



STATE AUTHORITY FOR GEOSPATIAL INFORMATION

CORS SYSTEMS INFRASTRUCTURE SECTOR

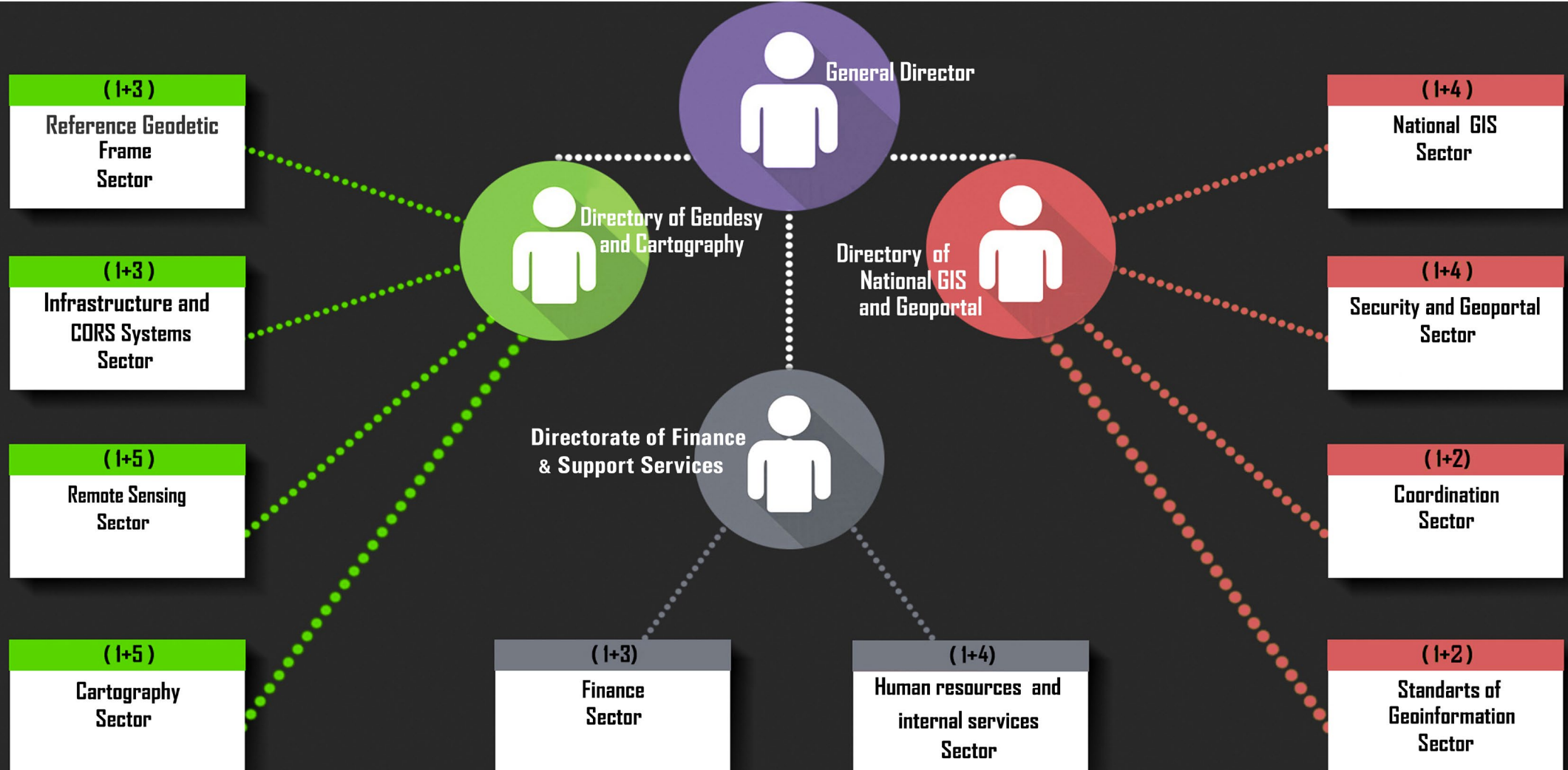
Albanian GNSS Network National Report

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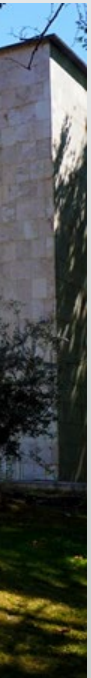
Key Words: **ALBCORS**, **ASIG**, **CORS**, **CRS**, KRGJSH-2010,

INTRODUCTION



The total number of staff is 42

Average annual budget is 0.5M €



BACKGROUND

- State Authority for Geospatial Information (ASIG) was established in **2013**, according to law 72/2012 "On the organization and functioning of the **national infrastructure of geospatial information** in the Republic of Albania"
- In terms of executing the regulations of **Law nr. 72/2012** and having regard the **EU requirements** related with **CRS**, we are engaged to establish a modern geodetic reference frame, based on **GNSS technology**, and will support accurate and **efficient horizontal and vertical positioning** throughout Albania!
- **ASIG is the responsible organization for establishment of Geodetic Reference Frame in Albania, including:**

The new
Geodetic
Reference
Frame

- National GPS Network (Active + Passive)
- National Gravimetric Network
- National Leveling Network
- National Tide Gauge Network
- Magnetometric Network

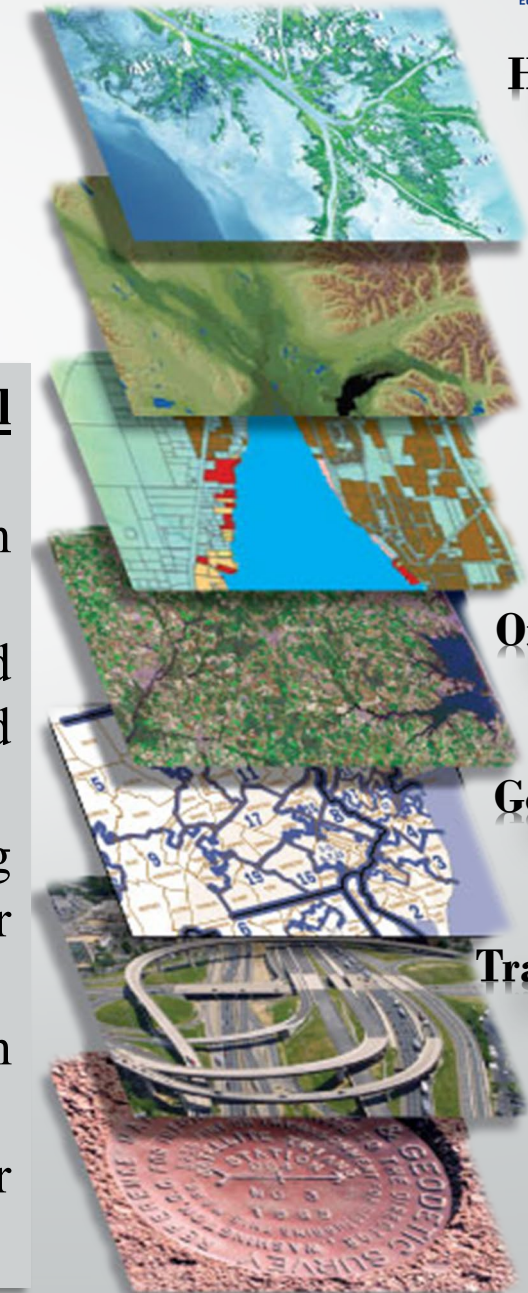


ROLE OF G.R.F FOR ALBANIA



Provide a common, accurate & reliable reference for positioning throughout Albania!

- **Improve the quality of existing Geo-information data** (Create cadastral maps => prevent property conflicts; smooth transactions etc.)
- **Provide accurate and reliable information** for urban planning and decision making to **territory administration**.
- Support **development of geographic information systems** for planning and service management functions (boundary determination for site planning, land use regulation, hydrology, soil conservation etc.)
- Provide a **reliable and accurate geodetic base** to Surveying and Mapping companies for implementation of all **engineering projects** throughout our country (cost & time effective).
- Monitoring **crustal deformation** and tectonics activity (high demand from the Albanian Institute of Geosciences).
- Monitoring the distribution of precipitable water vapor in the atmosphere for weather prediction (Improve the countermeasures to floods).



Hydrography

Elevation

Cadastral

**Digital
Orthoimagery**

**Governmental
Units**

Transportation

**Geodetic
Control**

HISTORY OF GEODETIC WORKS IN ALBANIA

1970-1977

1970-1986

2007-2008

2008

2013-2014

2019-2020

ALB86, Gauss Kruger (El, Krassovsky)

EUREF89 epoch 2008.0

ETRF2000 epoch 2008.0

KRGJSH, TM, ETRS89

Leveling

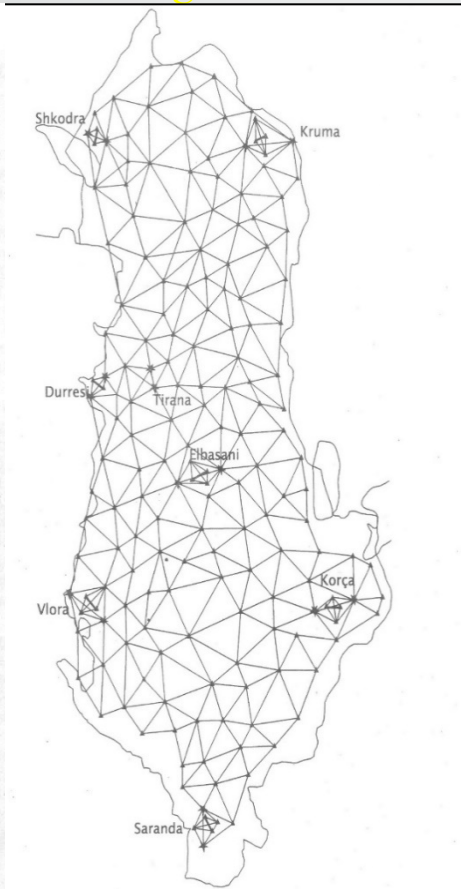
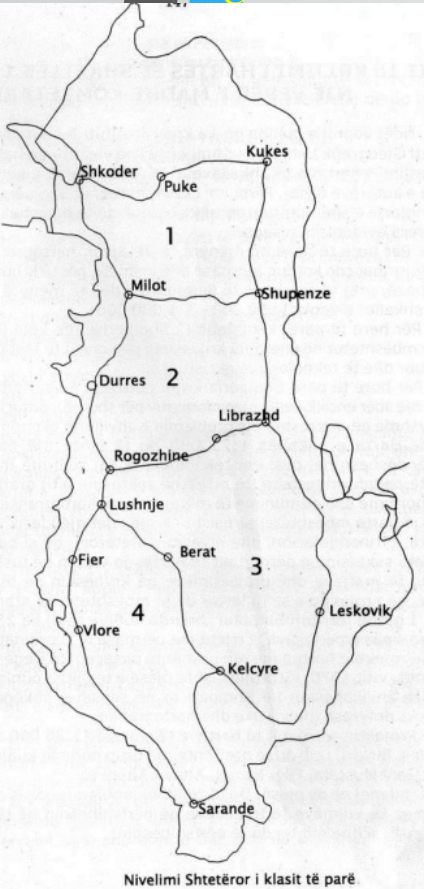
Triangulation

GPS Survey

AlbPos

GNSS Survey

ALBCORS



Established on 2008, (EU donation 1.7M €)

- 16 Roof Type Antennas.
- 75km aver. dist.
- Maintained by Geographic Military Institute.
- After 2014 system restarted operating at IPRO with support of Lantmäteriet (some stations changed locations)

Established on 2020, (ASIG investment 0.65M €)

- 21 ground pillars + 6 Roof Type Antennas.
- 35km aver. dist.
- Maintained by contractor company till 2024, supervised by ASIG.



Why a new CORS system?

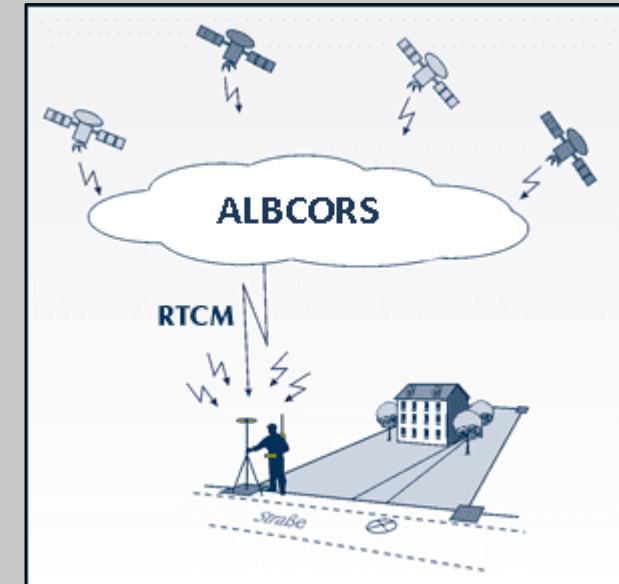
Problems regarding previews ALBPOS system:

- *Week stability of antennas.*
- *Old equipment (>10years).*
- *75km average distance, need for more stations.*
- *Not sustainable & not reliable.*
- *Not certified (doesn't fulfill national and EU requirements for CORS).*



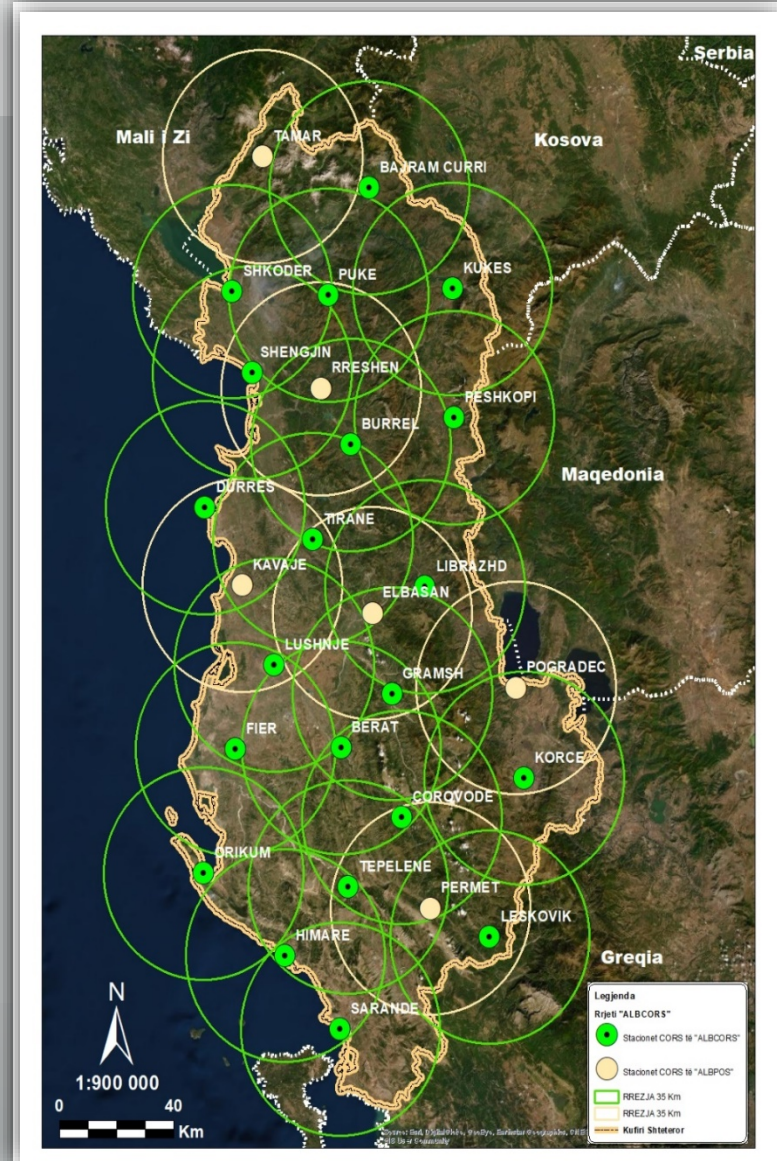
PHASES OF IMPLEMENTATION OF ALBCORS

- Drafting the technical project
- Technical Specifications and TOR
- Tendering and Criteria of the Winner Company
- Construction and installation of the new CORS system;
- Testing & system validation;
- Promotion activities & utilization of new CORS;
- Development of guidelines/manuals on maintenance of CORS;
- Provide services with the required accuracy/precision;
- Develop efficient methods for surveying by taking advantage of the evolving GNSS and communication technologies;



THE NEW GNSS NETWORK, ALBCORS

- 21 Active GNSS Pillar Point
- 6 Active GNSS Roof Point
- Ground reinforced concrete pillars
- Average distance: 40-50km
- According to EU requirements
- Integration with the existing GNSS system of Inst. of Geosciences



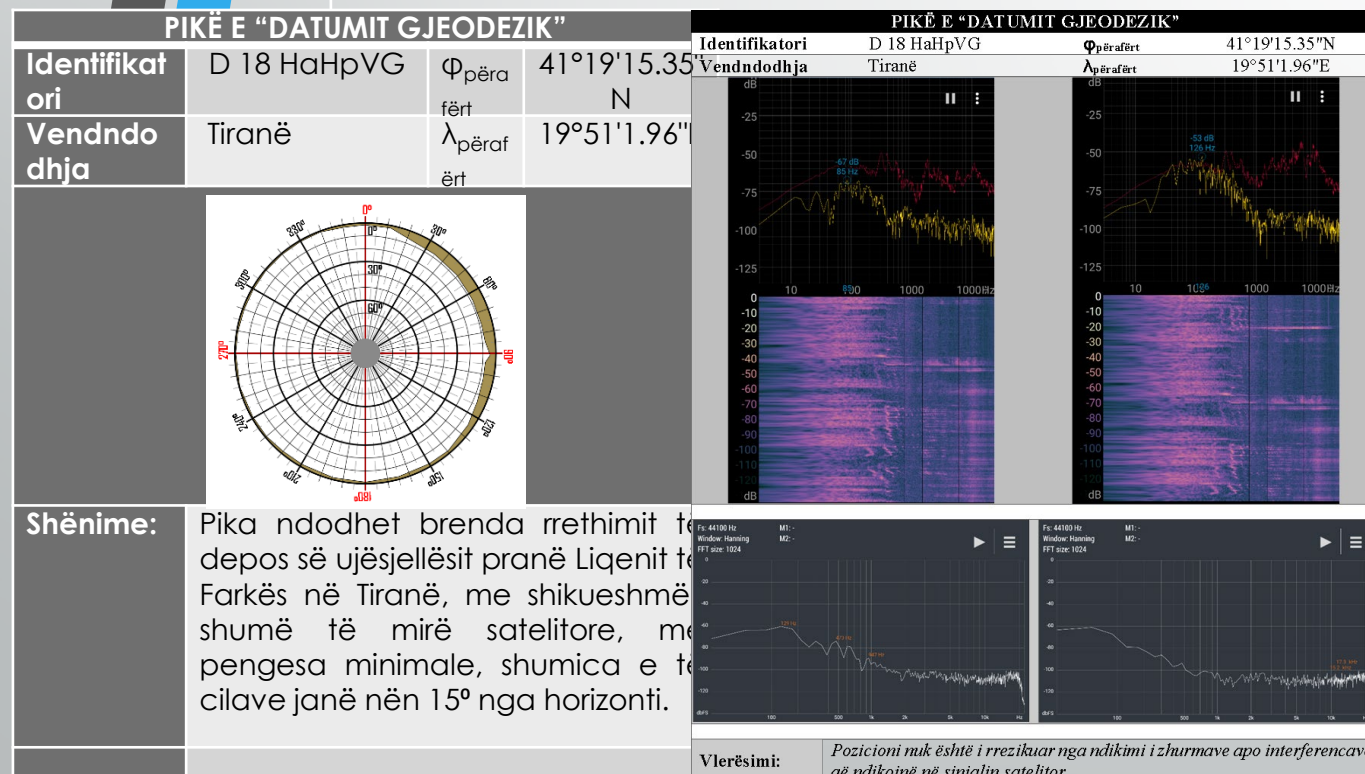
Effects:

- Create a **time-based dynamic** Geodetic Reference frame.
- Implement & Maintain **ITRS/ETRS** in Albania.
- Provide a **common and reliable** reference for accurate gathering & creation of geo-information.
- **Create Database for Land movement and crustal deformations** (in cooperation with Albanian Institute of Geosciences).
- Improve counter-measures to **floods** and other **natural disasters**.
- Productive & efficient use of GNSS for engineering surveying works (**time & cost effective**).
- Support navigation and augmentation.
- Research purposes.

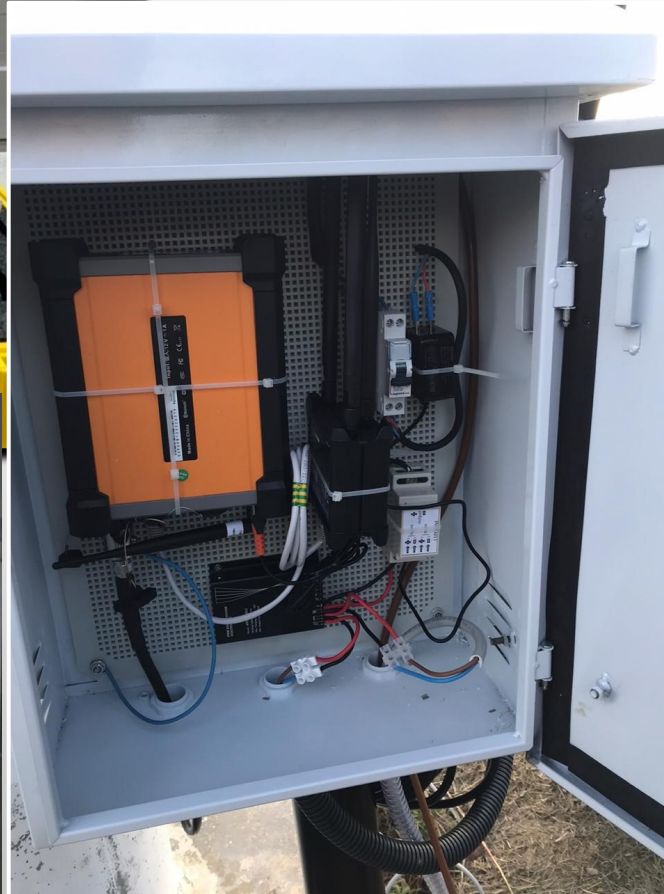
The construction of the NETWORK

Construction of 21 CORS pillars and 21 1st order passive GPS points

Field reconnaissance & site selection



NET S9 GNSS REFERENCE REICEVER



ALBCORS Stations Equipment

Description

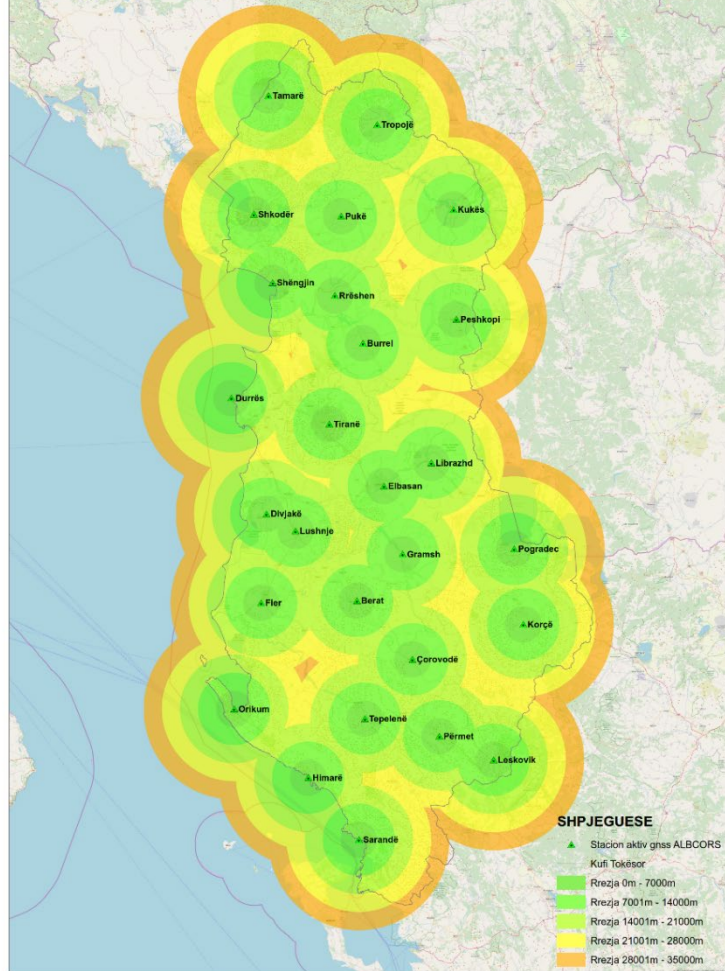
- 1 NET S9 Reciever
- 2 Choke Ring Antenna CR3-G3
- 3 Teltonika RUT955
- 4 Metalic case (Rack)
- 5 Plastic case (Box)
- 6 Sunlight Batery100V
- 7 Solar Panel 100x80cm
- 8 Automat 10A
- 9 Inverter Energjie 220v -> 12V
- 10 Sim Card
- 11 Automatic power source command
- 12 Solar Panel energy controller
- 13 Electric and internet cable
- 14 Thunder protection

The construction of the NETWORK

ACTIVE GNSS PILLAR POINT

ACTIVE GNSS ROOF POINT

RRJETI AKTIV GNSS ALBCORS



ALBCORS System Connection

Power supply connection

Internet network connection

Solar panel connection

Electric cable connection

4 Internet options

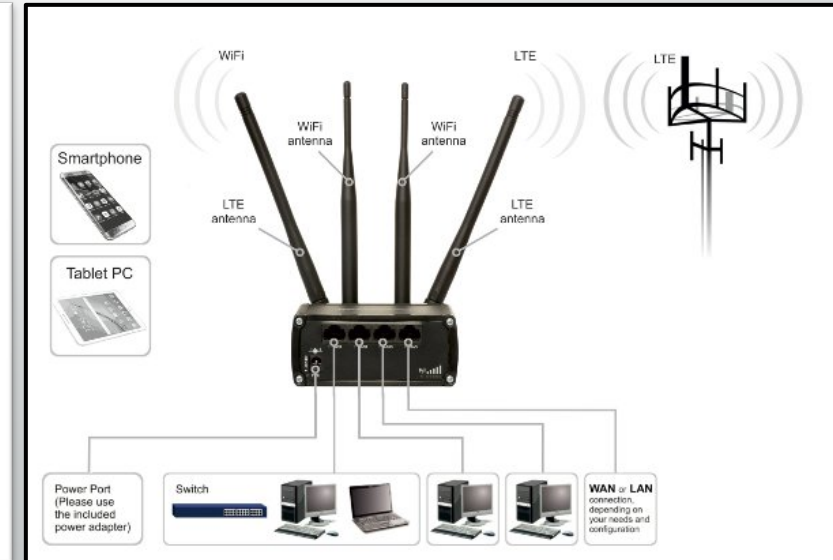
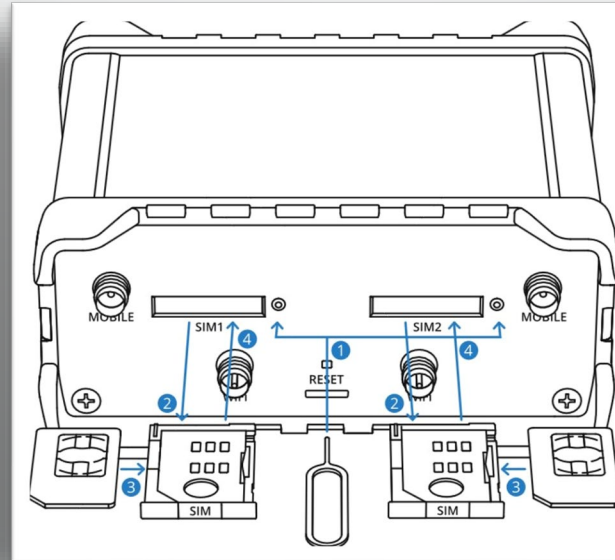
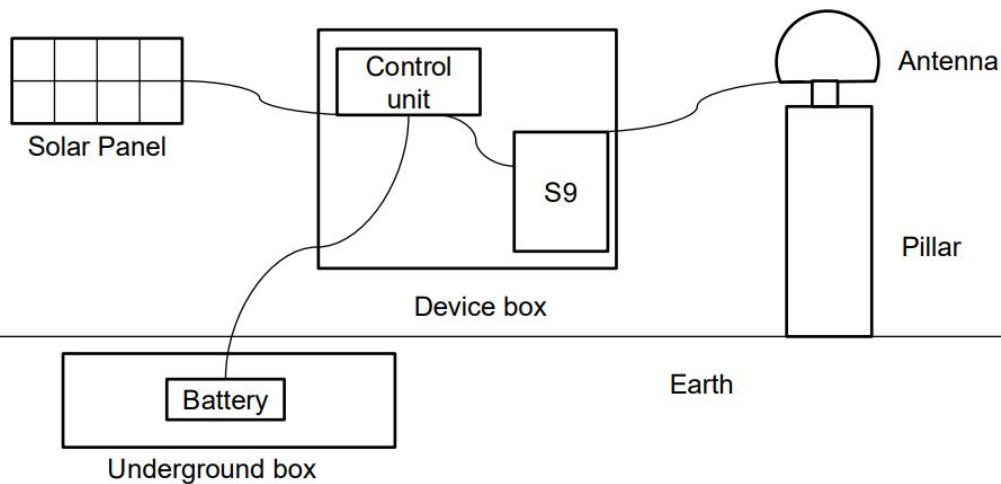
Sim Card 1

Sim Card 2

WAN WIRELESS

Internet Lan

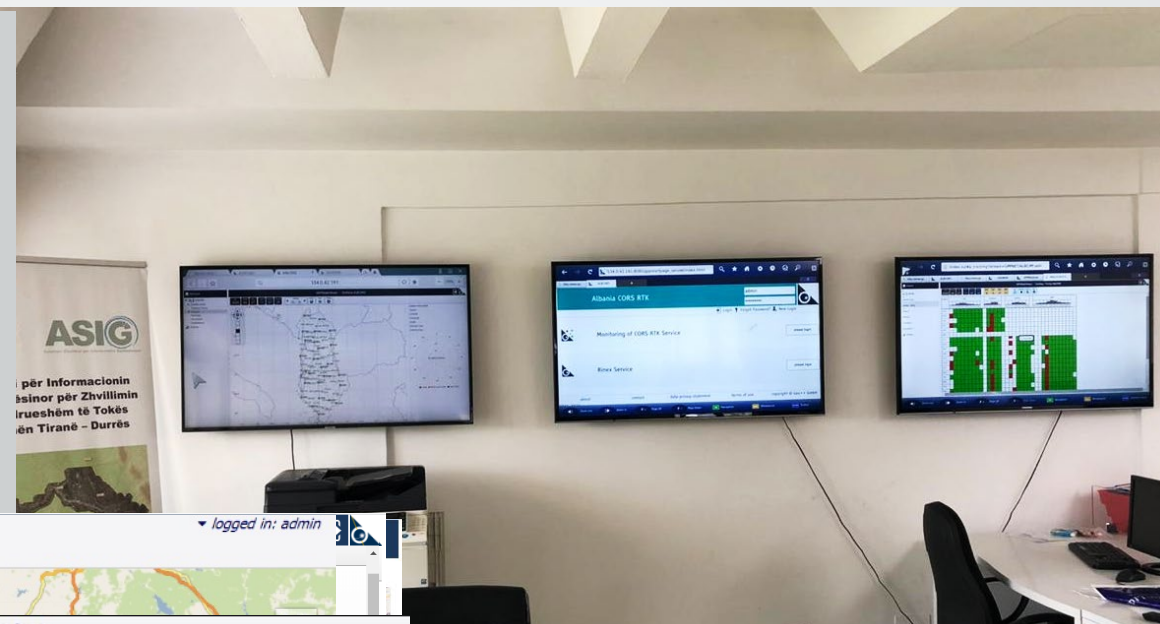
Part4 Whole system installation sample picture



❑ ALBCORS monitoring center program

(GNSMART, GEO++) consists of four modules:

- I. Module for monitoring CORS RTK Service, administration of CORS network reference stations, and user management.
- II. Module for compensation and calculation of data (corrections) in real time.
- III. Module for post-procesim GNSS.
- IV. Module for the WEB page.



ALBCORS RINEX Service

logged in: admin

Station Time period Signal Data format Cart

RINEX virtual RINEX

ALBCORS RINEX Service

Station Time period Signal Data format Cart

RINEX Version: RINEX Version 2.x RINEX Version 3.x

Navigation file: Off On

Data splitting: Session files Day files Hour files

Compact RINEX (Hatanaka): Off On

compressed RINEX: Off On

RINEX file suffix: *.rxo, *.rxn *.20o, *.20n, ...

Coordinates

Latitude	N	41	0	42	'	47.50173	"
Longitude	E	24	0	22	'	46.52986	"
Height						0.006	m

SP363 HIMA Gjirokastrë PERM LESK KO20 SARA

11-24/271

Albania CORS RTK hello admin

My Account Logout

Monitoring of CORS RTK Service to service

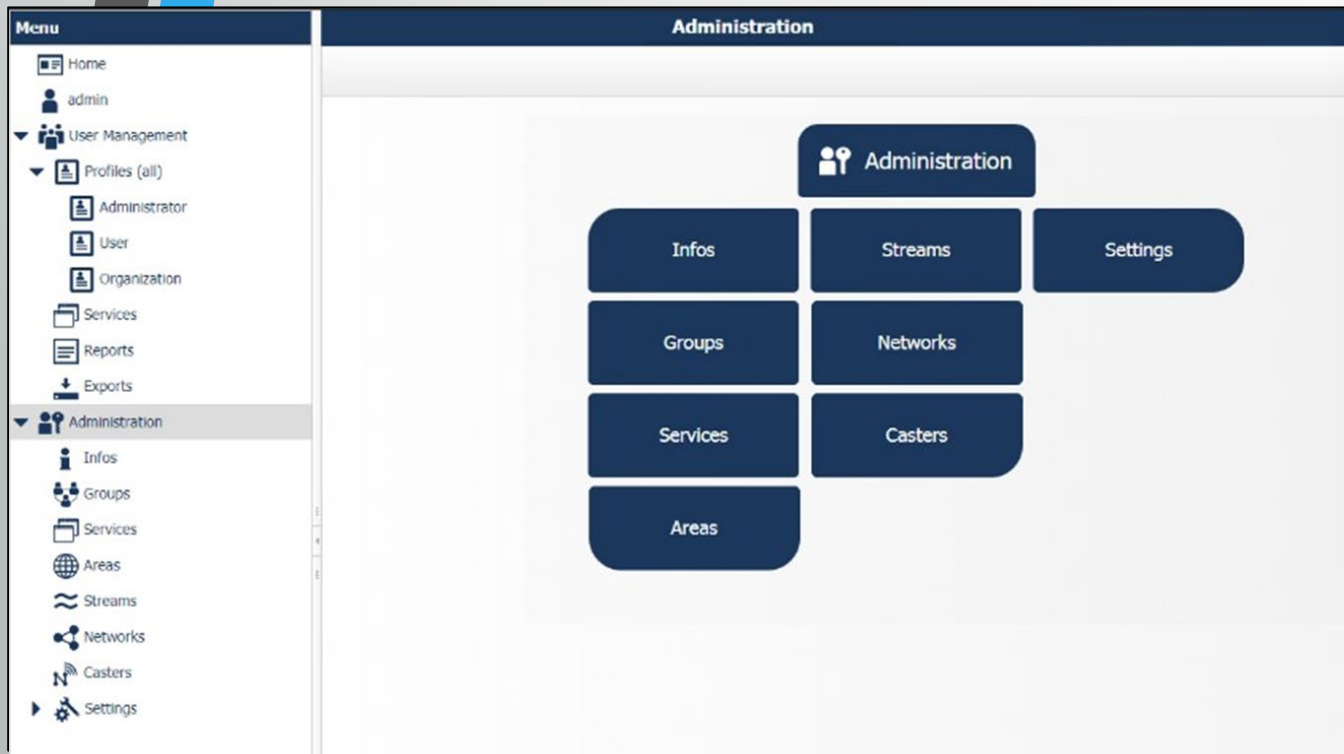
Rinex Service to service

Status of GNSS processing to service

CORS Receiver Status to service

➤ **The program also enables:**

- Registration of the users.
- Downloading station data at different intervals (from 1-30 seconds) to RINEX format (versions 2 and 3).
- Real-time computation of a GNSS multi-station solution of RTK service with sustainable accuracy, reliability and availability
- Graphic interface for :
 - Definition of correction models and parameters
 - Users position
 - Signal strength for stations
 - Corrections (ephemeris data, ionospher, multipath ect.)

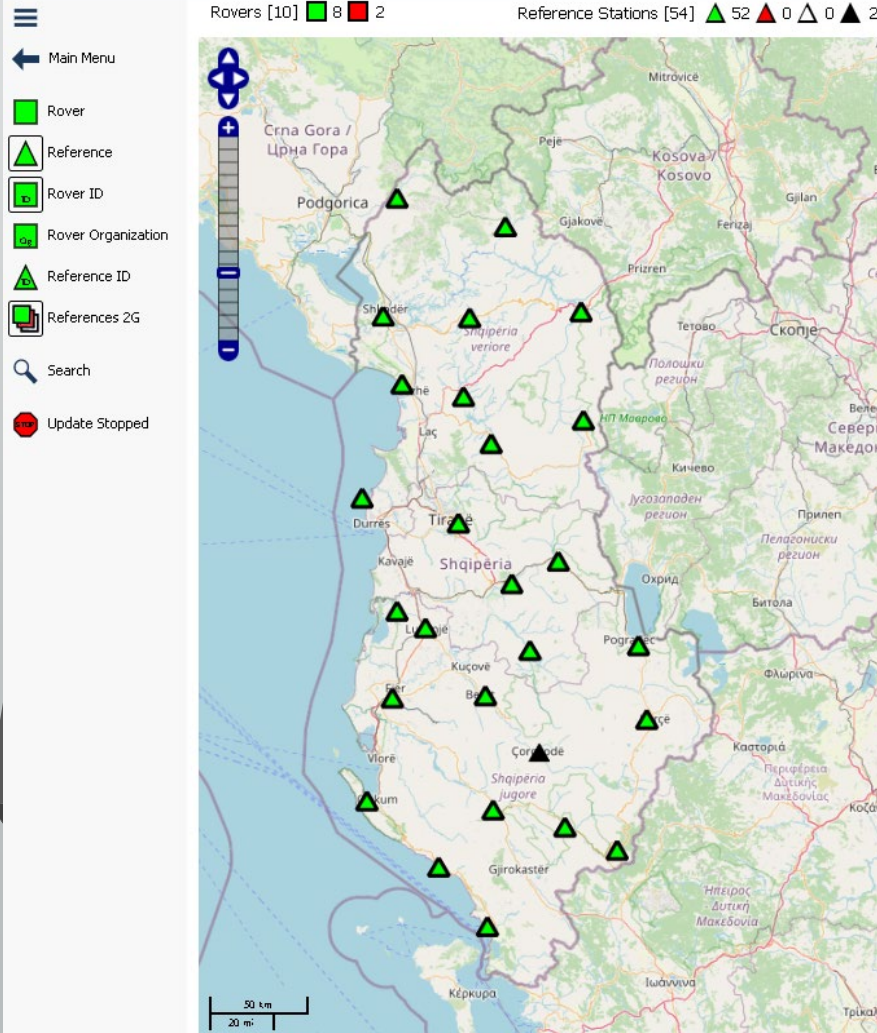


❑ Testing and sustainability of the network ALBCORS:

- A series of field measurements have been performed :
 - RTK Method
 - Static Method (Post-processing)
- Instruments:
 - GNSS Receivers, SOKKIA GRX2
- Accuracy :
 - RTK Method: ± 2 cm (2D)
 ± 3 cm (3D)
 - PP Method: ± 1 cm (2D dhe 3D)



GNSMON



☐ Services that ALBCORS system provide

ALBCORS service	Procedure/ method	Data transfer manner	Accuracy	Data format
DPS differential positioning	code network solution in real-time	Wireless Internet (GPRS, UMTS, ...) NTRIP protocol, GSM	±0.3m to ±0.5m	RTCM 2.3 RTCM 3
VPPS highly precise positioning	network solution of phase measurements in real-time	Wireless Internet (GPRS, UMTS, ...) NTRIP protocol, GSM	±2 cm (2D) ±3 cm (3D)	RTCM 2.3 RTCM 3
GPSS Geodetic highly precise positioning	post-processing	Internet (FTP, e-mail)	±1cm (2D, 3D)	RINEX 2.1 RINEX 3

NTRIP CASTERS and MOUNTPOINT

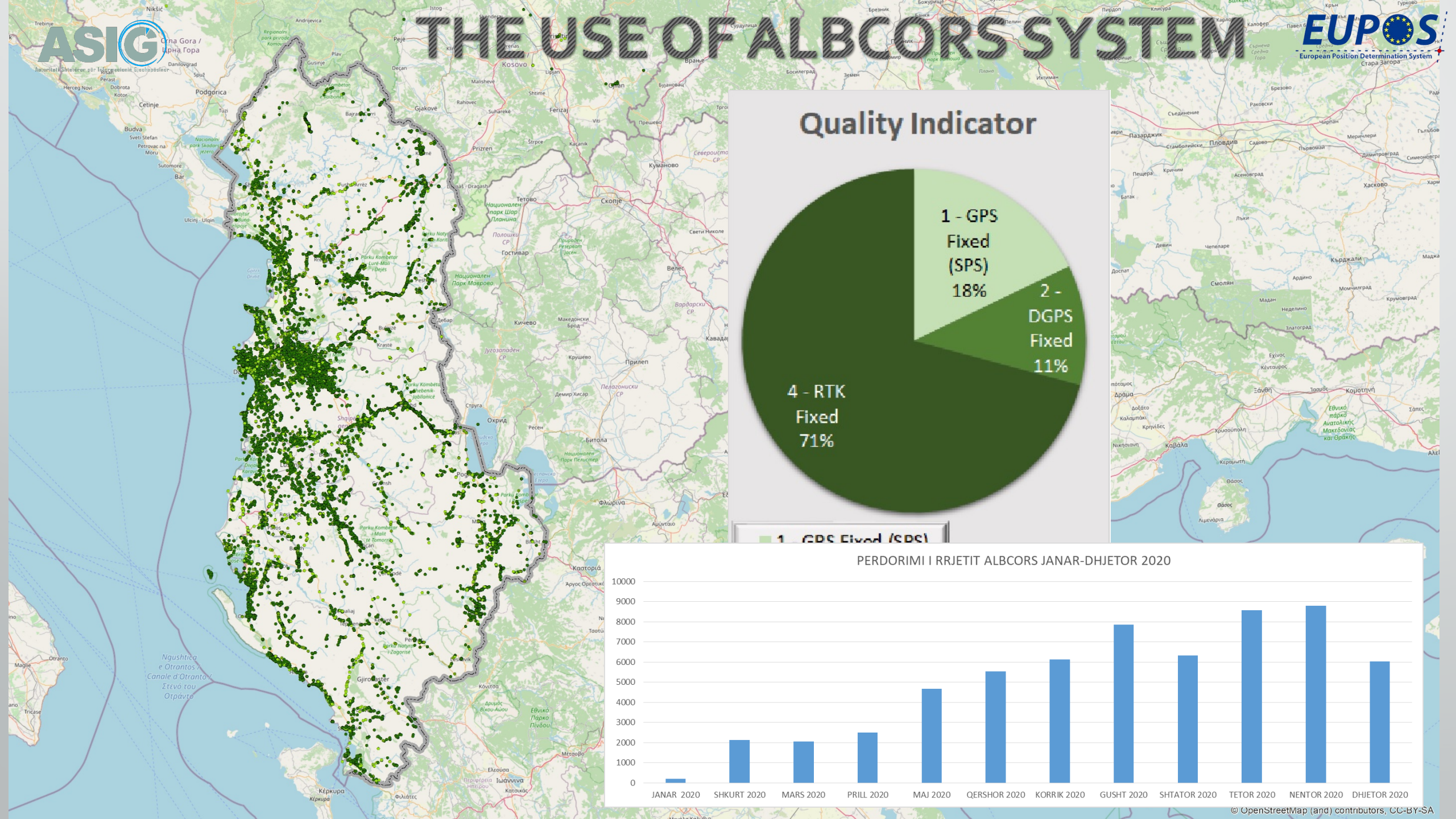
Streams

Caster	Mountpoint	Identifier / Description	Format	Format Details (Rate)	Carrier Phase	GNSS	Network	Country Code
2101	CMR_plus	VRS	CMR+	1(1), 3(1)	L1 L2	GPS+GLO	ALBCORS	ALB
2101	FKP01	FKP v31	RTCM31	1004(1), 1005(10), 1007(30), 1012(1), 1030(30), 1031(30), 1033(60), 1034(10), 1035(10)	L1 L2	GPS+GLO	ALBCORS	ALB
2101	MAC01	MAC v31	RTCM31	1004(1), 1005(10), 1007(30), 1012(1), 1014(10), 1017(10), 1030(30), 1031(30), 1033(60), 1039(10)	L1 L2	GPS+GLO	ALBCORS	ALB
2101	NSTA-GG	Nearest Station	RTCM32	1074(1), 1084(1), 1005(10), 1007(30), 1032(10), 1033(60)	L1 L2	GPS+GLO	ALBCORS	ALB
2101	NSTAT	Nearest Station	RTCM32	1074(1), 1084(1), 1094(1), 1005(10), 1007(30), 1032(10), 1033(60)	L1 L2	GPS+GLO+GAL+BDS	ALBCORS	ALB
2101	PRS-LEGACY	PRS v30	RTCM30	1004(1), 1012(1), 1005(10), 1007(30), 1032(10), 1033(60)	L1 L2	GPS+GLO	ALBCORS	ALB
2101	PRS-MSM	PRS v32	RTCM32	1074(1), 1084(1), 1094(1), 1005(10), 1007(30), 1032(10), 1033(60)	L1 L2	GPS+GLO+GAL+BDS	ALBCORS	ALB
2101	PRS01	PRS v30	RTCM30	1004(1), 1005(10), 1007(30), 1012(1), 1030(30), 1031(30), 1032(10), 1033(60)	L1 L2	GPS+GLO	ALBCORS	ALB
2101	VRS-MSM-GG	PRS v32	RTCM32	1074(1), 1084(1), 1005(10), 1007(30), 1032(10), 1033(60)	L1 L2	GPS+GLO	ALBCORS	ALB
2101	VRS_RTCM_2.3	PRS v2.3	RTCM2.3	1(1), 3(17), 14(60), 16(300), 18(1), 19(1), 22(10), 23(10), 24(10)	L1 L2	GPS+GLO	ALBCORS	ALB

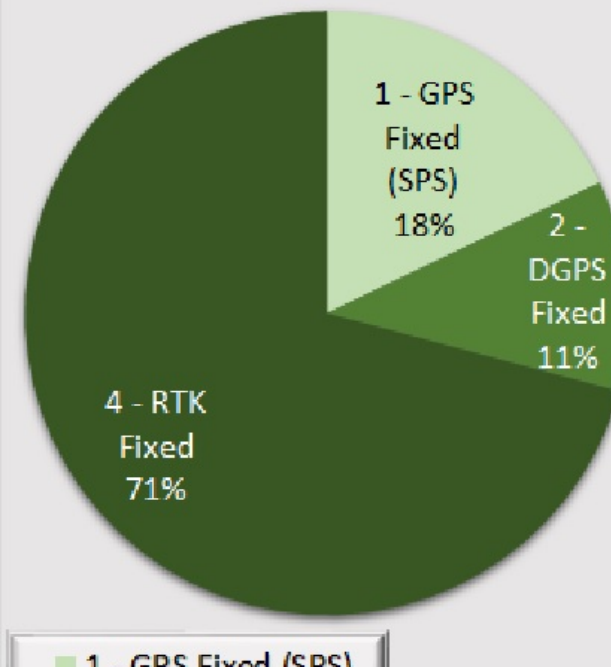
The service for a period of time (til 2020) it will be for free
There are around 200 active public and private users that use
ALBCORS services

Users of RTK and PP Service

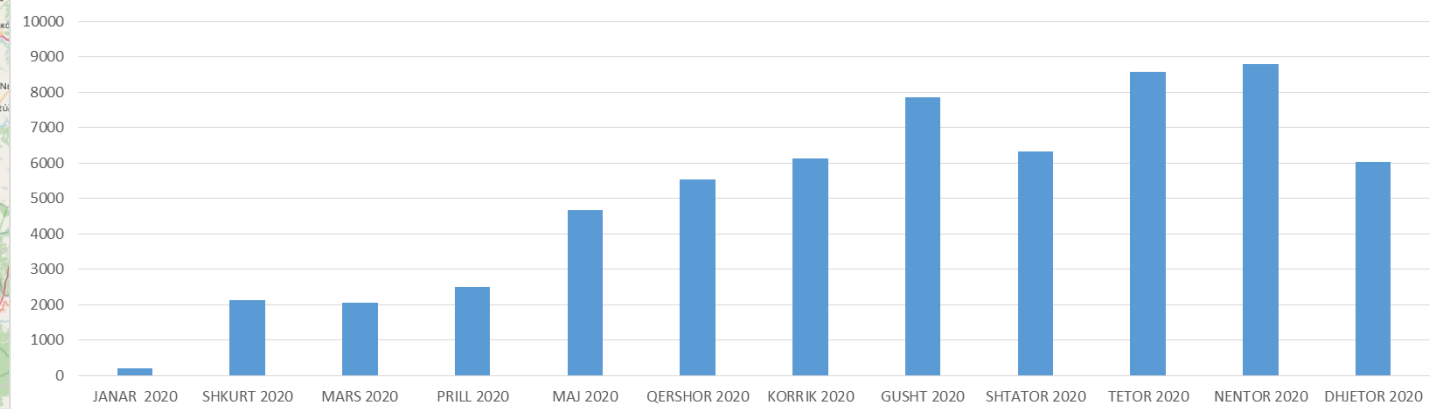
- Municipalities
- State Authority
- Universities
- Civil Engineering
- Measurement consult
- National Land Survey
- Other



Quality Indicator



PERDORIMI I RRJETIT ALBCORS JANAR-DHJETOR 2020



Next steps regarding Geodetic Reference Frame

- **Sustainable maintenance** service of ALBCORS until 2024;
- **ALBCORS Managment Development and Technical Development**
- Realization of one EPN point for the territory of Albania;
- Find solutions with neighborhood countries for a common reference frame;
- Cover all Albania with **gravity measurements** (are expected **1.2M €** of investments);
- Determine the precise **Geoid model** of Albanian territory;
- Number of benchmarks shall be kept minimum enough to maintain the height system (**accuracy check and validation purposes only**);
- Shift the **vertical datum from leveling-based to geoid-based** one in order to realize a more sustainable, **and up to date vertical reference frame** & develop the “**Smart Surveying**” technique based on GNSS & precise Geoid model;
- The over-all objective in the strategy is to make decision makers aware of the advantages of using a modern technology for geospatial data capture.



THANK YOU FOR YOUR ATTENTION!

CORS SYSTEMS INFRASTRUCTURE SECTOR

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