <sub>3</sub>	C <sub>H</sub>					SP	<sup>V</sup> TR	P <sub>B</sub>	DL	GSM	GPRS	SMS	FTP	HTTP
000BU040	+	+																			+	+	+		
Xxx (Radar)																									
Xxx (Other)																									
Data management	DS <sub>R</sub>	DS <sub>T</sub>	PC	VDU <sub>1</sub>	VDU <sub>2</sub>	SCU	UPS	LP	PPS	WML	IS	AV					GSM	GPRS	SMS	FTP	IP + HTTP				

**\*EXPLANATORY NOTES**

1 - Meteorological Abbreviations – PU (Universal Precipitation Gauge); PA (Tipping Bucket Raingauge); PM (Standard Manual Raingauge); T°A (Air Temperature); WS (Wind Speed); WD (Wind Direction); MB (Atmospheric Pressure); HM (Humidity); SW (Snow Water Equivalent); SD (Snow Depth); RD (Radiation); SH (Sunshine Hours); EA (Actual Evaporation); SP (12V 30 W Solar Panel); VTR (Power Control Unit); PB (Rechargeable 12V Battery 28 Ah+); DL (Multi-channel Data-logger). CO2 (Carbon dioxide); SM (soil moisture); ST (Soil Temperature)

2 - Hydrometric Abbreviations – HP (Water Level – Pressure); HR (Water Level – Radar); T°W (Water Temperature); LCD (Externally Mounted LCD Repeater); DO (Dissolved Oxygen); pH (pH); EC (Electrical Conductivity); TSS (Turbidity); NH4 (Ammonia); NO3 (Nitrate); CH (Lockable GRP or Stainless Steel Enclosure for all power & data units);

3 – Data Management Abbreviations – GSM (GSM Modem); GPRS (GPRS/GSM Modem + GPRS SIM Card); SMS (Short Message Service Protocol); FTP (File Transfer Protocol); HTTP (Hyper Text Transfer Protocol); IP (Dedicated Static IP); DSR (Rack-mounted Data Server, Intel Xeon E5-2000+ (2.4 GHz+), 12 GB RAM, 2 x 2TB HD, 4 Bay RAID 1); DST (Tower Data Server, Intel Xeon E5-2000+ (1.8 GHz+), 8 GB RAM, 2 x 500 GB HD, 4 Bay RAID 1); PC (Desktop PC, Intel i5, 2.5 GHz+, 8 GB RAM); VDU1 (19" LCD PC Display); VDU2 (24" LCD Display Panel); SCU (Self-cooling Housing Unit for Rack mounted Data Server); UPS (Uninterruptible Power Supply); LP (1200 dpi Network Laser Printer); PPS (Manufacture Proprietary Data/Sensor Software); WML (WaterML 2.0 compatible database); IS (Proprietary Software for sensor configuration + data management); AV (Licence Based Antivirus Software);

Existing structures in the field site	
(The given structures are given only as examples)	
Mast no 1	The level sensor is located in the cabin. Inside the cabin are placed all the equipment of the automatic station, as well as the transmission antenna.
Other	The piezometric sensor is placed in a vertical pipe that communicates with the water flow.
Horizontal pole no 1	
Mast no 2	

Existing civil structures	
Fencing	It is not fenced
Protection	It is guarded and protected by the observer
Foundation	IGEO dhe GIZ
Other	-

Info about history of the station and other elements to be considered	
Year of establishment	1956
Data history	The data recorded in this station exist, manual, digital, they are found in the archive of IGEO, they are accessible
Importance of the station	The station is very important, not only for its history, but also because it evaluates the flows after the confluence of the Bune river with the Drin. This station provides data to assess floods, the basin, which is prone to flooding, in the area below Shkodra. The station is a priority according to studies done by IGEO.
Maintenance	The station is maintained by IGEO AKMC and GIZ.
Need for relocation	No
Reasons for relocation	
Recommendation	To be maintained at all times to always be in working condition. To create conditions to carry out discharge management.
Other	

### Summary Table of Needs/replacement/ change for each station

Existing sensors/ station technical details																											Other equipment needs			
Paramet er/ Station ID	Data acquisition																Data telimetry										Data logger	Solar panel	Battery	Staff gauge
Xxx (Meteo)	PU	PA	P M	T° A	W S D	MB	HM	S W	SD	RD	SH	E A	C H	CO 2	S M	S T	SP	VT R	PB	DL	GS M	GP RS	SM S	FT P	HT TP					
Buna Dajc (Hydro)	HP	H R	T° W	T° A	LC D	DO	pH	E C	TS S	NH3	NO 3	C H					SP	VT R	PB	DL	GS M	GP RS	SM S	FT P	HT TP					
	B	B																			B	B	B							
Xxx (Radar)																														
Xxx (Other)																														
Data manage ment	DS R	DS T	PC	VD U1	V D U2	SC U	UP S	L P	PP S	WM L	IS	A V					GS M	GP RS	SM S	FT P	IP + HTT P									

\*Please mark with one of the following each sensor/equipment that needs replacement (A= needs to be replaced, B= needs to be calibrated/maintained/repared, C= change for the station).

## Station sheet

Name of the station: Meteorological station Leskovik.

Type of the station:	Manual	Automatic
Hydrological		
Meteorological		+
Radar		
Other???		

General information Informacion i pergjithshem	
Station ID ( if not available agree on a nomenclature and mark it accordingly in the map)	ALXX2470
Geographic position	Lat 40° 9' 9 " N Lon 20° 35' 49" E
Description about on the site Përshkrimi rreth në sit	The meteorological station is located within the private property of the observer and is located in the village of Leskovik.
Access to the site	It has access to the main road of the village.
Elevation (above sea level)	H = 920 m
Operational Status Gjendja Operacionale	1. The automatic meteorological station is functional but needs maintenance.
Observer	Observer has many years of experience. He wants to continue as an observer but there is a need to build a manual station because the old one is not functioning anymore.
State of manual data provided by Observer Gjendja e të dhënave manuale të ofruara nga Observer	For now there is no manual station there functioning so there is no manual data observed.
Land	The land is private property with documentation.
Mobile network coverage	The area is very well covered by both Vodafone and One operator.
Access to power	There is no power supply, but there is a possibility for a line.



Existing sensors/ station technical details    Detajet teknike të sensorëve/stacionit ekzistues																											
Parameter/ Station ID Parametri/ ID e stacionit	Data acquisition Marrja e të dhënave																	Data telemetry									
Xxx (Meteo)	P <sub>U</sub>	P <sub>A</sub>	P <sub>M</sub>	T° <sub>A</sub>	<sup>W</sup> SD	M <sub>B</sub>	H <sub>M</sub>	S <sub>W</sub>	S <sub>D</sub>	R <sub>D</sub>	S <sub>H</sub>	E <sub>A</sub>	C <sub>H</sub>	CO <sub>2</sub>	SM	ST	SP	<sup>V</sup> TR	P <sub>B</sub>	DL	GSM	GPRS	SMS	FTP	HTTP		
automatic			+	+	+	+	+	+	+	+	+	+										+					
Xxx (Hydro)	H <sub>P</sub>	H <sub>R</sub>	T° <sub>W</sub>	T° <sub>A</sub>	LCD	DO	pH	EC	TSS	NH <sub>3</sub>	NO <sub>3</sub>	C <sub>H</sub>					SP	<sup>V</sup> TR	P <sub>B</sub>	DL	GSM	GPRS	SMS	FTP	HTTP		
Xxx (Radar)																											
Xxx (Other)																											
Data management	DS <sub>R</sub>	DS <sub>T</sub>	PC	VDU <sub>1</sub>	VDU <sub>2</sub>	SCU	UPS	LP	PPS	WML	IS	AV					GSM	GPRS	SMS	FTP	IP + HTTP						
			+																								

**\*EXPLANATORY NOTES**  
**SHËNIME SHPJEGUESE**

**1 - Meteorological Abbreviations** – PU (Universal Precipitation Gauge); PA (Tipping Bucket Raingauge); PM (Standard Manual Raingauge); T<sup>°</sup>A (Air Temperature); WS (Wind Speed); WD (Wind Direction); MB (Atmospheric Pressure); HM (Humidity); SW (Snow Water Equivalent); SD (Snow Depth); RD (Radiation); SH (Sunshine Hours); EA (Actual Evaporation); SP (12V 30 W Solar Panel); VTR (Power Control Unit); PB (Rechargeable 12V Battery 28 Ah+); DL (Multi-channel Data-logger). CO<sub>2</sub> (Carbon dioxide); SM (soil moisture); ST (Soil Temperature)

**2 - Hydrometric Abbreviations** – HP (Water Level – Pressure); HR (Water Level – Radar); T<sup>°</sup>W (Water Temperature); LCD (Externally Mounted LCD Repeater); DO (Dissolved Oxygen); pH (pH); EC (Electrical Conductivity); TSS (Turbidity); NH<sub>4</sub> (Ammonia); NO<sub>3</sub> (Nitrate); CH (Lockable GRP or Stainless Steel Enclosure for all power & data units);

**3 – Data Management Abbreviations** – GSM (GSM Modem); GPRS (GPRS/GSM Modem + GPRS SIM Card); SMS (Short Message Service Protocol); FTP (File Transfer Protocol); HTTP (Hyper Text Transfer Protocol); IP (Dedicated Static IP); DSR (Rack-mounted Data Server, Intel Xeon E5-2000+ (2.4 GHz+), 12 GB RAM, 2 x 2TB HD, 4 Bay RAID 1); DST (Tower Data Server, Intel Xeon E5-2000+ (1.8 GHz+), 8 GB RAM, 2 x 500 GB HD, 4 Bay RAID 1); PC (Desktop PC, Intel i5, 2.5 GHz+, 8 GB RAM); VDU<sub>1</sub> (19" LCD PC Display); VDU<sub>2</sub> (24" LCD Display Panel); SCU (Self-cooling Housing Unit for Rack mounted Data Server); UPS (Uninterruptible Power Supply); LP (1200 dpi Network Laser Printer); PPS (Manufacture Proprietary Data/Sensor Software); WML (WaterML 2.0 compatible database); IS (Proprietary Software for sensor configuration + data management); AV (Licence Based Antivirus Software)

Existing structures in the field site    Strukturat ekzistuese në terren	
(The given structures are given only as examples) Mast no 1 (Strukturat e dhëna jepen vetëm si shembuj) Direk nr 1	
Other Të tjera	
Horizontal pole no 1 Shtylla horizontal nr 1	
Mast no 2 Direku numër 2	

Existing civil structures    Strukturat civile ekzistuese	
Fencing rrethim me gardh	The station is located in a plain area, in the courtyard of a private property.
Protection Mbrojtja Ruajtja	Protected by the observer.
Foundation Mbeshtetja	IGEO
Other	

Info about history of the station and other elements to be considered	
Year of establishment Viti i themelimit	The station started its surveys on 1946 and continues today.
Data history Historia e të dhënave	The data recorded in this station exist; they are found in the archive of IGEO and are accessible.
Importance of the station Rëndësia e stacionit	The station is important, not only for its history, but also for the evaluation of the meteorological conditions of the area.
Maintenance Mirëmbajtja	The station is maintained by IGEO. The maintenance procedure starts immediately after the defects are detected.
Need for reallocation Nevoja për zhvendosje	It is not necessary.
Reasons for reallocation Arsyet e zhvendosjes	There is no reason to relocate it.
Recommendation Rekomandim	To be maintained and in working conditions.
Other	

SUMMARY TABLE- Needs/replacement/ change for each station  
**TABELA PËRMBLEDHJE- NEVOJA/ZËVENDËSIM/ NDRYSHIM PËR ÇDO STACION**

Existing sensors/ station technical details																											Other needs		equipment	
Parameter/ Station ID	Data acquisition																Data telimetry										Dat a log ger	Sol ar pan el	Batt ery	Staf f gau ge
Xxx (Meteo)	PU	PA	P M	T°A	WS D	MB	HM	S W	SD	RD	SH	E A	C H	CO 2	S M	S T	SP	VT R	PB	DL	GS M	GP RS	SM S	FT P	HT TP					
automatic			B	B	B	B	B	B	B	B	B											B				B	B	B	B	
Xxx (Hydro)	HP	H R	T° W	T°A	LCD	DO	pH	E C	TS S	NH3	NO 3	C H					SP	VT R	PB	DL	GS M	GP RS	SM S	FT P	HT TP					
Xxx (Radar)																														
Xxx (Other)																														
Data manageme nt	DS R	DS T	PC	VDU 1	VDU 2	SC U	UP S	L P	PP S	WM L	IS	A V					GS M	GP RS	SM S	FT P	IP + HTT P									
			B																											

\*Please mark with one of the following each sensor/equipment that needs replacement (A= needs to be replaced, B= needs to be calibrated/maintained/repared, C= change for the station).  
 Ju lutemi shënoni me një nga sa vijon çdo sensor/pajisje që ka nevojë për zëvendësim (A= duhet të zëvendësohet, B= duhet të kalibrohet/mirëmbaj/riparohet, C= ndryshim për stacionin).

Note: Each sensor of automatic stations requires constant, periodic maintenance.

### **Appendix 3: Photo documentation from stations**

This appendix showcases a selection of photos of stations taken by the IGEO monitoring team. Additional photos and videos / each of the stations is available through IGEO and GIZ project staff.

*Photograph 5: Meteorological station, Selce*





*Photograph 6: Manual hydrological station, Ibe*



*Photograph 7: Automatic hydrological station, Skavice*





*Photograph 8: manual and automatic meteorological station, Shen Koll*



*Photograph 9: Manual and automatic meteorological station, Rapsht*





*Photograph 10: Manual meteorological station, Ura e Shenite*



*Photograph 11: Manual meteorological station, Vidhuka*



*Photograph 12: Manual meteorological station, Verga*





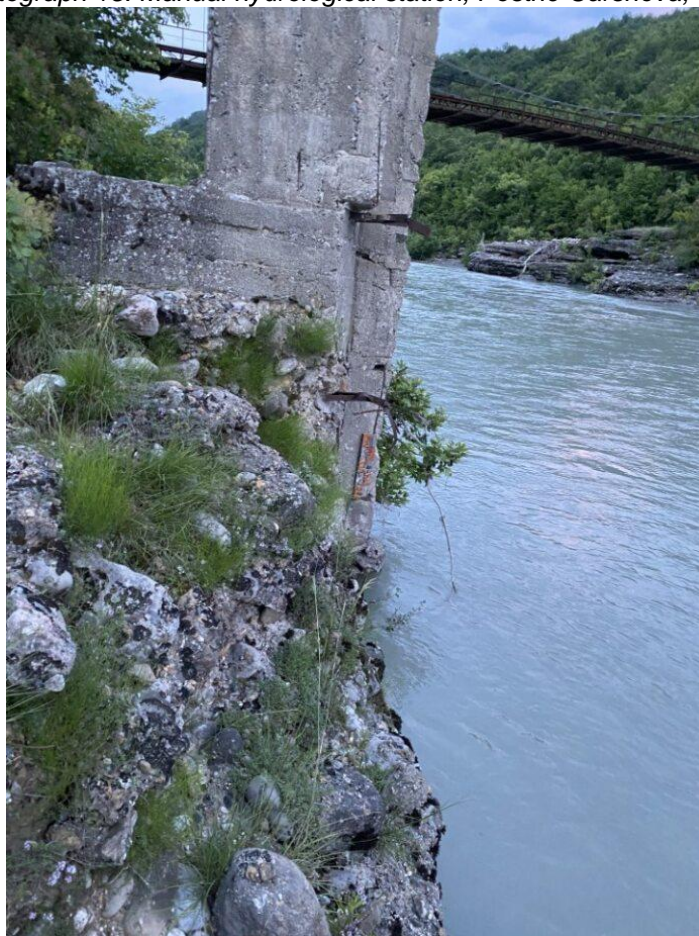
*Photograph 13: Manual meteorological station, Xare*



*Photograph 14: Manual meteorological station, Bishnice*



*Photograph 15: Manual hydrological station, Posthe Carshova, Viose*





*Photograph 16: Manual hydrological station, Pustec, Prespa*

