



AGENCY FOR LAND ADMINISTRATION
AND MANAGEMENT, GEODESY AND
CARTOGRAPHY

GNSS Efficient Management and Collaboration with Private and Public Partnerships in a Pilot Project

Helsinki, Finland

2023.10.24

SENIOR SPECIALIST responsible for GNSS-CORS

ZOLZAYA Lkhamsuren



LEGAL FRAMEWORK

A LAW ON GEODESY AND CARTOGRAPHY, 1997

LONG-TERM DEVELOPMENT POLICY OF MONGOLIA “VISION – 2050” PROJECT

3.6.6 Establish a geodetic measurement infrastructure throughout Mongolia’s territory consisting of stations with regular operation and connected real-time information, deliver information promptly to customers, and provide locational and thematical maps and atlas of one approved pattern in compliance with customers’ demands and needs.

IMPLEMENTATION PLAN OF GOVERNMENT ACTION PROGRAM ON 2020-2024

3.7.2.2 Install a reference station to receive data from navigation satellites and improve location determination accuracy to within 2 cm for geodetic measurement and surveying work.

GOVERNMENT RESOLUTION (No 267) in 2022

To approve the Geodetic coordinate and height system, and projection

- ITRF2020 coordinate system
- UTM mapping projection
- Baltic Sea level height system

In 2000 the first GNSS-CORS (Continuously Operating Reference Station) station was established in Mongolia.



ACTIVITIES TO BE IMPLEMENTED IN 2021-2030 OF THE OBJECTIVE

- 3.6.1. Improve the legal environment for urban development and land relations based on the adequate population residence and settlement system.
- 3.6.2. Create an integrated planning system of land organization based on knowledge and participation of citizens and the public.

Figure 3.7 Integrated Management Planning System for Land Use



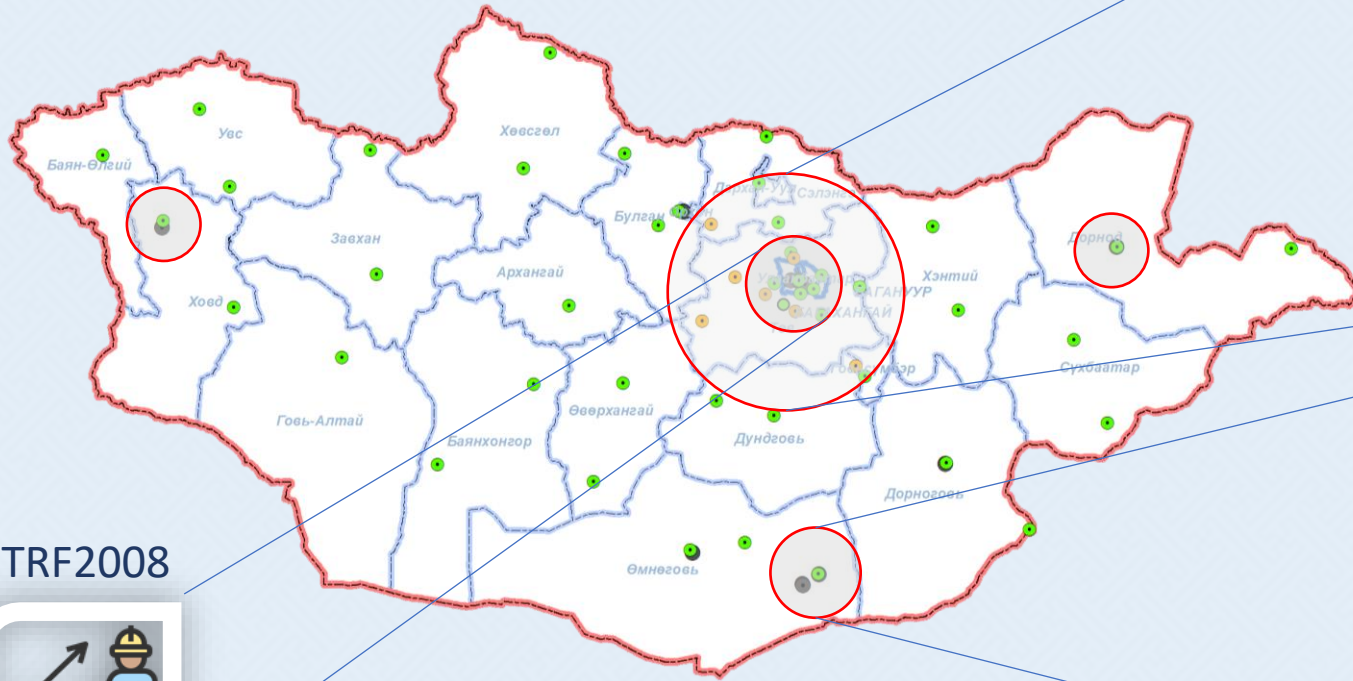
Source: Minister of Construction and Urban Development (2020)

- 3.6.3. Establish a smart integrated land cadaster system and improve the availability of citizen-centered state services.
- 3.6.4. Conduct the nationwide census on land use according to its utilization purpose, make cadastral maps and register in the information database.



PUBLIC AND PRIVATE GNSS-CORS 65

- PUBLIC CORS - 43
- PRIVATE CORS - 10
- RESEARCH (Academy of Science) CORS-12



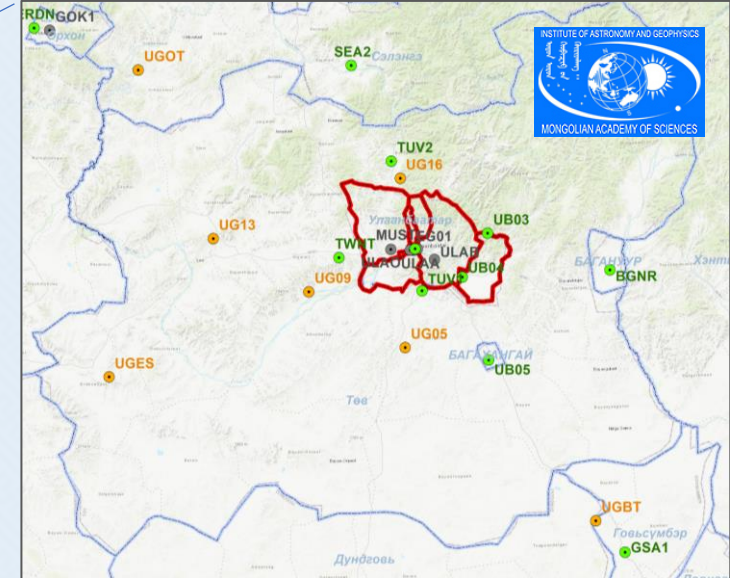
Government Implementing Agency
 for the Land Administration and Management, Geodesy and Cartography



ITRF2014



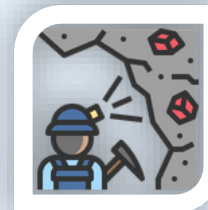
Geodynamic



ITRF2008



RTK for Topographic survey



Mining survey

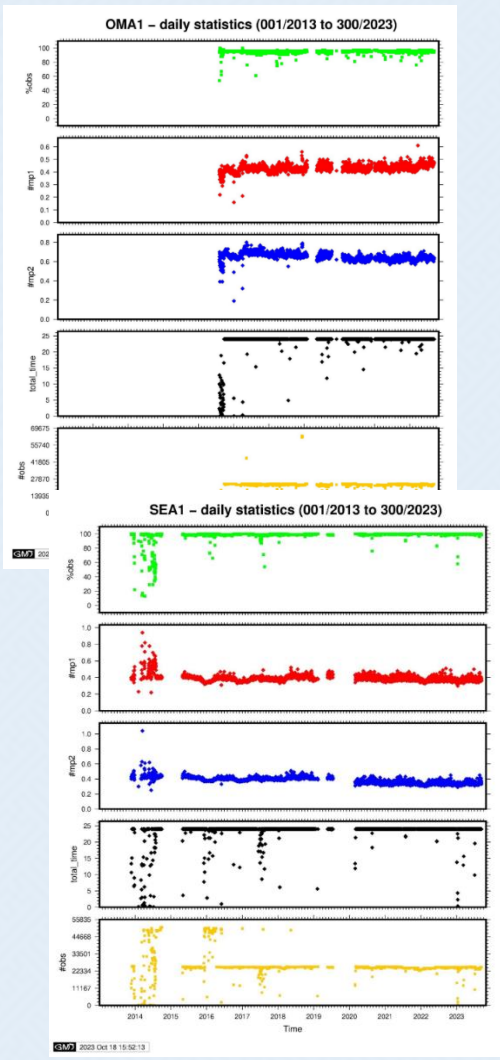
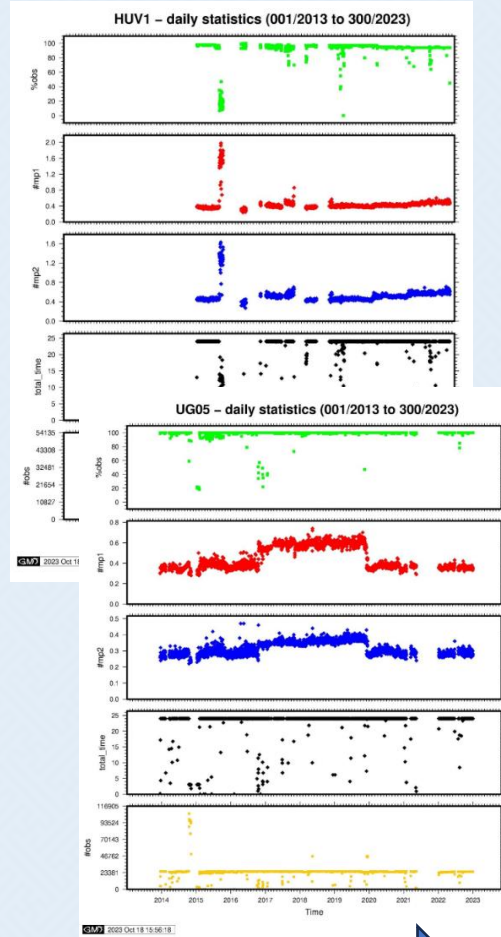
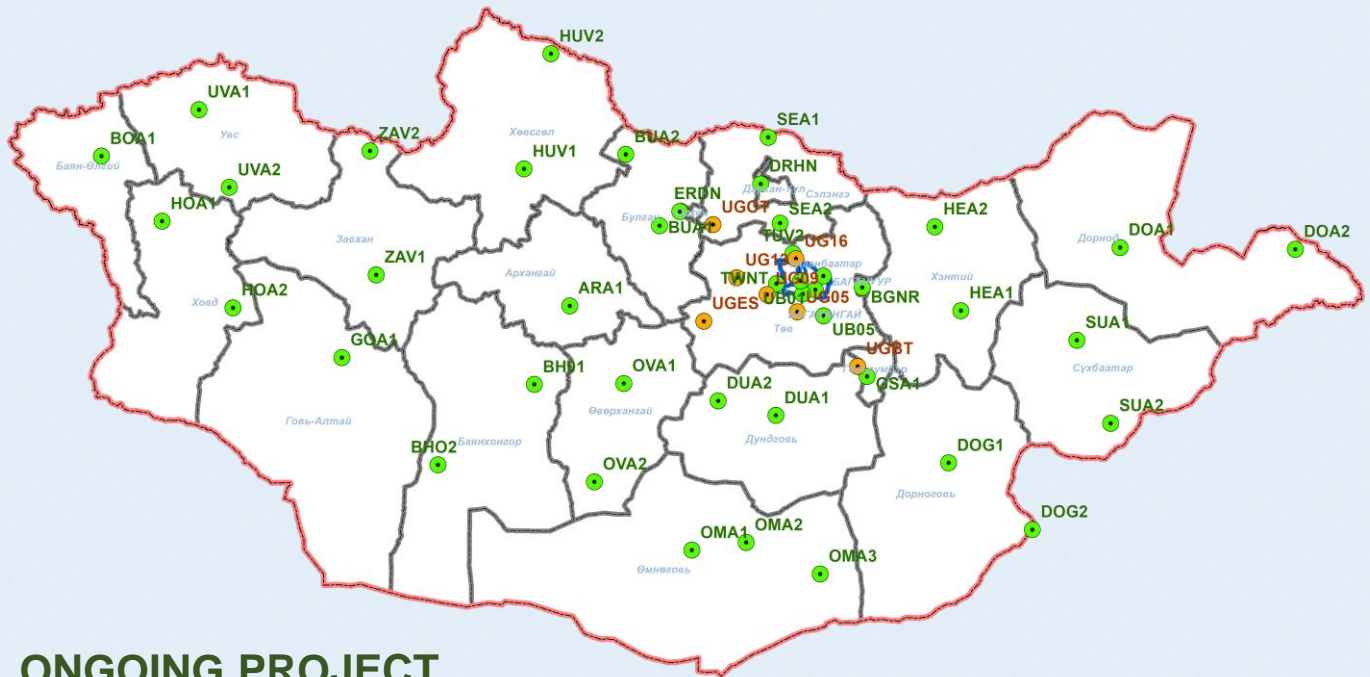


Local coordinate system



TO INTEGRATE GNSS-CORS in ITRF2020 COORDINATE SYSTEM

- AGENCY CORS - 43
- RESEARCH (Academy of Science) CORS-6



ONGOING PROJECT

1. Adjustment GNSS observation data
2. Calculate Velocity of GNSS-CORS
3. Development of MonPOS system





DAILY USAGE OF THE CORS-GNSS in MONGOLIA

SNIP, the simple NTRIP Caster (w/PRO 3.05)

MountPt	ova2	dua1_mgl	ova1	bgnr_mgl	buua2_mgl	ub01	oma1_mgl	tuv2_mgl	oma2
UpTime	2 Days 10:52 Up(1/33)	2 Days 10:47 Up(1/47)	2 Days 06:24 Up(10/35)	1 Day 22:46 Up(2/6)	1 Day 16:26 Up(1/38)	1 Day 14:14 Up(1/3)	22:02:10 Up(5/51)	1 Day 09:30 Up(1/38)	1 Day 09:16 Up(2/44)
Input	69.627 MB	62.193 MB	62.431 MB	48.207 MB	41.041 MB	42.913 MB	36.067 MB	35.115 MB	34.538 MB
Output	0 Bytes	595.67 KB	5.654 MB	2.392 MB					
Clients	0 / 0 [R]	0 / 172 [R]	0 / 146 [R]	0 / 1,043 [R]					

Reserved MountPts (34/40)

- ub05 [H] (44th/405)
- uva1_mgl [H] (26th/295)
- uva2_mgl [H] (49th/673)
- zav1 [H] (42nd/458)
- zav2 [H] (53rd/612)
- doa2 [H](293)
- hea2 [H](0)

Incoming NTRIP Servers [Push-In]

Connected Users (67 entries)

User Name	IP:Port	Base	Lat-Long	City	Duration
1 rover	202.179.25.216:35478	MGL_network	Lat:47.9004, Long:107.0283	Ulaanbaatar, MNG	31 Days 21:31
2 rover	66.181.160.208:11694	MGL_network	Lat:47.9222, Long:106.9181	Ulaanbaatar, MNG	27 Days 06:00
3 rover	66.181.161.154:12344	MGL_network	Lat:47.9222, Long:106.9181	Ulaanbaatar, MNG	26 Days 21:01

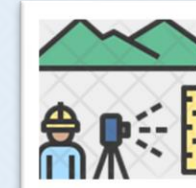
Map of Mongolia showing CORS-GNSS stations. Radius-35km.



GEODETIC FUNDAMENTAL NETWORK



LAND DISPUTE



TOPOGRAPHIC MAPPING



CADASTRAL MAPPING



RTK DRONE

USER
70-100

RTK CORRECTION

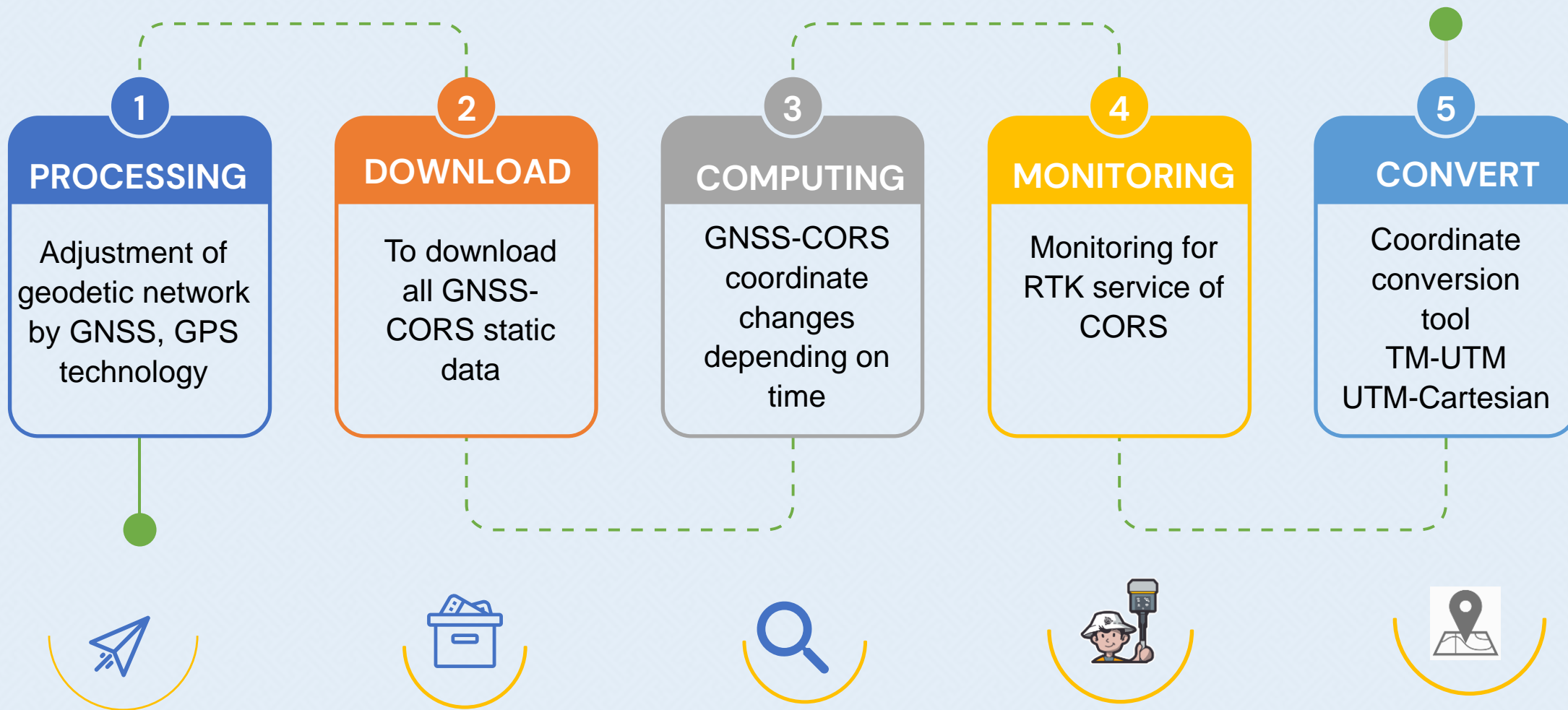
DURATION
3-8 hour



ONLINE POSITIONING PROCESSING SERVICES

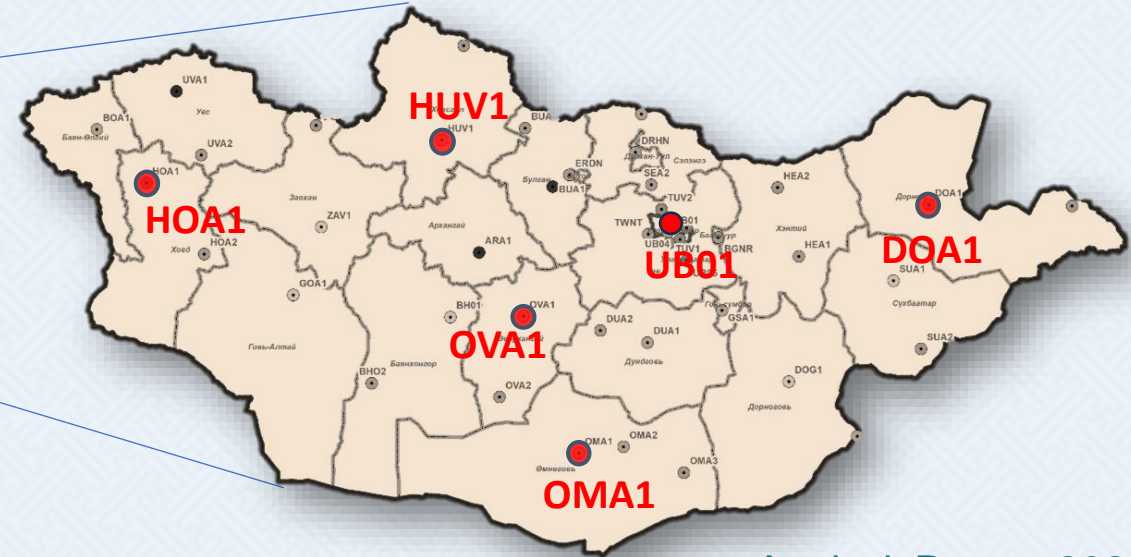
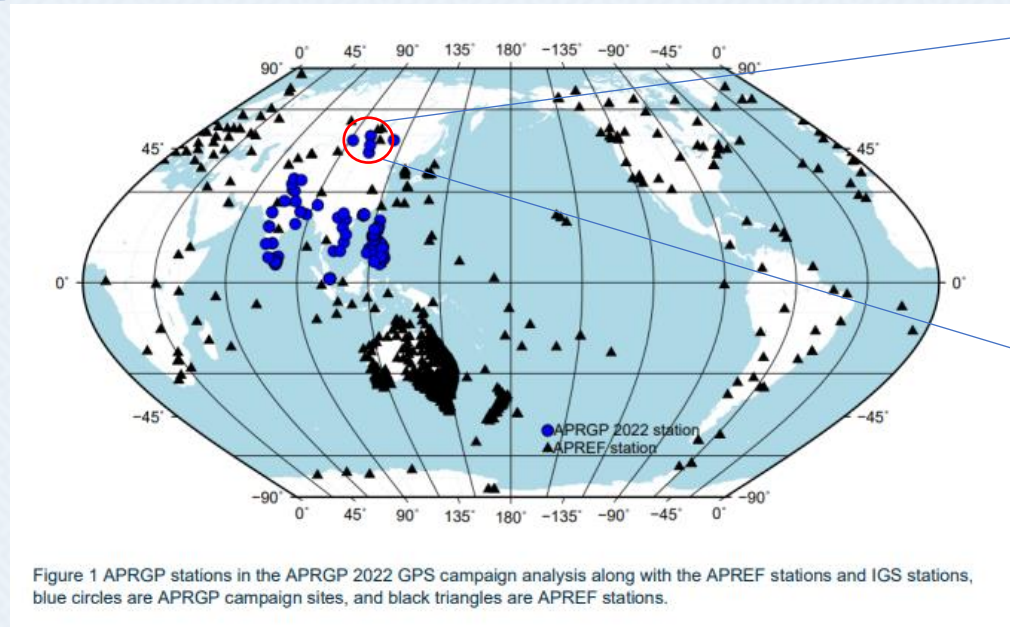
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MANAGEMENT, GEODESY AND CARTOGRAPHY

<https://monpos.gazar.gov.mn>





INTERNATIONAL COLLABORATION



APRGP – Asian Pacific Region Geodetic Project

Mongolia joined the campaign since
1999 - 2023



GPS WEEK -2227

AnalysisReport-2022

Station	LONGITUDE (DMS)			1 std (m)	LATITUDE (DMS)			1 std (m)	ELLIPSOID HEIGHT (m)	1 std (m)
DOA1	114	31	26.08757	0.0003	48	4	28.00265	0.0004	731.6646	0.0011
HOA1	91	40	5.64190	0.0003	48	0	31.57610	0.0003	1378.6624	0.0010
HUV1	100	9	57.06656	0.0003	49	38	9.81222	0.0004	1243.4418	0.0012
OMA1	104	22	14.62723	0.0003	43	36	19.29986	0.0004	1416.5275	0.0011
OVA1	102	46	39.02807	0.0003	46	15	59.73632	0.0003	1816.9366	0.0008

Geodetic Reference Frame Working Group (WG) of the Regional Committee of United Nations Global Geospatial Information Management for Asia and the Pacific (UN-GGIM-AP).



LOCAL COOPERATION

Government Implementing Agency
AGENCY FOR THE LAND ADMINISTRATION AND
MANAGEMENT, GEODESY AND CARTOGRAPHY

GOVERNMENT



Ministry of Construction and Urban
Development Mongolia

RESEARCH INSTITUTE



Institute of Astronomy and Geophysics of the
Mongolian Academy of Sciences

UNIVERSITY



Mongolian University of Science and Technology

NON-GOVERNMENT
ASSOCIATION



Mongolian Geospatial Association



Mongolian Association of Geodesy
Photogrammetry and Cartography

Law and regulation



Joint research



Capacity building,
Human resource



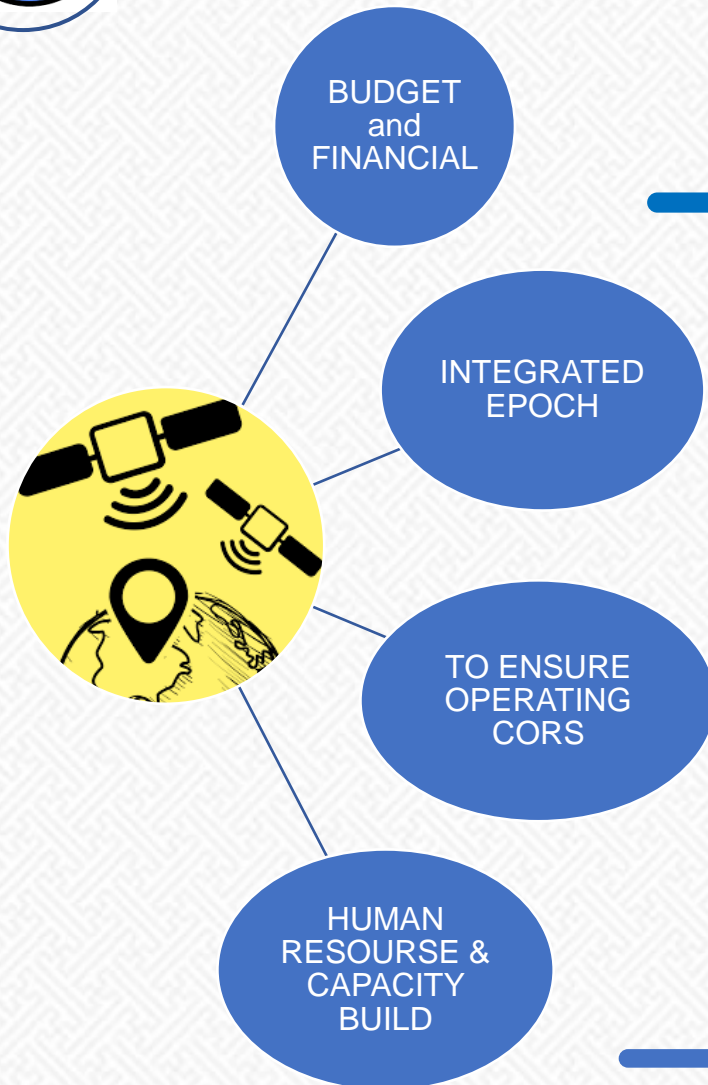
Capacity building,
Training



Joint research,
technology training



CHALLENGES GNSS-CORS MANAGEMENT



- Update technique parts
 - UPS – 15, Arrester-5
- Physical server -1
- License NTRIP caster - 10
- Firmware version update -20



- MONREF97- old
- ITRF2008 – now
- ITRF2014 – other
- ITRF2020 – future



- Antenna location move – 2 cors
- Maintenance – 43 cors
- Control center - Furnished 1 room
- GNSS to improve management (Free of charge-Payment)



- Capacity building for teaching staff in university
- Improve curriculum of university program regarding GNSS technology
- Short and long-term training for Government specialists, particularly in the local level





FUTURE PLAN

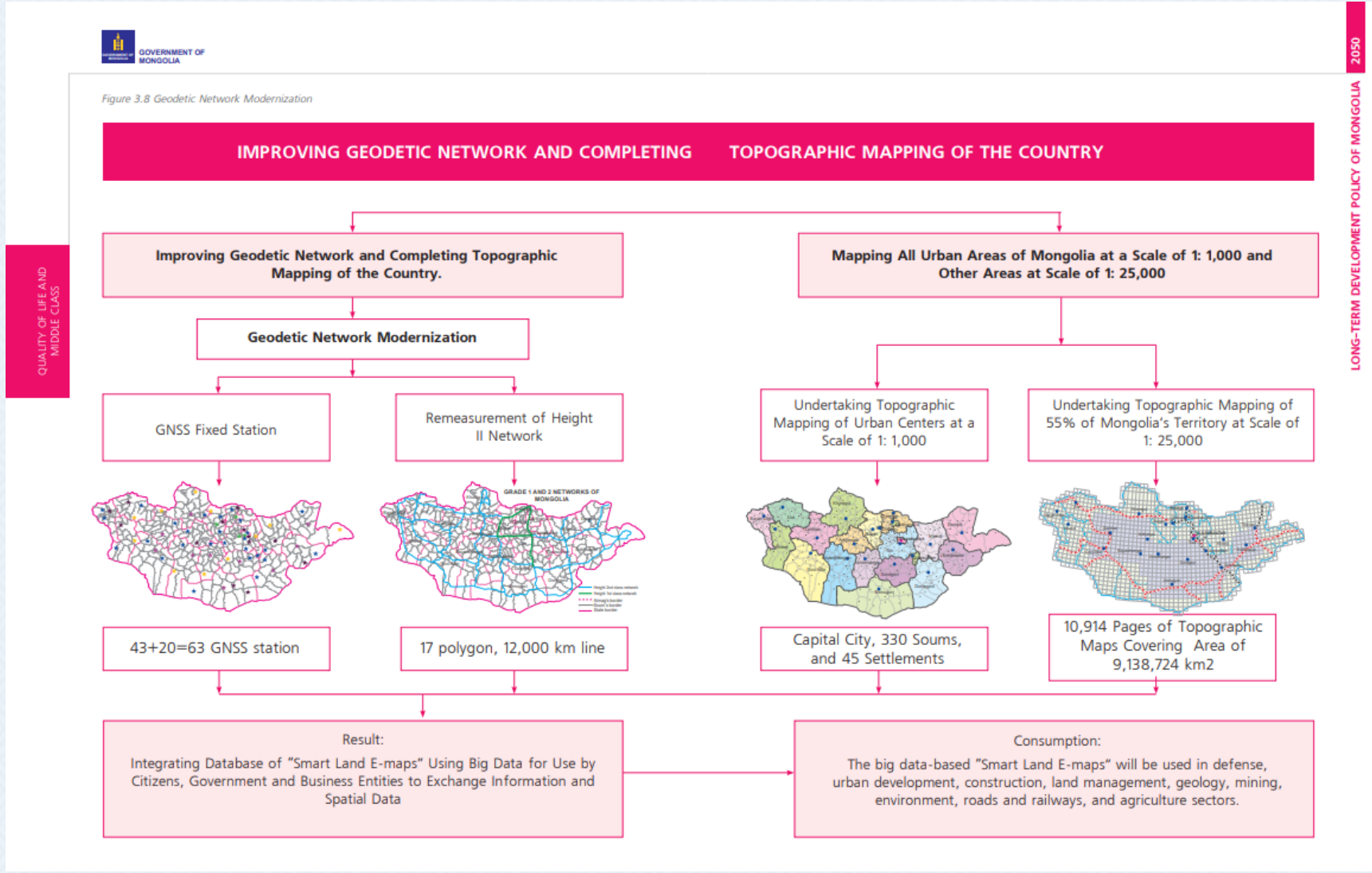
- To implement according:
1. VISION-2050
 2. IMPLEMENTATION PLAN OF GOVERNMENT ACTION PROGRAM ON 2020-2024

TO INSTALL 20 GNSS-CORS

To improve
geospatial data accuracy



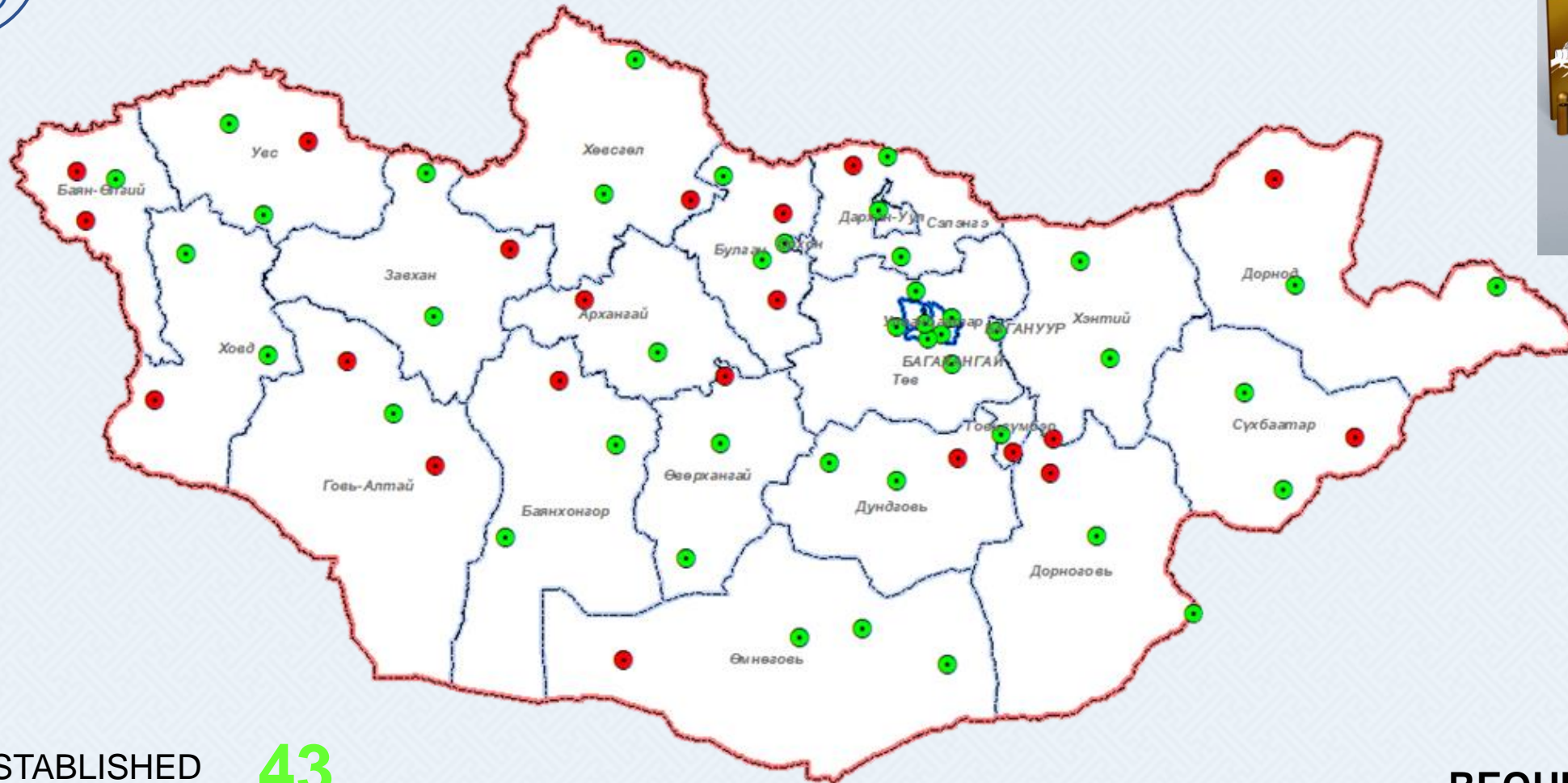
Figure 3.8 Geodetic Network Modernization





DENSIFYING GNSS-CORS NETWORK – TECHNICAL PROJECT

Government Implementing Agency
AGENCY FOR THE LAND ADMINISTRATION AND
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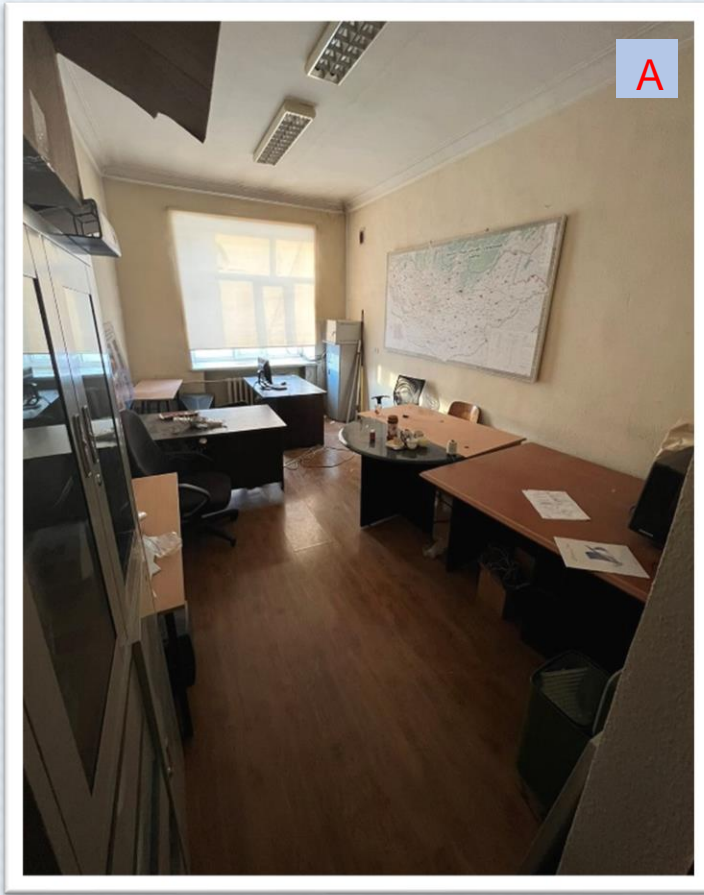


● ESTABLISHED **43**
● PLANNED **20**

REQUIRED BUDGET
725'000 USD



PILOT PROJECT – GNSS CONTROL CENTER



A. GNSS CONTROL CENTER

БАТЛАВ.
ГАЗАР ЗОХИОН БАЙГУУЛАЛТ, ГЕОДЕЗИ,
ЗУРАГ ЗҮЙН ГАЗРЫН ДАРГА Ж.БАТСАЙХАН

ХЯНАЛТЫН ДЭЛГЭЦ

УГСАРДАГ ХИВС 20м2

АКУСТИК ХАВТАН 18м2

Д/д	НЭР	Хэмжээ	Тоо ширхэг	ТӨЛӨВ	Нэгж үнэ /төгөрл/	Нийт үнэ	Хаана
1	Ухаалаг дэлгэц	Sony 75 инч	2 ш	Шинээр авах	6 499 000	12 998 000	BSB
2	Ханын тогтоогч	80 инч хүртэлх даацтай 80*140	2 ш	Шинээр авах	55 000	110 000	BSB
3	Ажлын ширээ		2 ш	Байгааг нь хэрэглэнэ	-	-	-
4	Сандал	албан өрөөний	2 ш	Шинээр авах	450 000	900 000	BSB
5	Хувцасны шүүгээ	90*56*197.5	1 ш	Шинээр авах	1 992 100	1 992 100	BSB
6	Намхан шүүгээ	80*40*75*	1 ш	Шинээр авах	799 900	799 900	BSB
7	Дотоод сулжээ, кабели			Холболт хийх	-	-	-
8	Угс						
9							
10							
11							
12							
13							
14							
15							
16							
17							

REQUIRED BUDGET

7300 USD

GNSS-ӨРӨӨНИЙ ЗОХИОН БАЙГУУЛАЛТ	НЭР	ГАРЫН УССГ	ЗАЛВАР ЗУРАГ
ЗАХИРГАА, УДИРДАГА, ХАМТЫН АЖИЛГААНЫ ГАЗРЫН ДАРГА	Б.ЭНХГЭРЭЛ		M1: 1000
САНХҮҮ, ЭДИЙН ЗАСГИЙН ХЭЛТСИЙН ДАРГА		
ГЕОДЕЗИ, ЗУРАГ ЗҮЙН ХЭЛТЭС		2023 он

B. IN OTHER COUNTRIES

C. PLAN DRAWING FOR REFURNISHMENT



THANK YOU FOR ATTENTION

Senior specialist for responsibility GNSS-CORS

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