



Mongolian Geospatial Association

<http://www.geomedeelel.mn>

GNSS Application based on citizen science in Mongolia

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22 - 26 April 2024, Manila, **Philippines.**



UNITED NATIONS Office for Outer Space Affairs

**UN / PHILIPPINES
GNSS
APPLICATIONS
WORKSHOP**



Background



Photos: Alina Reyzelman

FACTS

- 1,564,000 sq.km
- ~3,500,000 people (2023)
- Language: Mongolian
- Main religions: Buddhist (53%), Shamanism (3%), Muslims (3%), Christian (2%)
- GDP 5,045.50 USD (2022)
- HDI 0.737 (2023)
- Parliament democracy
- Government: 16 Ministries, 36 Agencies

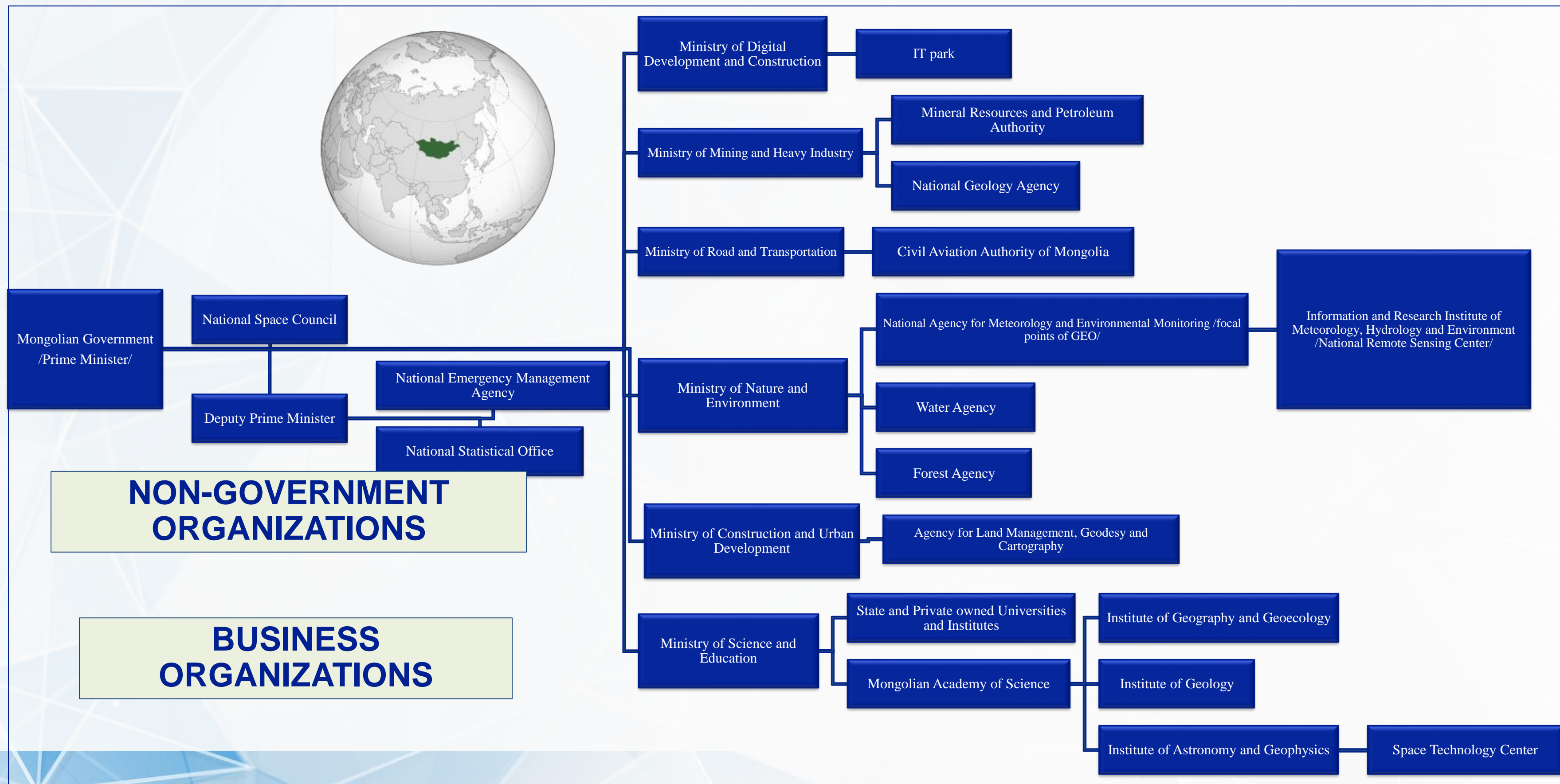
Source: www.nso.mn

Background

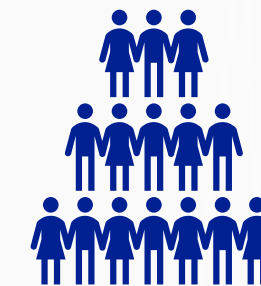


- 1965: Space technology and application is started under INTERCOSMOS program
- 1970: First Telecommunications satellite data receiving station “ORBIT”
- 1970: World meteorological satellite data receiving ground station is established /NRSC/
- 1981: J. Gurragchaa, the first cosmonaut of Mongolia the 2nd Asian in the space.
- 2017: Mazaalai /CubeSAT/, the first satellite in the space

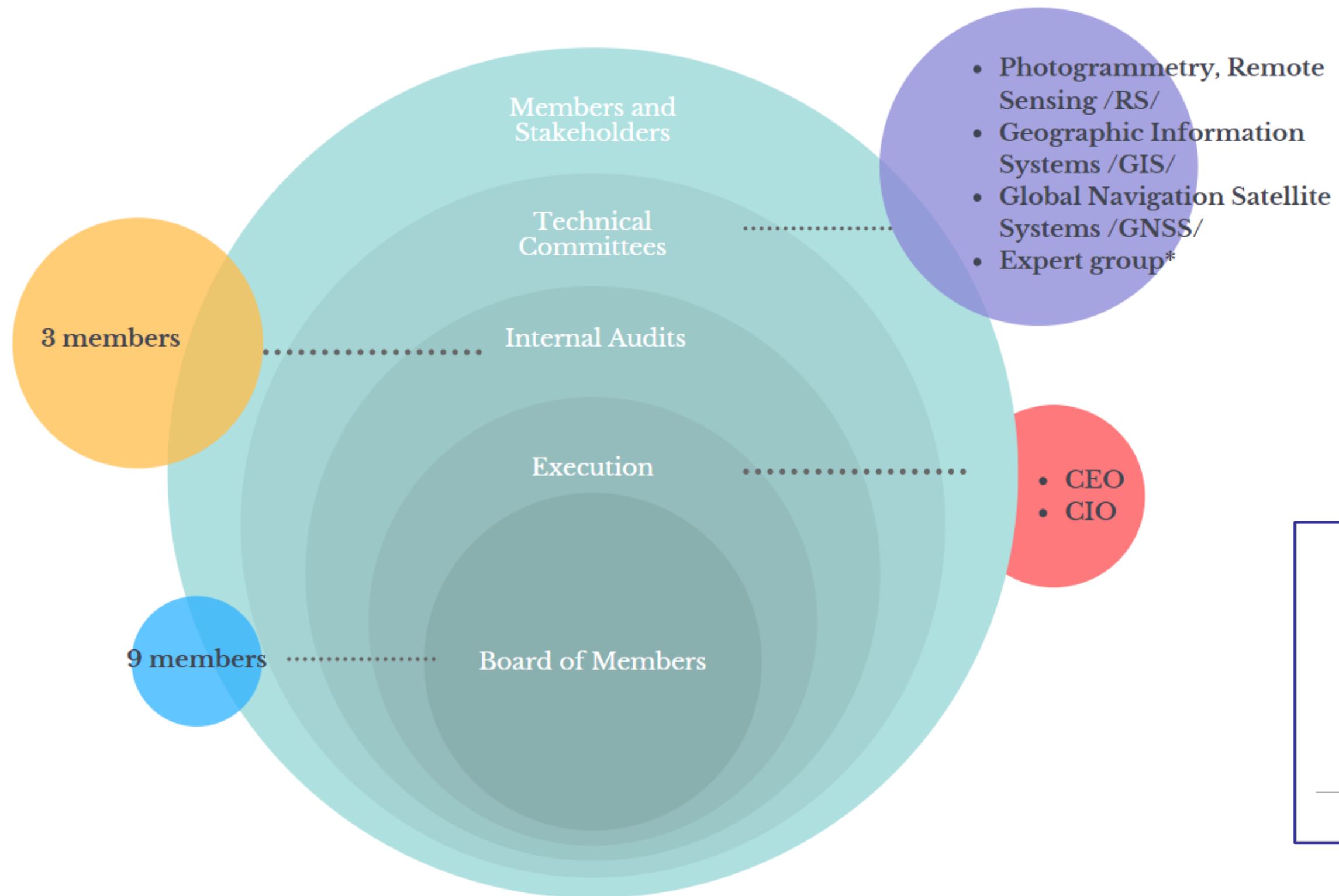
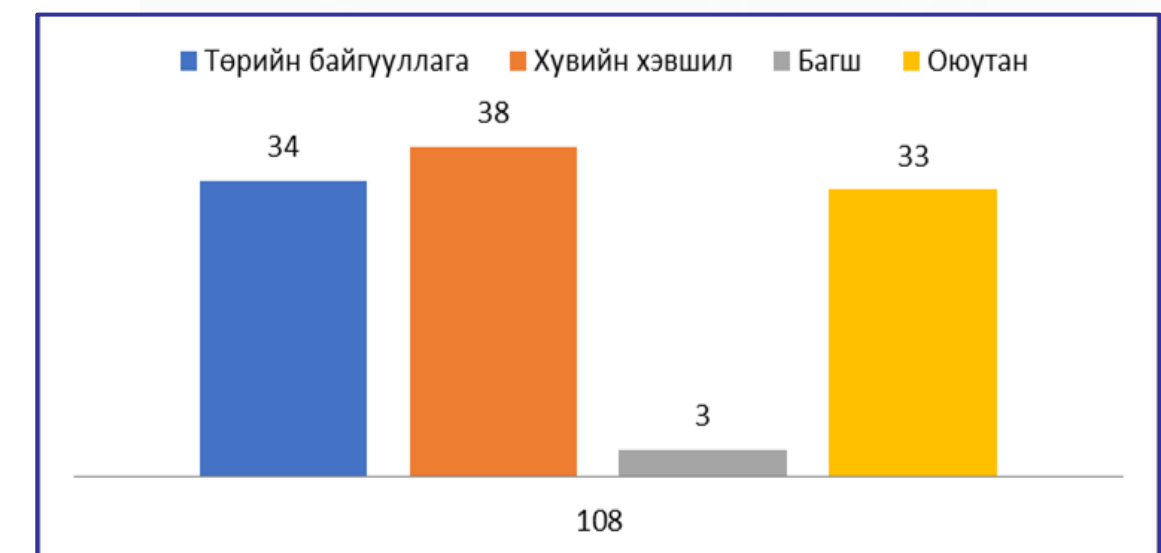
GEOSPATIAL RELATED ORGANISATIONS IN MONGOLIA



Introduction



MEMBERS /ACTIVE/



Introduction

VISION

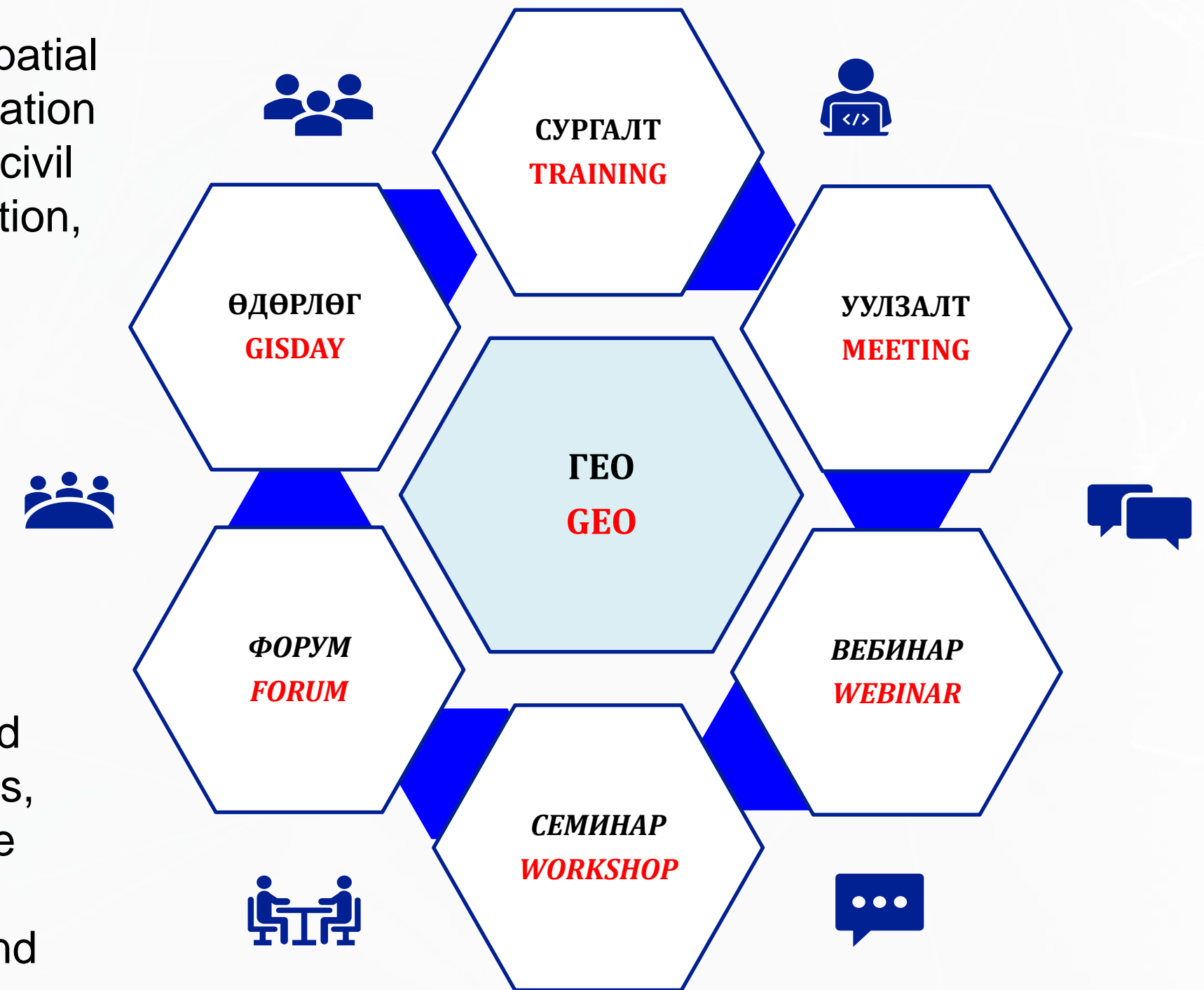


To be the leading advocate and facilitator of geospatial technology adoption worldwide, fostering collaboration among governments, industries, academia, and civil society to drive sustainable development, innovation, and societal well-being.

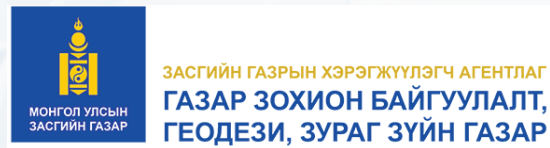
MISSION



To promote the widespread adoption and responsible use of geospatial technology worldwide through advocacy, education, and collaboration. We aim to empower individuals, organizations, and governments to leverage geospatial data and tools for sustainable development, environmental stewardship, and societal well-being.



Stakeholders



НИЙСЛЭЛИЙН БОДЛОГЫН СУДАЛГА
ШИНЖИЛГЭЭНИЙ ТӨВ



НИЙСЛЭЛИЙН АВТО ЗАМЫН
ХӨГЖЛИЙН ГАЗАР



МОНГОЛ УЛСЫН ИХ СУРГУУЛЬ



МОНГОЛ УЛСЫН ШИНЖЛЭХ УХААНЫ АКАДЕМИ
ГАЗАРЗҮЙ, ГЕОЭКОЛОГИЙН ХҮРЭЭЛЭН



МОНГОЛ УЛСЫН ШИНЖЛЭХ УХААНЫ АКАДЕМИ
ОДОН ОРОН, ГЕОФИЗИКИЙН ХҮРЭЭЛЭН



МОНГОЛ УЛСЫН ШИНЖЛЭХ УХААН
ТЕХНОЛОГИЙН ИХ СУРГУУЛЬ
MONGOLIAN UNIVERSITY OF SCIENCE AND TECHNOLOGY



ХӨДӨӨ АЖ АХУЙН ИХ СУРГУУЛЬ
MONGOLIAN UNIVERSITY OF LIFE SCIENCES



ҮНДЭСНИЙ ТЕХНИКИЙН
ИХ СУРГУУЛЬ
NATIONAL UNIVERSITY OF MONGOLIA



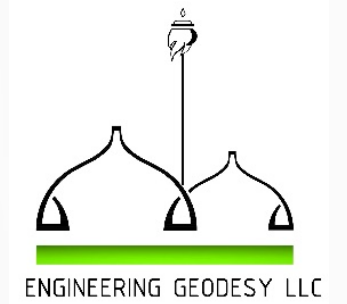
ANDOREAN



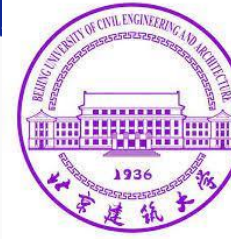
ICT GROUP | INFORMATION AND
COMMUNICATION
TECHNOLOGY



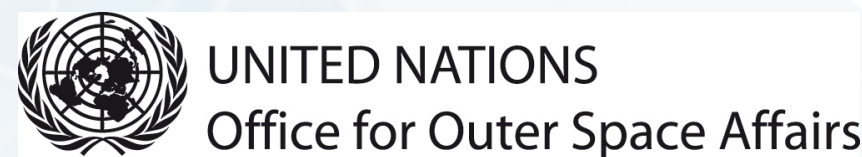
ГЕОМЕТРИ ЗУРАГ ЗҮЙН ҮЙЛДВЭРЛЭЛ, ҮЙЛЧИЛГЭЭ



TRIGTEQ



5D WORLD
Геодезийн хэмжилт боловсруулалт,
зураг төсөл, сургалт үйлчилгээ



ECURS
SHAPING A CONNECTED, INTELLIGENT WORLD TOGETHER!



CHCN AV
Make your work more efficient



Events

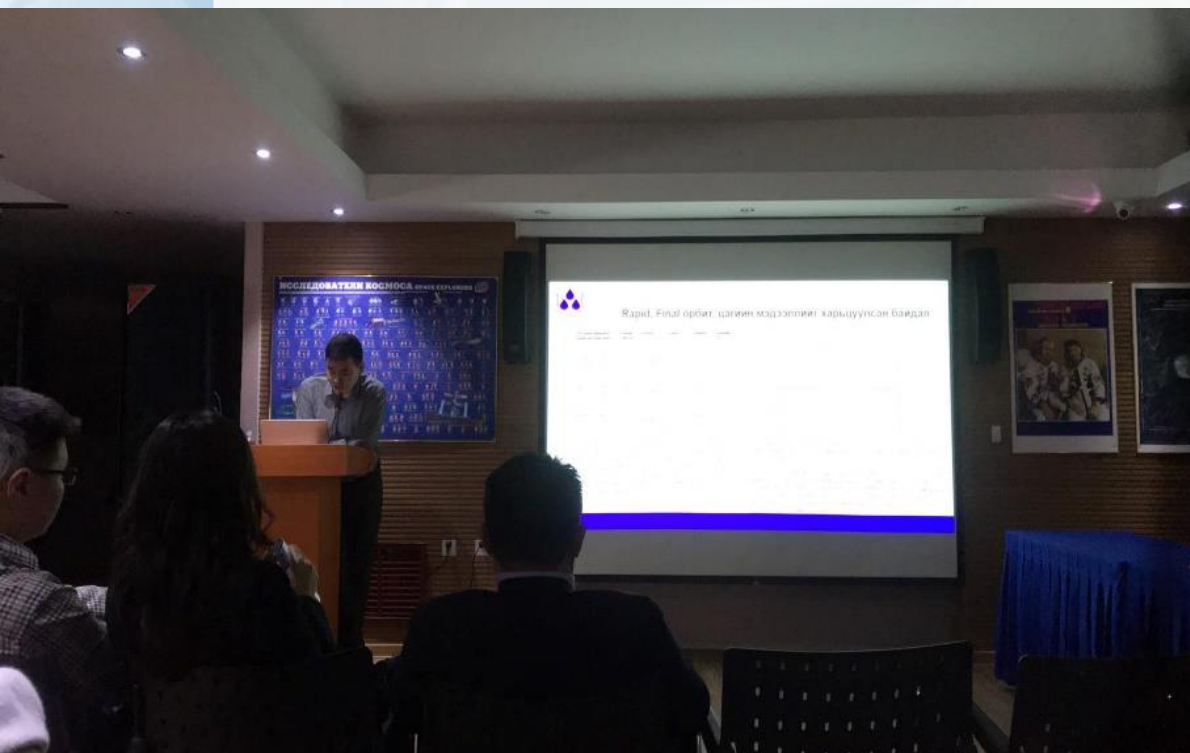
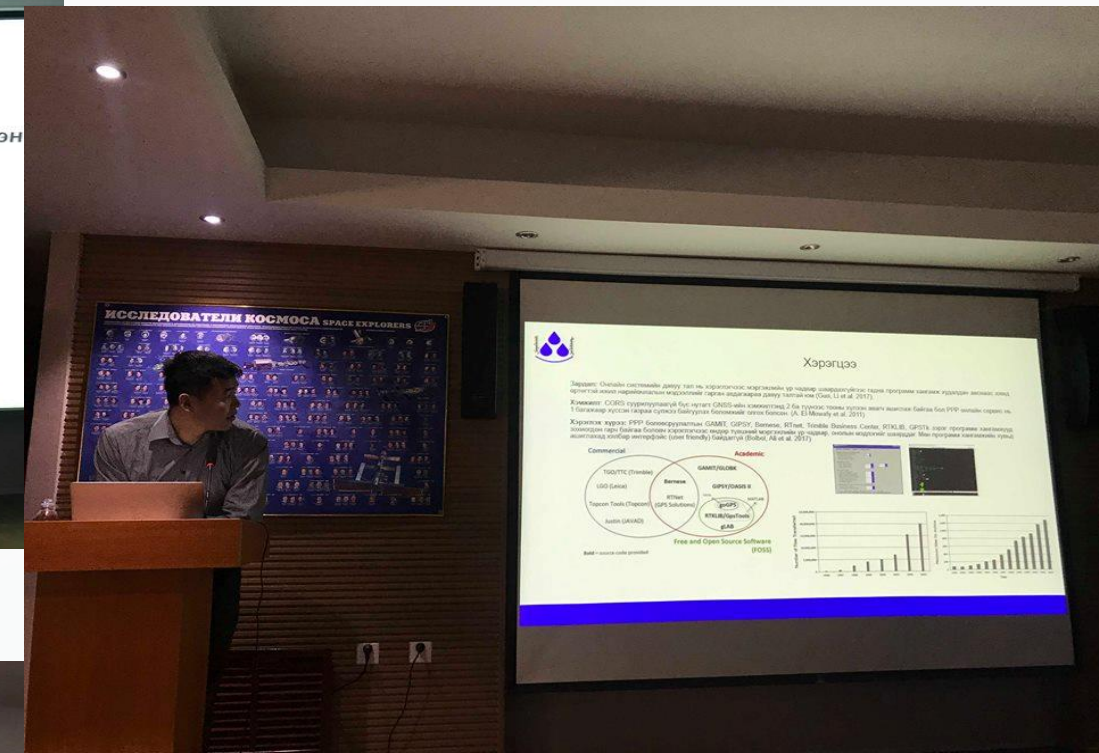


Geo-workshop



- Remote sensing:
SENTINEL data
processing
- GIS: ArcGIS Pro
- GNSS:
GAMIT/GLOBK
training

Geo-forum: GNSS



In collaboration with Institute of Astronomy and Geophysics of the Mongolian Academy of Sciences, "Geo-Forum: Applications of the GNSS" was successfully organized on April 17, 2019.

Virtual Format

- More than 100 people participated from over 20 countries;
- All GNSS Providers and other observers;

UNITED NATIONS Office for Outer Space Affairs

МОНГОЛ УЛСЫН ГАДААД ХАРИЛЦААНЫ ЯАМ

БАРИЛГА ХОТ БАЙГУУЛАЛТЫН ЯАМ

UNITED NATIONS/MONGOLIA WORKSHOP ON THE APPLICATIONS OF GLOBAL NAVIGATION SATELLITE SYSTEMS

ULAANBAATAR, MONGOLIA, 25 - 29 OCTOBER 2021

ORGANIZED JOINTLY BY
The United Nations Office for Outer Space Affairs and The Mongolian Geospatial Association

SUPPORTED BY

CO-SPONSORED BY



Research /project/

➤ Mongolia Government, member of APSCO, is granted to our association for the local institution of APSCO-iGMA project implementation (2018-2023).

➤ APSCO International GNSS Monitoring and Assessment” (IGMA) project in Mongolia is implemented with our members, New Mongol Institution of Technology and Chandmani Survey, LLC, Since 2018.



Ulaanbaatar, Sep, 2018



Uvs, Jun 2019

Source: APSCO

Capacity-building


- **GNSS Training Course and GNSS for Policy and Decision-Makers Course since 2018 – current**
- **GNSS Summer School – Japan**
- **International Training Workshop on BeiDou Technologies and its Applications in the Belt and Road Countries and Regions, China**
- **UNOOSA IGS activities**
 - Reference Frames in Practice, May 2018, Turkey
 - The International Space Weather Initiative School on Space Weather and Global Navigation Satellite Systems 2018, Baku, Azerbaijan;
 - Workshop on The Application of GNSS

CSIS
The University of Tokyo

GEO SPATIAL Монголын Гео-мэдээллийн Холбоо
<http://www.geomedeel.mn>

GEO-WEBINAR #2:
HIGH-ACCURACY GNSS POSITIONING BY QZSS MADOCA BASED ON LOW-COST RECEIVER SYSTEMS

March 23, 2022 15:00

Хамтран зохион байгуулагч:  **ШУТИС**
Геологи уул уурхайн сургуулийн
Геодезийн салбар

GEO SPATIAL Монголын Гео-мэдээллийн Холбоо
www.geomedeel.mn

Trimble

GEO-WEBINAR #6:
SUPPORT FOR MODERN GEODETIC DATUMS IN TRIMBLE SOFTWARE.

SPEAKER: DR. CHRIS PEARSON

NOVEMBER 8, 2023
15:00

GNSS Applications

In Mongolia, the utilization of GNSS technology has gained momentum across multiple domains, including but not limited to:

- **Infrastructure Development:** GNSS plays a crucial role in land surveying, construction, and infrastructure development projects across Mongolia, facilitating accurate positioning and mapping in remote and rugged terrains (Altangerel et al., 2019).
- **Agriculture and Natural Resource Management:** GNSS-based precision agriculture techniques have been explored to optimize resource utilization, monitor soil conditions, and enhance crop productivity in Mongolia's agricultural landscapes (Tsend-Ayush et al., 2018). Furthermore, GNSS-enabled tracking systems have been deployed for livestock management, enabling herders to monitor animal movements and grazing patterns more effectively (Lunden et al., 2020).
- **Environmental Monitoring and Disaster Management:** GNSS technology provides valuable data for environmental monitoring and disaster management efforts in Mongolia, including monitoring of land cover changes, glacier movements, and seismic activities (Tsend-Ayush et al., 2020). Real-time GNSS data also contributes to early warning systems for natural disasters such as earthquakes and floods (Davaasuren et al., 2017).

Private services /CORs station/

- **MonMAP LLC /Septentrio/**
- **Engineering Geodesy LLC /Kolida/**
- **Geomasters LLC /Trimble/**
- **5d World LLC /CHCNav/ + Mongolian University of Science and Technology (MUST)**

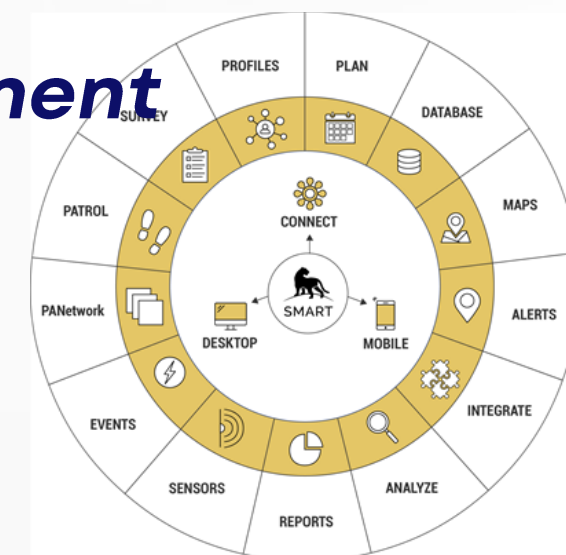
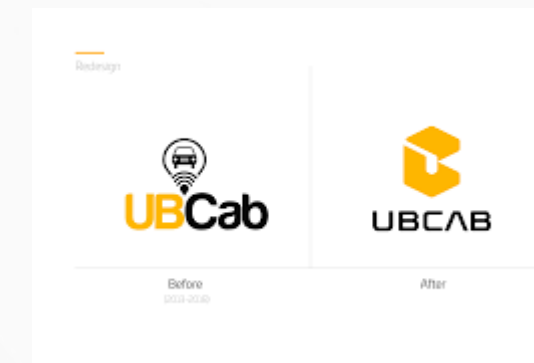
Academic Level

- **Institute of Astronomy and Geophysics, Mongolian Academy of Sciences –
*Monitoring for Seismics and Geodynamics***
- **School of Mining and Geology, MUST - CORs**
- **New Mongolia Institute of Technology (NMIT) – *a part of iGMA***

GNSS Applications

Tools and Apps

- **GPS tools – Monitoring of Vehicles /Logistics and Transportations/**
- **Mining activities and monitoring /coal mining etc/**
- **Civil Society and everyday life**
 - **UB cab /taxi services using GPS tracking system/**
 - **Jet/Tapatrip – bicycle/scooter renting services**
- **Conservation and Environmental Monitoring**
 - **Spatial Mapping and Reporting Tool (SMART) – GNSS based application for environmental law enforcement activities of Mongolian SPA's department**
 - **Treelings – Forest monitoring applications**



Citizen-science

- **In Mongolia, citizen science initiatives have been gaining traction in recent years, particularly in areas such as biodiversity monitoring, climate change research, and community-based conservation efforts (Batbold et al., 2019).**
- **However, the integration of citizen science with GNSS applications remains relatively unexplored in the Mongolian context, presenting an opportunity to leverage the collective efforts of local communities for enhancing spatial data collection and monitoring.**

SMART CITIES: MAPPING ULAANBAATAR

HOT Program · Mongolia · COMPLETED



Spring, 2020 – Spring, 2021 – 5 times

Public Activities

Survey 123 of ArcGIS, Qtools, NextGIS

Mongolia, local NGO

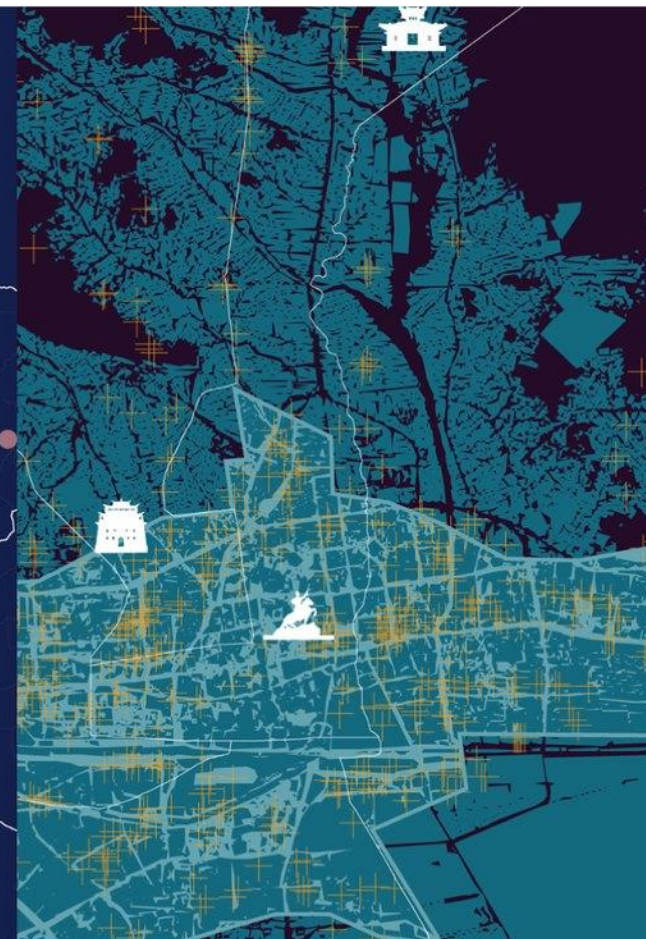
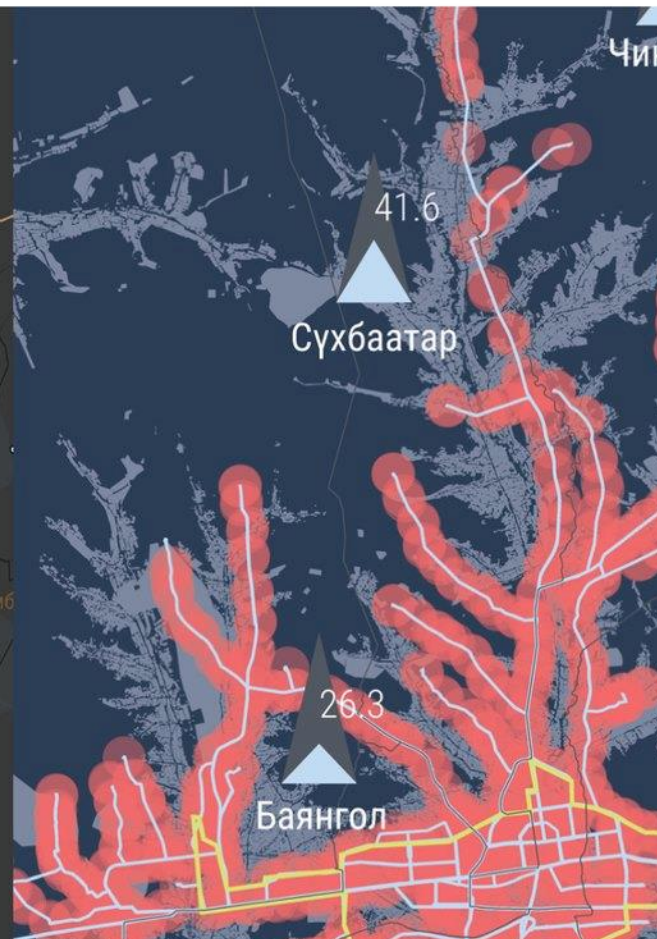
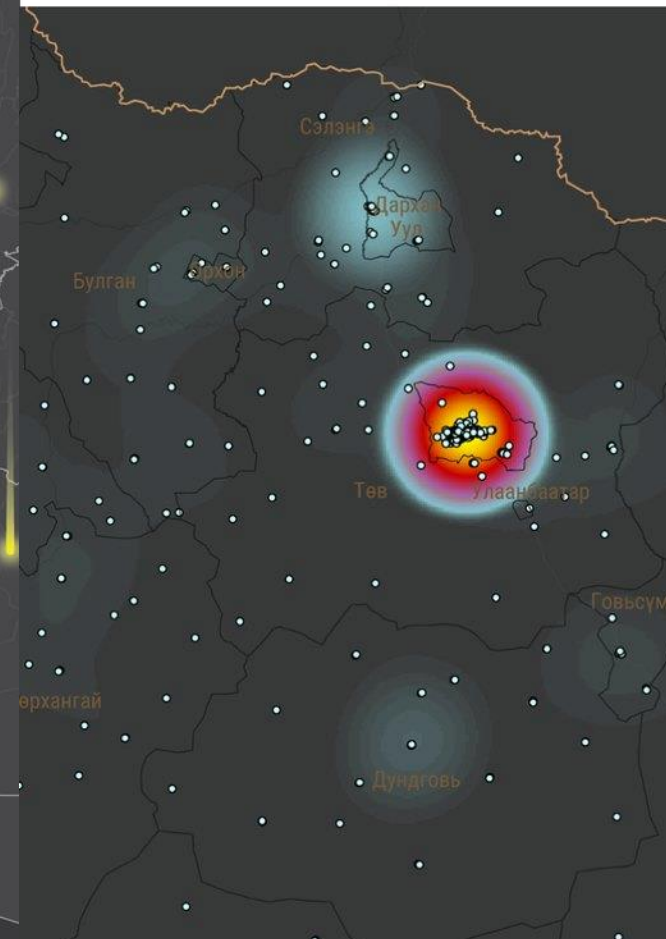
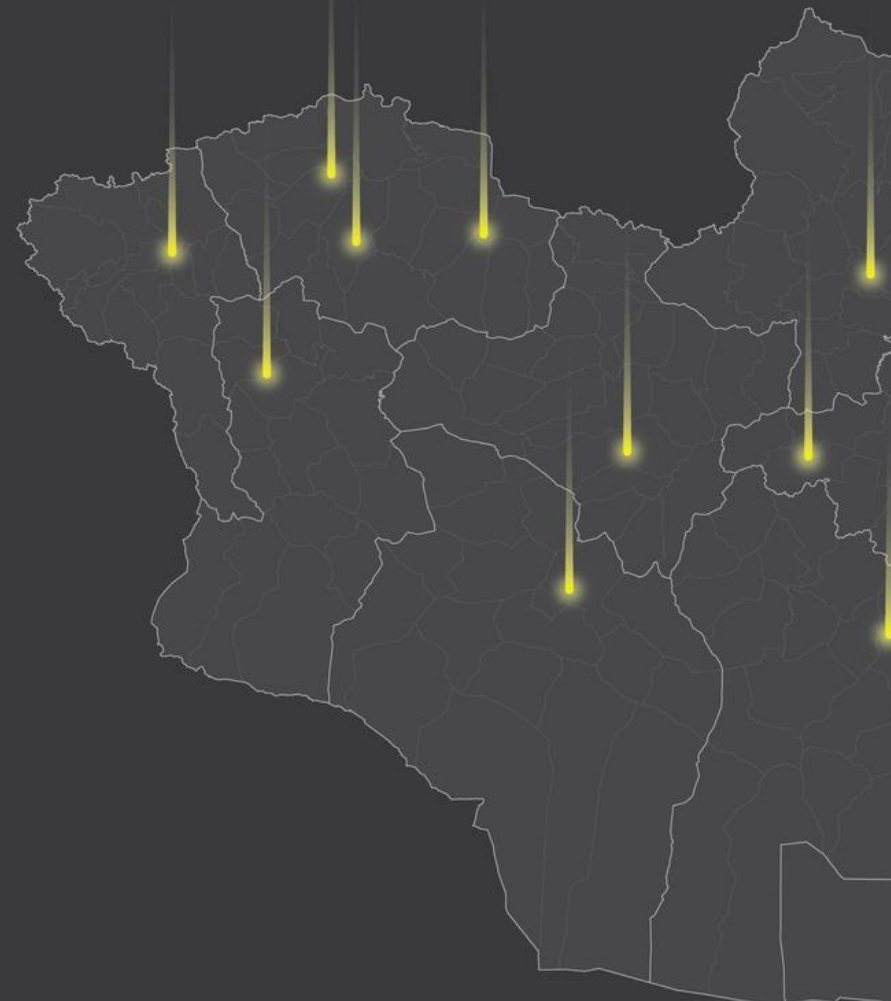
Universities and institutions

- **Mapathon for mapping and updating OSM using GNSS applications such as Mapillary and iMap, local community mapping application developed by ICTGroup**
 - **Ulaanbaatar – 2 times, Spring 2020 and November 2021**
 - **Erdenet city, Orkhon province – November 2022**
 - **Darkhan city, Darkhan-Uul province – fall, 2024 /October or November/**

Public Activities

GISday-2022

OPEN STREET MAP-ЗУРАГЛАЛ



#GISday2022
ГАЗРЫН ЗУРАГТ СУУРИЛСАН
ӨГӨГДЛИЙН ДҮРСЛЭЛИЙН ҮЗЭСГЭЛЭН

Year	Distance (km)
2017	9,520
2018	57,585
2019	84,827
2020	115,718
2021	140,415
2022	150,684



200M

3KM

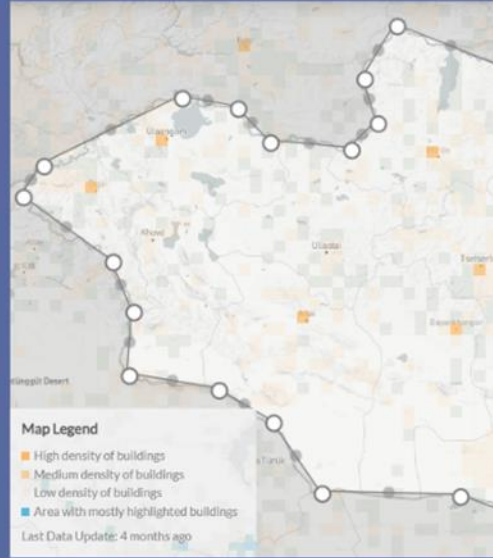
Buildings

87163  526631

Public Activities

2018

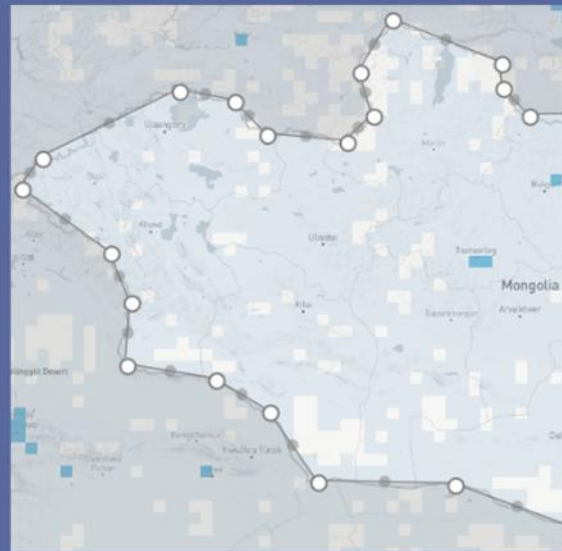
2022



Road

18058  150651

2018



526,631 Buildings 74 HOT Projects 512+ Contributors 40 Distinct Tags

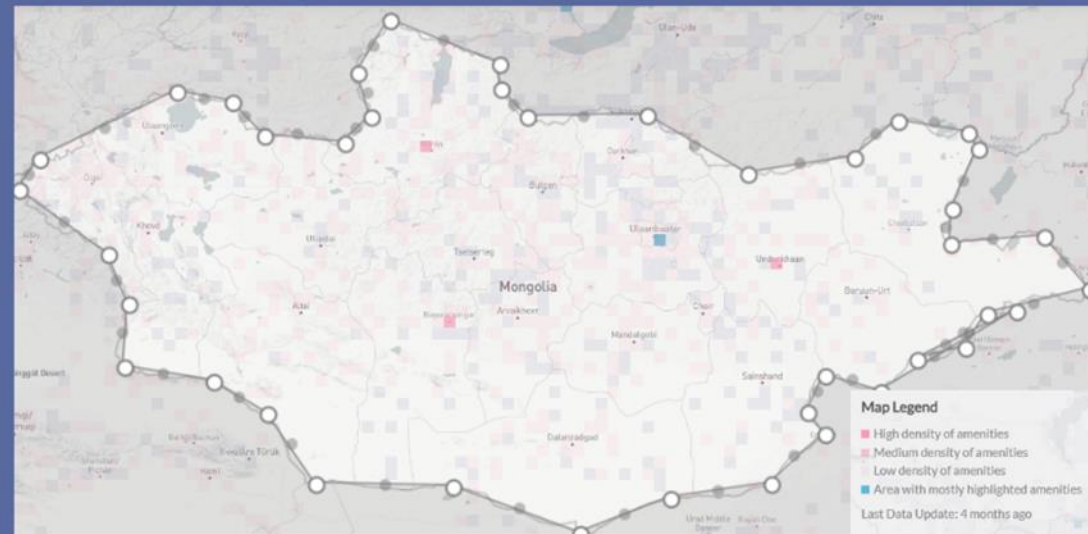
2008 20

150,651 km of Roads 74 HOT Projects 636+ Contributors 27+ Distinct Tags

2008 2010

Amenities

2018

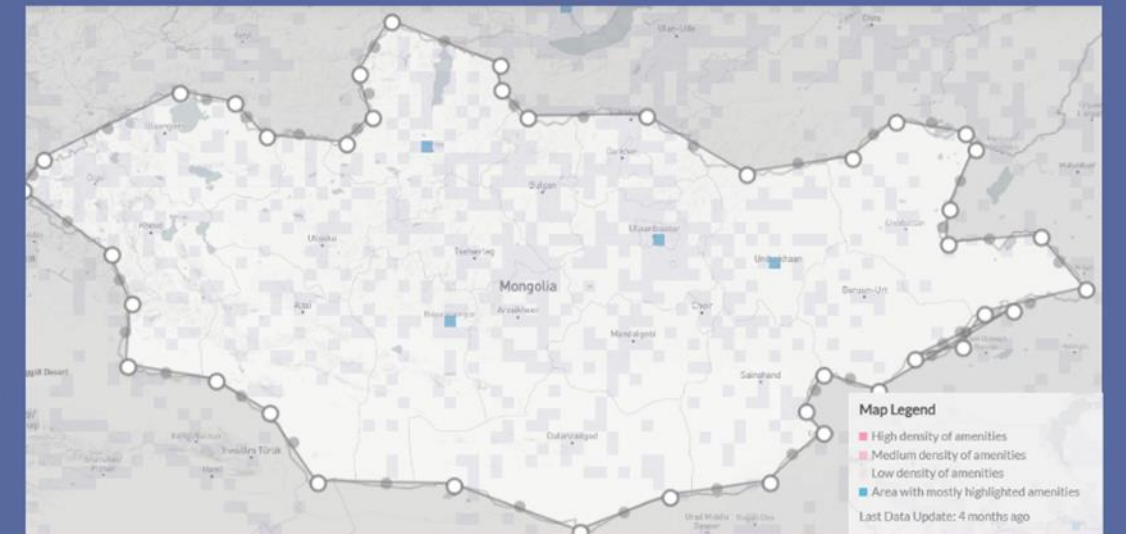


5017



17596

2022



17,596 Amenities 74 HOT Projects 476+ Contributors 77+ Distinct Tags

Compare Time Periods

Close

2008 2010 2012 2014 2016 2018 2020 2022

Conclusion

1. Investing in comprehensive training and support for citizen scientists to enhance data collection skills and ensure data quality.
2. Developing standardized protocols and guidelines for citizen science data collection, management, and sharing.
3. Strengthening partnerships between government agencies, research institutions, and local communities to facilitate knowledge exchange and co-management of natural resources.
4. Leveraging emerging technologies such as crowdsourcing platforms, UAVs, and AI algorithms to enhance data collection efficiency and accuracy.
5. Promoting interdisciplinary collaboration and participatory approaches to address complex socio-environmental challenges and achieve sustainable development goals.

Challenges

WIN-WIN

STRATEGY

- i. Government institutions and NGOs – **A memorandum of understanding (MoU)**
- ii. Citizens, companies – membership
- iii. International organizations – MoU

RECOMMENDATIONS???

- Human resources
- Technology
- Financial issues
- Geospatial activities
 - National (geo-workshops, geo-training, geo-seminars etc)
 - International (Summer school etc.)



Mongolian Geospatial Association

<http://www.geomedeel.mn>

Thank You

ADDRESS:

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 www.facebook.com/MonGeoSpatialAssoc

 [Geomedeel](https://twitter.com/Geomedeel)

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Question and Answer...

