UNITED NATIONS GLOBAL GEODETIC CENTRE OF EXCELLENCE

MODERNISING GEOSPATIAL REFERENCE SYSTEM CAPACITY DEVELOPMENT WORKSHOP

Identifying Capacity Development Needs in Geodesy for the region

Ryan Keenan
Senior Consultant for UN-GGCE

Day 3, Session 2 [3_3_1]

Acknowledgements: *Albert Momo (USA); Andrick Lal (SPC); Vaipo Mataorta (PGSC); Meizyanne Hicks (PGSC); Eva-Marie Unger-Morscher (AUT); John Gitau (NIG); Zuheir Altamimi (FRA); Ryan Keenan (AUS)*

Overview of Capacity Development

What it is and what forms does it take?

Why is it needed?

How it does it happen?

Who initiates it?

Case Study examples (Country and Region)

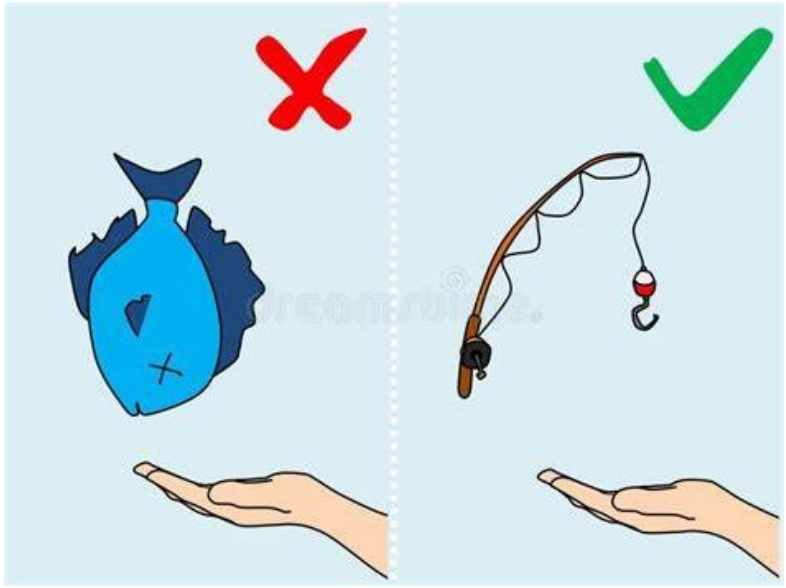
Useful Links, Insights and Resources

Communications and Marketing

Capacity Development - What and Why?

What is it? It is assistance (formal and/or informal) comprising….

- Resources
  - Human
  - Fiscal
  - Equipment
  - Expertise
  - Data
  - Policy
  - Time



Why is it needed?

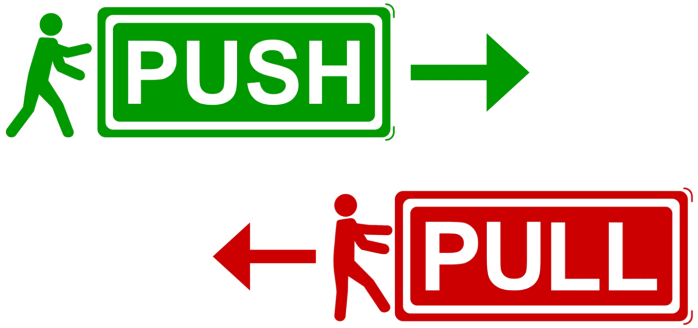
- Because an ‘organisation’ may not possess a sufficient amount of resources (or capability) to do it by themselves
  - It can also be stated as ‘lack of capacity’
- Because groups wish to learn, network and collaborate

STRONGER.
TOGETHER.

Capacity Development - How and Who starts?

It depends ….

- Those with the spare capacity, can offer it to the community (..PUSH)
- Organisations requiring it, can request it (..PULL)



Often summarised as:

- Knowledge transfer
- Capacity Development (CD)
- Education, Training and Capacity Building (ETCB)
- Outreach and Engagement (OE)

Not all capacity development is between two parties

… it can also be ‘Inreach’ - internal to an organisation

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Capacity Development - Geodesy Crisis

Geodesy Crisis ….

- Lack of geodesists?
- Lack of resources?
- Lack of funding?
- Lack of support?
- Lack of interest??

All of the above! Plus more!

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Capacity Development - Some Sources

Various Examples (internal and external)

- Institutional / Agency
  - United Nations - UNDP; UN-GGIM; UNOOSA; UN GGCE;
  - World Bank Group
  - Development Banks - ARDB (Asian Regional Dev Bank)
- Academic
  - UN GGIM Academic Network
  - IAG Early Career Scientists
- Corporate and Foundations
  - The Gates Foundation…..
- Community of Geospatial Science and Associations
  - IUGG, IAG; FIG …..

More information in the Business Cases session

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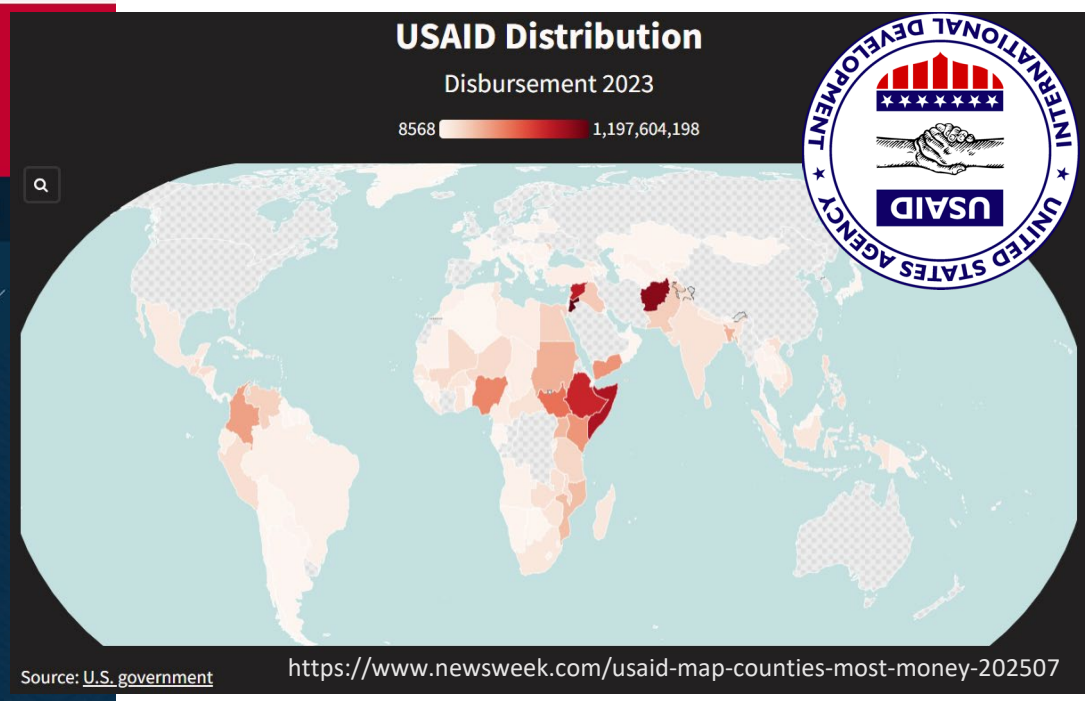
Capacity Development Sources - Institutional Risks

USAID disbursed US$72 billion in fiscal year 2023, the most recent full year for which information is available.

USAID was suspended in January 2025….. This action has triggered global repercussions, with unknown consequences both in terms of scale and coverage



The Budget makes critical, targeted investments in the American people that will promote greater prosperity and economic growth for decades to come. At the Department of State and USAID, the Foreign Affairs Budget will:

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Capacity Development - Case Studies

The following section will feature examples of CapDev in different countries and regions

Purpose is to provide:

- **Evidence** – capacity development does work!
- **Motivation** - it can be done … with a little effort to start
- **Inspiration** – as to how this could be done for your member state/region

Present a number of Case Studies where Capacity Development activities have been provided between countries, across regions, and internationally

Note 1: for these studies: the Capacity, the forms, the providers and the levels of collaboration.
Note 2: not all are exclusively geodesy, most are a combination of capabilities that complement each other.

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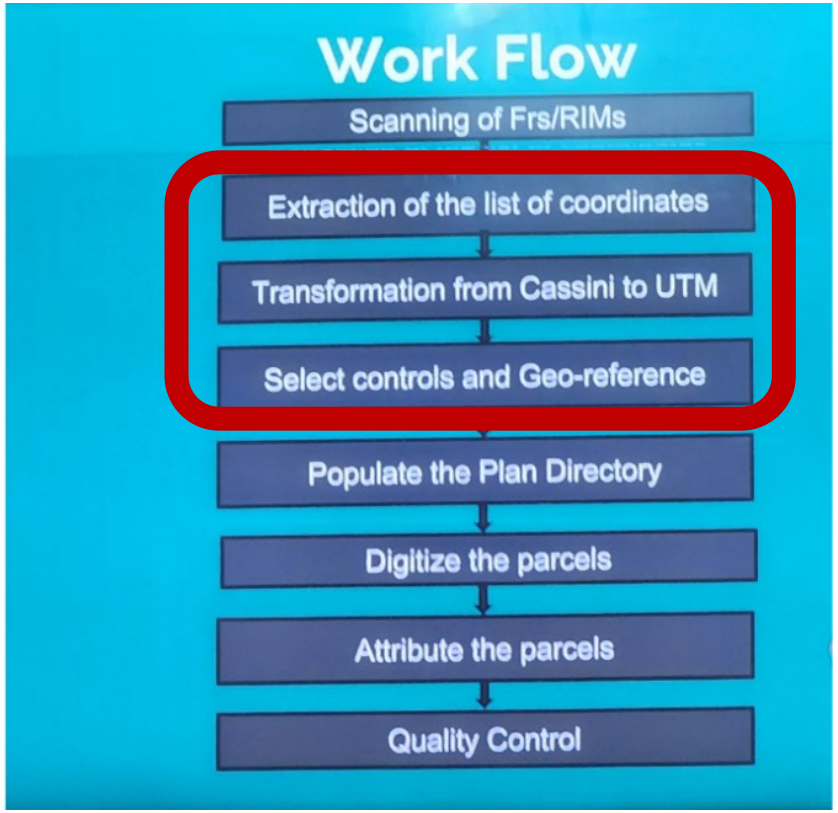
CapDev – Kenya – Land Administration

The long road to digitization in Kenya | GIM International - January 2025*

By Dennis Mbugua Muthama, Catherine Gateri



A visualization of the spatial data digitization workflow (captured during the Ardhisasa stakeholder meeting and training presentation in July 2024).

Geodetic-related activities required within this workflow….

Transformations and geo-referencing

*https://www.gim-international.com/content/article/the-long-road-to-digitization-in-kenya

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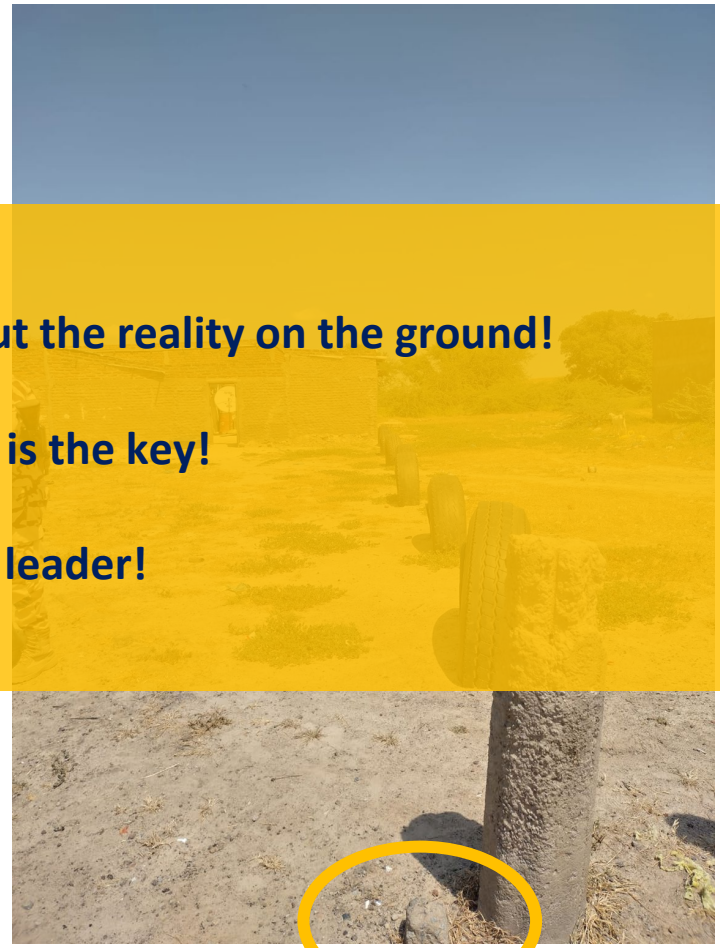
CapDev – Chad – Land Administration

Data Collection – Observations

CapDev – Chad – Land Administration

Data Collection – Observations



When we are discussing about accuracy and precision, let's not forget about the reality on the ground!

Besides accuracy and precision, the neighbors agreement is the key!

In the case of Chad, the role of the community/village leader!

CapDev – Land Administration Challenges

In Land Administration (LA), the importance of centimetre-level accuracy varies—sometimes it matters, but often what truly matters is the agreement between neighbours.

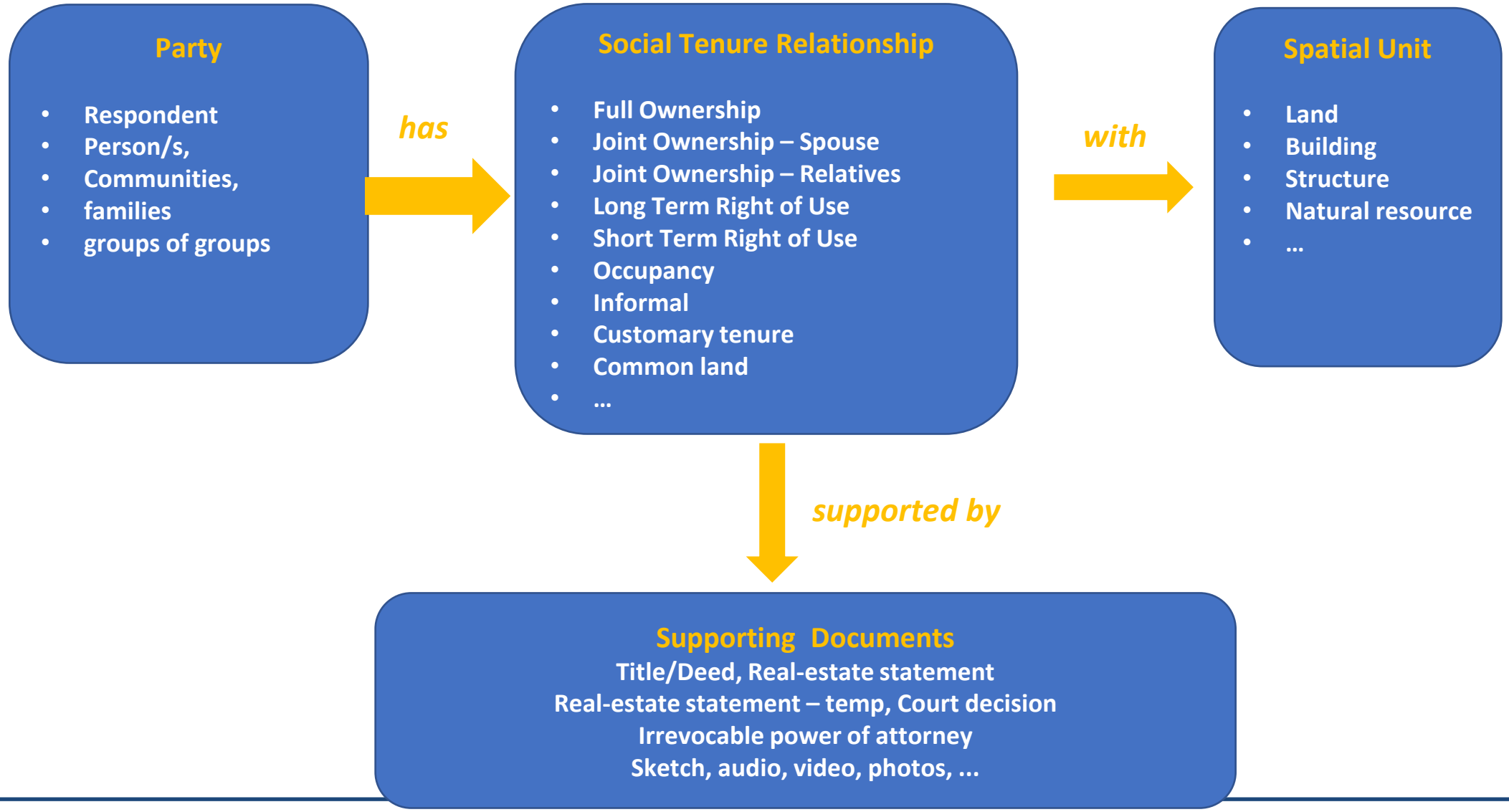
In **ICT systems and visualisation for LA, centimetre precision is relevant** unless overlapping claims or parcels are permitted.

Processes must be intuitive and easily understandable. For example, the GNSS antenna (with the stick) is effective in most cases because **people perceive boundaries based on where they place the 'stick.'**

Regarding **capacity developmen**t, education levels and technical expertise vary significantly across countries. While online courses are available, they may not always be accessible due to unstable internet connections and other barriers.

From **geodesy**, LA requires processes and tools that facilitate accurate and cost-effective distance measurements. This is particularly crucial in inaccessible areas, such as conflict zones, hazardous regions, dense forests, or underground spaces.

Finally, LA processes should support countries affected by natural disasters—such as earthquakes, floods, and fires—by enabling the quick and efficient adjustment of cadastral parcels and maps. While the technical aspects can be streamlined, governmental procedures present a separate challenge.



Eva-Maria Unger, Kadaster International
John Gitau, UN-Habitat, Global Land Tool Network

STDM as an Information Tool Implementations

Users

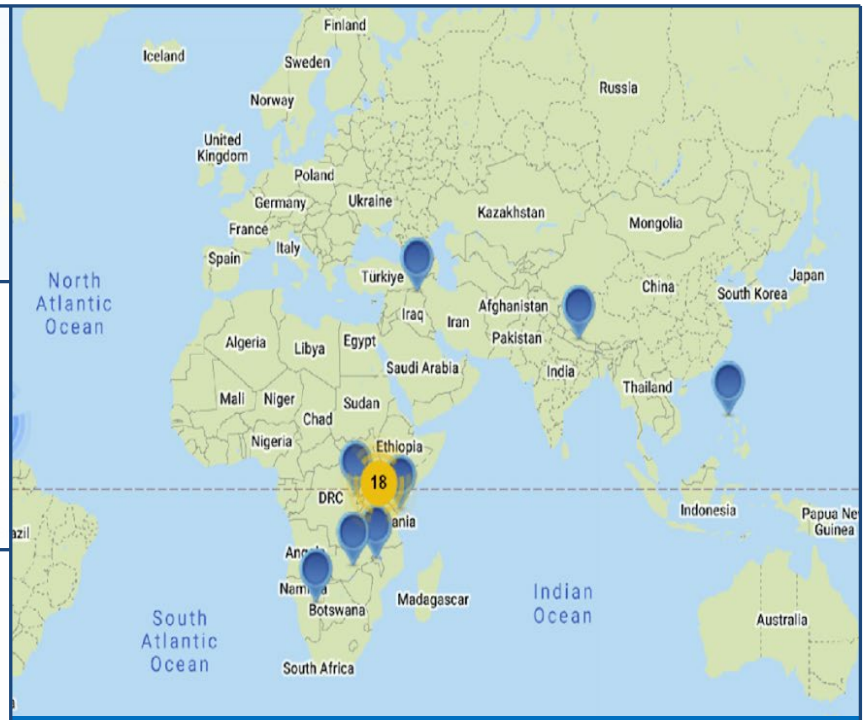
- Beneficiaries > 2.000.000
- Active users > 200.000
- Capacity developed > 5.000

Countries Using STDM

- African countries (7)
- In Asia (app. 6)
- Latin America (2)

Development and Implementation Team

- Regional office <10
- Country focal points > 20



Over 10 Countries, and 4 countries developed national land policies

Approximately 20+ projects (20M+)

Eva-Maria Unger, Kadaster International
John Gitau, UN-Habitat, Global Land Tool Network

CapDev – New Approaches in Land Admin

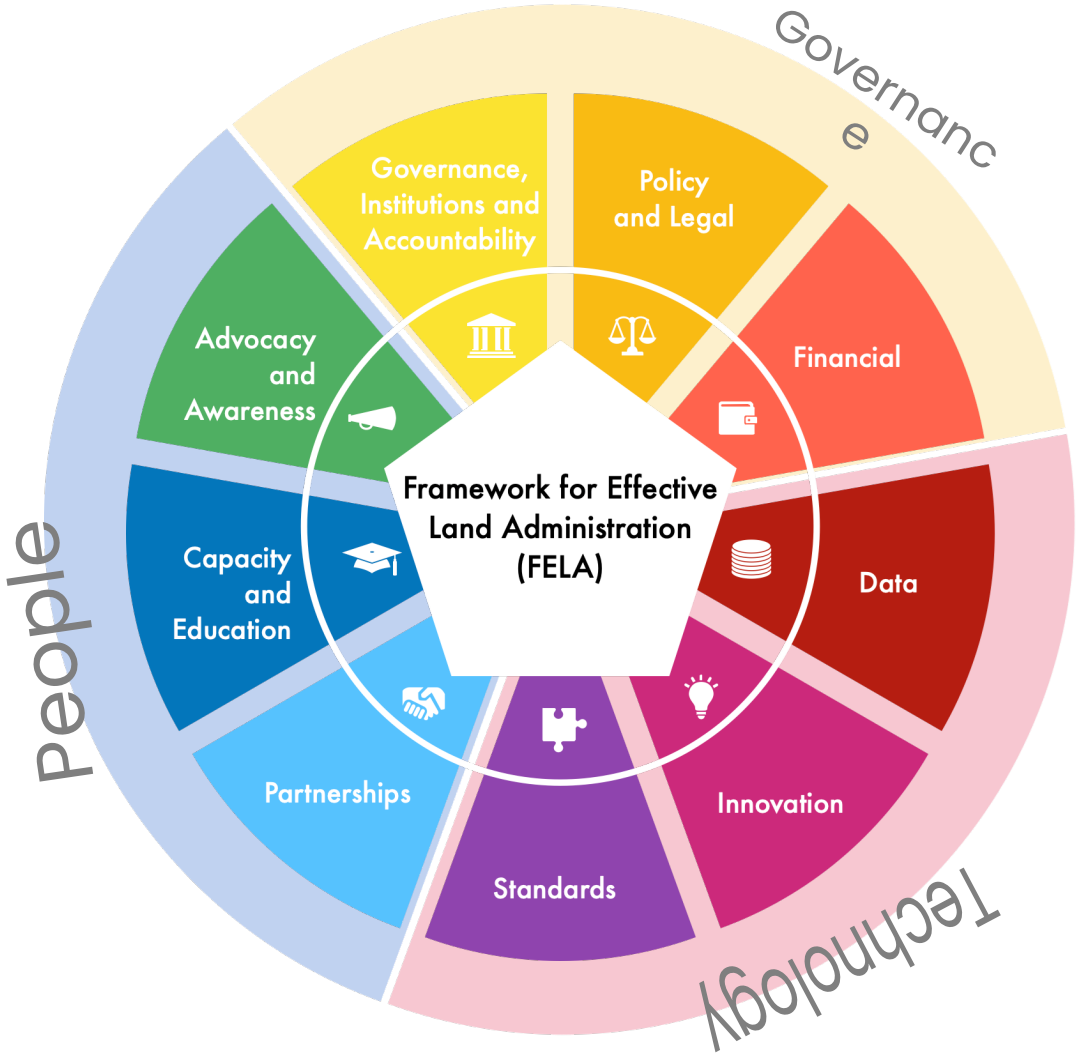
First of all, in LA the Global Land Tool Network (GLTN) is a **unique network that bring together NGOs, CSOs but also governments and industry**.

A lot of focus of GLTN is on **Capacity Development through in country work, publications, webinars and regional events/workshops** – a lot of the CD is also happening in cooperation with FIG and other Network partners.

That's also how STDM (Standard that is based on ISO LADM) was developed.

STDM is used in informal setting – and can bring benefits to communities in need – that can for example not be registered/mapped by the government (because it is informal).

FELA – the Framework for Effective Land Administration



- Adopted at 10th Session of UN-GGIM
- Global Framework for Land Administration

Application in Chad

- Used to raise awareness within leadership (link to SDGs and 2030 Agenda
- Used to develop guidance (baseline assessment prior and impact assessment post field work)
- Supported assessment As Is Situation and the Wants to Be Situation

CapDev – Framework for Effective Land Administration

FELA was developed by the UN-GGIM Expert Group on Land Administration and was adopted by the Member States.

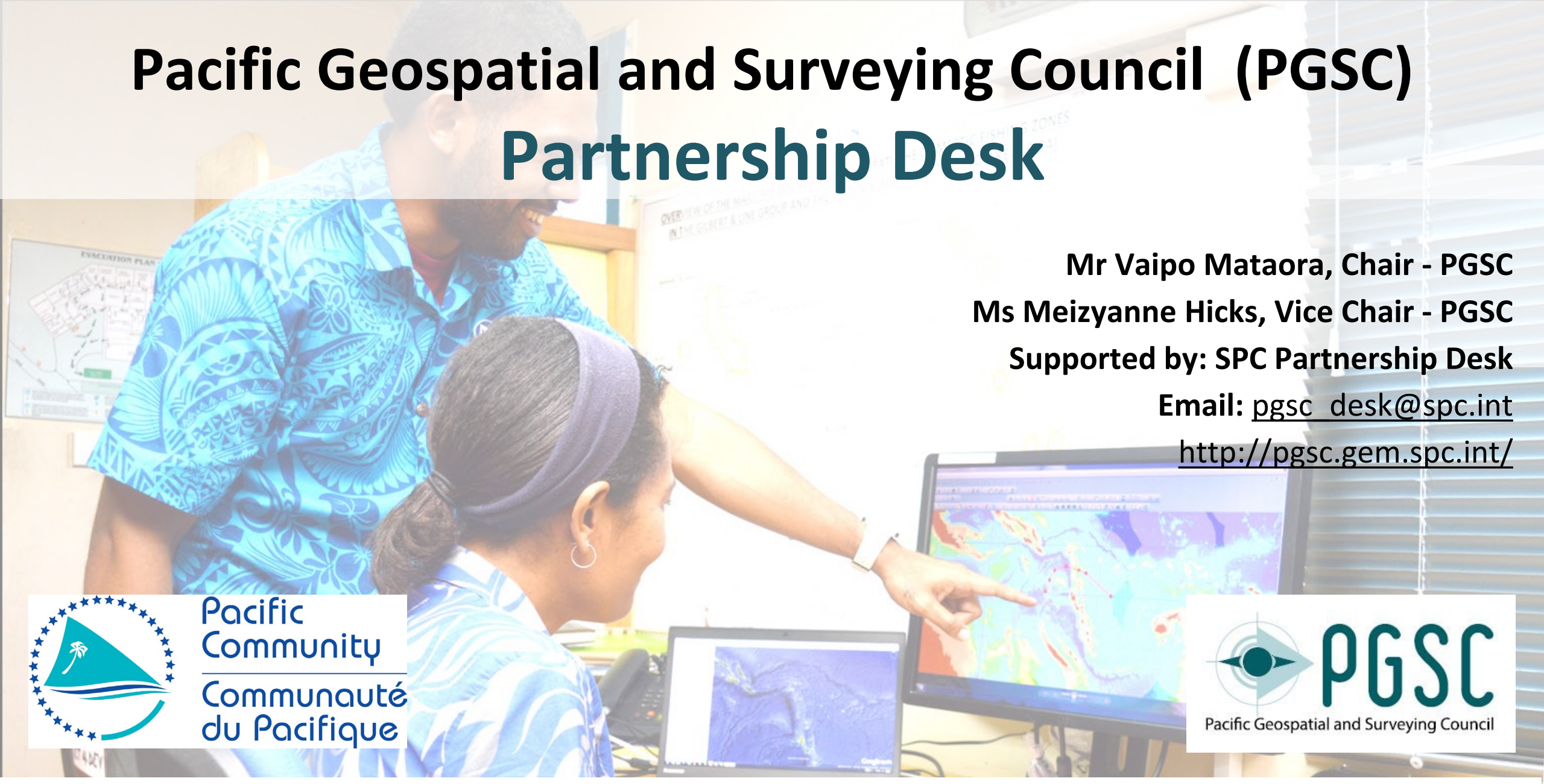
Though it is ‘just’ a framework, it finds its application as guiding policy document in various countries/applications.

Good thing in LA many ‘tools’ exist but all developed in silos – coordination and coherence among these tools/frameworks/policies is missing.

UN-GGIM
UNITED NATIONS INITIATIVE ON GLOBAL GEOSPATIAL INFORMATION MANAGEMENT

Pacific Geospatial and Surveying Council (PGSC)

Partnership Desk



Mr Vaipo Mataora, Chair - PGSC

Ms Meizyanne Hicks, Vice Chair - PGSC

Supported by: SPC Partnership Desk

Email: pgsc_desk@spc.int

http://pgsc.gem.spc.int/

Pacific Community
Communauté du Pacifique

PGSC
Pacific Geospatial and Surveying Council

Mission

PGSC
Pacific Geospatial and Surveying Council

Pacific Island survey and geospatial services, including hazard mapping, urban planning, cadastre mapping, hydrography, and other geospatial requirements for sustainable development, are sufficiently resourced to respond to member country priorities.

PGSC Partnership Desk

PGSC
Pacific Geospatial and Surveying Council

1. Facilitating Collaboration and Partnerships; Global & Regional Collaboration, Technical Assistance, Capacity Building
2. Supporting Sustainable Development Goals (SDGs); Geospatial Data , Surveying Techniques and Tools
3. Promoting Data Sharing and Standards; Data Management, Standards and Protocols
4. Disaster Risk Management and Climate Change Adaptation
5. Building Geospatial Infrastructure
6. Advocacy and Awareness
7. Providing Technical and Financial Resources
8. Supporting Maritime and Oceanographic Surveys

Communications & Community

PGSC
Pacific Geospatial and Surveying Council

Pacific Geospatial and Surveying Council

Public group · 1.3K members

https://www.facebook.com/groups/3998884766792177/

Home › Updates from SPC › Web Stories

Mapping our Pacific Geospatial Future

Suva | 21 June 2022

Imagine a world without maps. It's hard to do. Humans are born map-makers, instinctively looking for landmarks, making sense of patterns, and forming connections when we venture beyond our known environment.

For this reason, geospatial science may be one of the most important fields of study you have ever heard of. Geospatial information is location information. At its simplest, this can be topographical information found on a map. But you can also add in layers of location-tagged data, to show changes or trends, for example, in land use, population density, vaccine distribution, or coral reef health over time.

"If you look at Fiji's national development plan, there are so many areas where geospatial information comes in. There are calls


feature

Embracing challenges through Partnerships, Pacific Geospatial & Surveying Council (PGSC) and the Pacific Community (SPC)
By – Andrick Lal, Senior Geodetic Surveyor

Modern Geodetic Infrastructure – Key to Consistency and Efficiency
By – Sanjesh Kumar, Senior Surveyor; Asaikala Tabua, Surveyor-General Fiji

PGSC Partnership - Activities

- UN GGIM Integrated Geospatial Information Framework **IGIF Deep Dive Session**; November 2024
- UN-GGCE International Workshop on the Integration of Terrestrial, Maritime, Built, and Cadastral Domains: **“Joining Land and Sea”**; December 2024
- FIG Working Week (Brisbane) – **SIDS Session**; April 2025
- **GNSS Applications and Capacity** Workshop (COSPPac); May 2025
- IAG/GGOS Geohazards Focus Area, IUGG GeoRisk Commission, IUGG Joint Tsunami Commission, **GeTEWS Oceania Workshop**; November 2025

PGSC Partnership Desk - Capacity

- PGSC Coordinator – SPC Partnership Desk
- PGSC Communications – SPC Partnership Desk
- Regional Positioning – GNSS & Tide Gauge (equipment pool) for PICs

UN-GGIM:Americas
REGIONAL COMMITTEE OF UNITED NATIONS ON GLOBAL GEOSPATIAL INFORMATION MANAGEMENT FOR THE AMERICAS

Structure of UN-GGIM: Americas

Leadership

- President: **Sofía Nilo Crisóstomo**
- Vice-President: **Leonardo Scharth Loureiro**
- Executive Secretary: **Pamela Castillo**
- Board Members (Vocales)
  - **Gabriela García Seco**, North America
  - **Isis Tejada**, Central América
  - **Simone Lloyd**, Caribbean
  - **Marcelo Emery**, South America

Working Groups and Networks

Working Groups

- Integration of Statistical and Geospatial Information
- Disasters
- **Geodesy (GRFA)**
- Integrated Geospatial Information Framework
- Land Administration (in process of implementation)

- **Networks**
  - ANA - **Rosario Casanova**
  - Private Sector – **Valrie Grant**

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SIRGAS WG 2

Technical guidelines

- Guidelines for the Coordination of the SIRGAS Continuously Operating Network (SIRGAS-CON)
- Guidelines for the installation, operation and registration of SIRGAS-CON stations
- Guidelines for SIRGAS Analysis Centers
- Guidelines for IHRF station selection
- Guidelines for performing gravimetric measurements around IHRF stations

Recommendations

- IGS site guidelines
- Monumentation of permanent GNSS stations ? UNAVCO
- Physical Site Specifications: Geodetic Site Monumentation (W.L. Combrinck and M. Schmidt)
- NOAA/NGS Guidelines for establishing and operating CORS

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SIRGAS WG 3 - Training activities

2022 - Workshop "Vertical Reference Systems" – Santiago, Chile

November 2 to 4. 14 assistants from 6 countries.

2023 - 14th International School on "The Determination and Use of the Geoid" – Buenos Aires, Argentina

November 13 to 17. The school was held in cooperation with the International Service for the Geoid from the International Association of Geodesy. 40 assistants from 14 countries.

2024 - SIRGAS Symposium

November TBD. To train scientists, professionals and technicians from national mapping agencies, universities and research centers in the most modern geodetic techniques linked to the geocentric, altimetric and gravimetric reference frameworks.

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ACADEMIC NETWORK UN-GGIM: AMERICAS

Collaboration working groups

- Aguascalientes Declaration
- Capacity Development WG

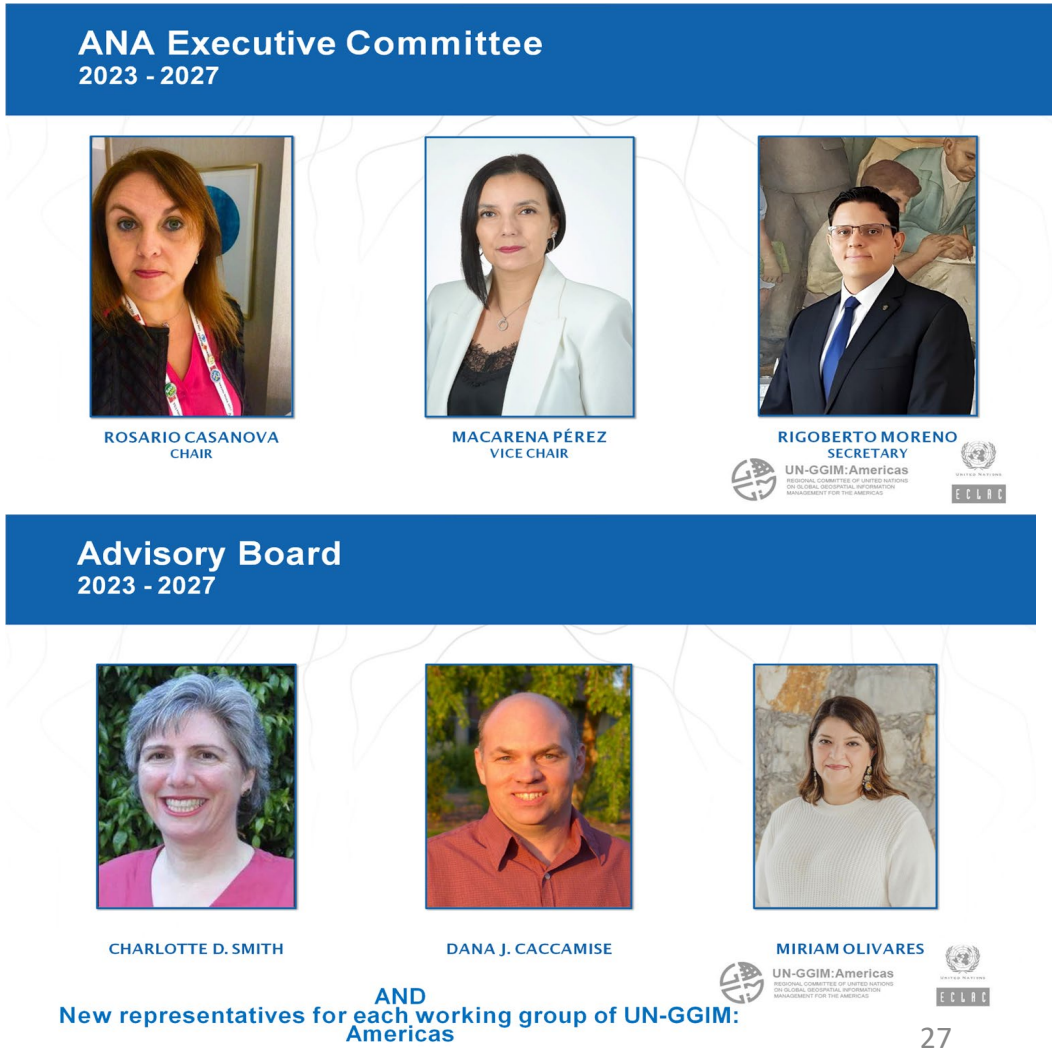
Education/webinars

- As part of the activities of UN-GGIM: Americas
- Diffusion of other educational activities from partners

Geo-Ethics

- Include SDG in Academic Curriculum
- Ethical use of Geospatial Data

Inventory of courses related to Geospatial Data



Translation documents IGIF

TRANSLATION TEAM


Mikael Lilje


Sergio Cimbaro


Paul L. Riley


Rosario Casanova

The overall ambition of the Translation Team (TT)is:

- to help promote the UN-IGIF documents widely in support of improved geospatial information management for sustainable development.
- to help foster the launch of as many language tracks as possible.

FRENCH TEAM	BELGIUM – Sandrine D'Hoedt CANADA – Eric Loubier


Sandrine D'Hoedt


Eric Loubier

ARABIC TEAM	KINGDOM OF MOROCCO – Nabila Licer KINGDOM OF SAUDI ARABIA - Mohammad Abdoh AlMabrook UNITED ARAB EMIRATES - Mohamed Gheta


Nabila Licer


Mohammad Almabrook

PORTUGUESE TEAM	BRAZIL – Rafael Lopes da Silva MOZAMBIQUE – Odete Semiao


Rafael Lopes da Silva

SPANISH TEAM	ARGENTINA – Sergio Cimbaro MEXICO – Gabriela García Secco


Sergio Cimbaro


Gabriela García Seco

SERBIAN TEAM	SERBIA – Ljiljana Živković


Ljiljana Živković

RUSSIAN TEAM	RUSSIA – Alexey Trifonov

GERMAN TEAM	GERMANY – Gwendolin Seidner


Gwendolin Seidner

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UNITED NATIONS
ECLAC

HOW

NETWORKS

- Standards Network
- Regional Capacity Network
  - Americas
  - Africa ARN (African Regional Network)
  - Asia/Pacific AP-CDN (Capability Development Network)
- Young Surveyors Network (YSN)

Americas Capacity Development: Outcomes of the Orlando Declaration

- FIG Council established the Americas CDN in August 2023
- Spans all of the Americas: Subregions for Caribbean, Latin America & North America
- To address concerns of all Nation States, territories and constituent countries
- Build capacity and capability outside of the government agencies in FIG constituents

News in 2023

FIG Council establishes new Regional Network

August 2023

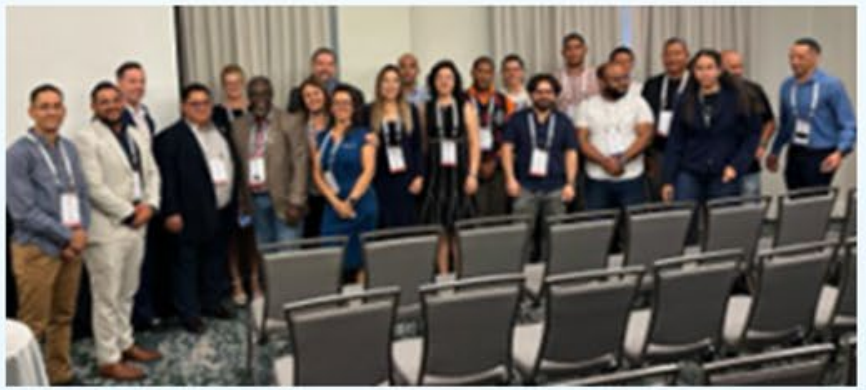
A new FIG Regional Network has been born. This is the third FIG Regional Network and covers the entire Americas region.

The Regional Capacity Development Network originates from the **Africa Task Force 2009-2014** that delivered a clear direction for African member Associations to actively increase their presence in FIG. This resulted in the first Regional Network in Africa (ARN). The idea was to have a global network operationalised on a Regional basis. Initially, the CDN was expanded to include the Asia-Pacific region (AP-CDN).

The appointed Chair of the Network, Dan Roman US, presents the proposal for a new Regional Capacity Building Network in the Americas region for the General Assembly in Orlando, Florida, 1 June 2023.

Focus Areas

- Establishing contact with existing subregional and regional organizations
- Find and engage with national professional societies
- Connect national professional societies with their respective governments
- Work within FIG to ensure action and activity throughout the Americas



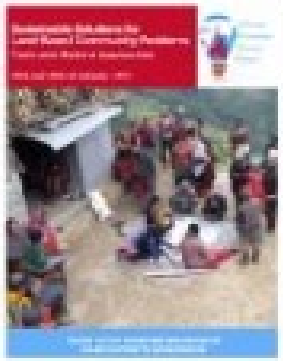
HOW

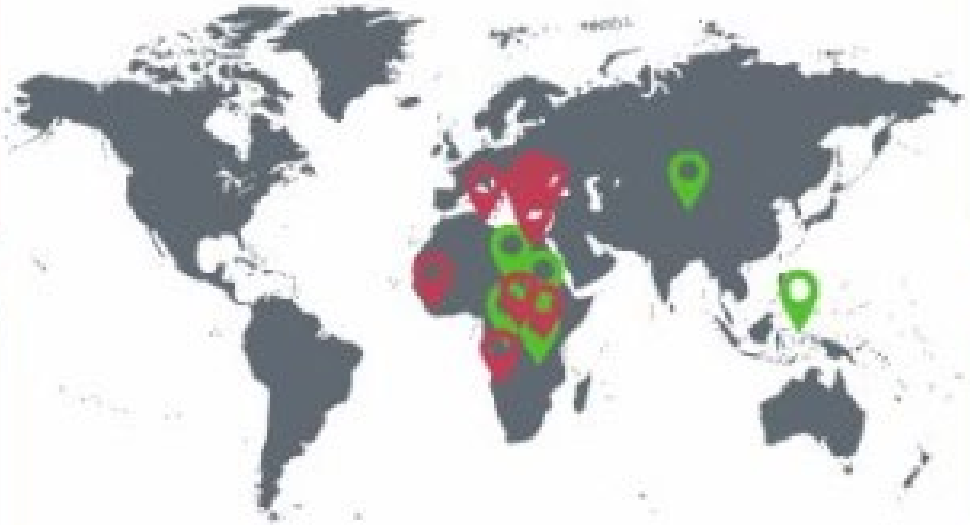
FIG YOUNG SURVEYORS NETWORK

- To **improve** the number of young professionals participating within FIG.
- To **help** young professionals in the beginning of their careers with contacts.
- To **increase** co-operation between the commissions and the students and young professionals network.

HOW

Volunteer Community Surveyor Programme





in-Country Deployments

2015 - 2021 (green):
6 Countries
2 Opportunity Partners
7 GLTN Partners
20 VCSs
7 VCS Mentors

2022-2023 (red):
9 Countries
2 Opportunity Partners
8 GLTN Partners
15 more VCSs
15 VCS Mentors

VCSP Wisdom Workshop

3 seperate workshops and MOOCS with over 250 participants from over 40 countries globally

Knowledge Portal

Comprehensive and ambitious structure
Technical development well underway
On track for 2024 delivery

VCSP e-Volunteering

3 Mapathons
2 Countries, 1 global
140 + Mappers (45+ countries)
3 Opportunity Partners
37,000+ Features Mapped

FIG Asia Pacific Capacity Development Network

FIG AP CDN - Delivery of Capacity Development (1)

- **Promote and create an awareness of the geodetic / geospatial profession** through an effective technology-based marketing campaign
- **Evaluate the geodetic / geospatial capability** – status, determine immediate needs, future core capabilities, educational and training requirements, institutional curriculum, mutual recognition of qualifications
- Developed mechanisms to **access and exchange information and experience** w.r.t geodetic / geospatial technical developments, data management, operations, applications
- Create **opportunities for professional development, mentoring, sponsorship**
- Provision of "advice" through **workshops, forums, meetings, seminars**
- Collaborate to **form alliances with "like minded agencies**", and
  - Professional / Scientific organisations - ASEAN Flag, PGSC, FIG, IAG, LINZ, Geoscience Australia, NGS, SSSI, SSNZ, RICS
  - Academic / Educational institutions (secondary / tertiary) – USP, University of Fiji, UNSW, RMIT, University Otago
  - International agencies - UN GGIM, UN ICG, UN SCoG – ETCB, World Bank

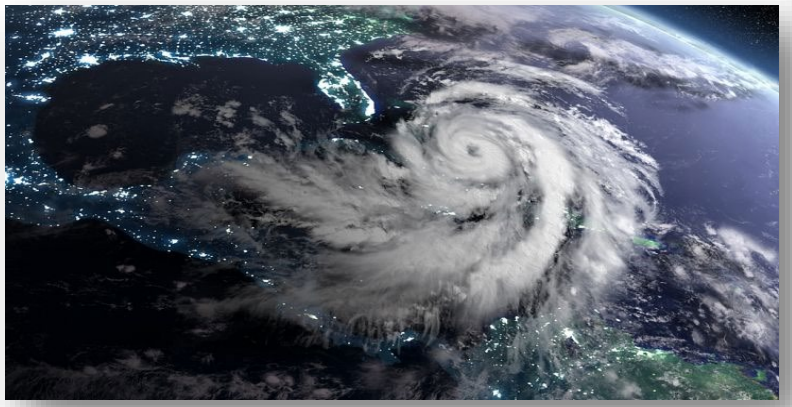
What is a Disaster?

https://www.undrr.org/

Natural hazards:
Earthquake, volcanic eruption, mass movement (landslide, debris flow, avalanche), windstorm (including tropical cyclone, tornado, blizzard etc.), flood, tsunami, drought, forest fire.

Technological ("man-made")hazards:
Industrial pollution, nuclear activities and radioactivity, toxic wastes, dam failures; transport, industrial or technological accidents (explosions, fires, spills).

UNDRR
UN Office for Disaster Risk Reduction

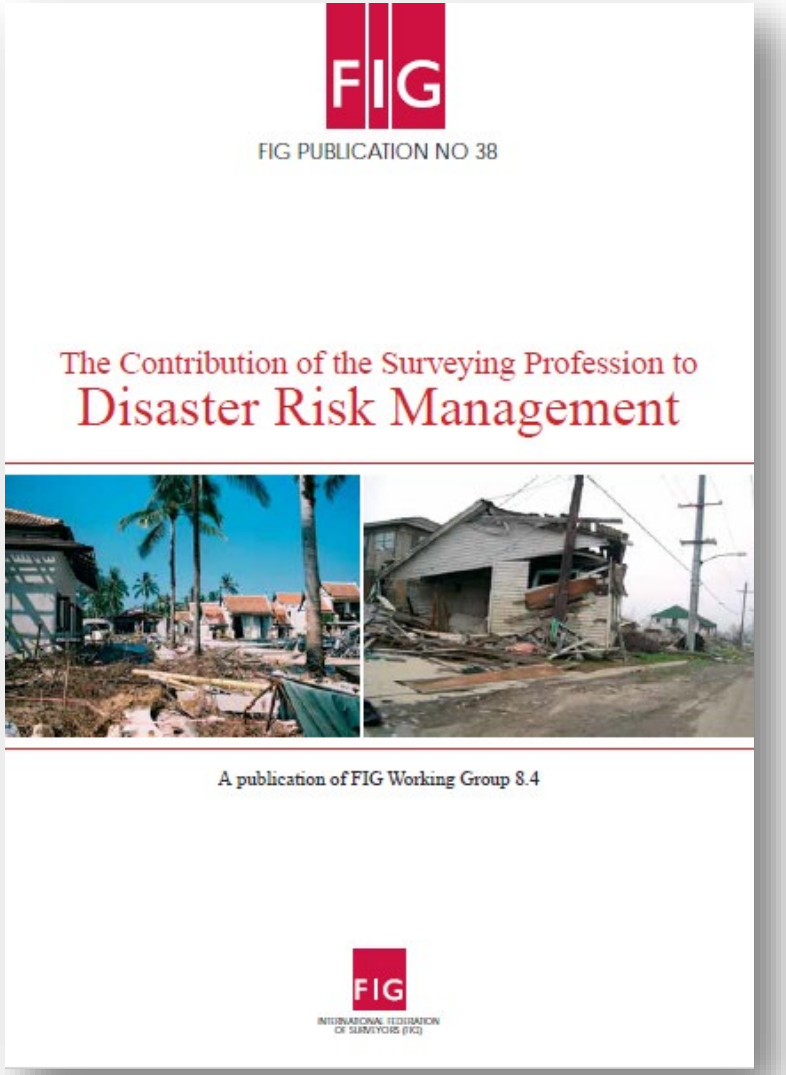


Capabilities of Surveyors

Surveyors' capabilities make an important contribution to improve the outcomes of the disaster risk reduction and resilience …..

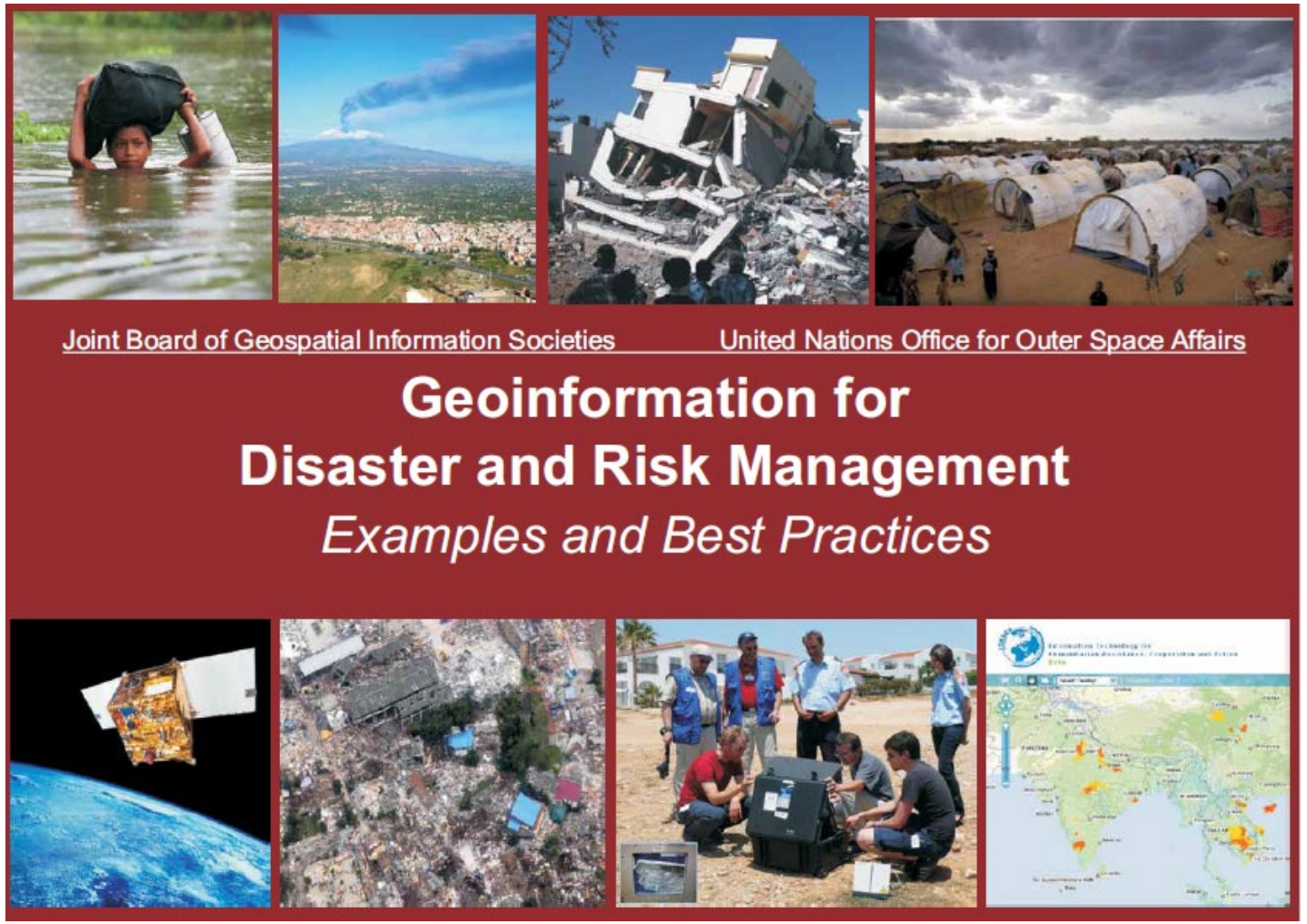
Through the supply of geospatial / geodetic information from a combination methods and measures

- **before** (risk analysis, prevention, preparedness),
- **during** *(*emergency planning) and
- **after** a disaster (reconstruction).

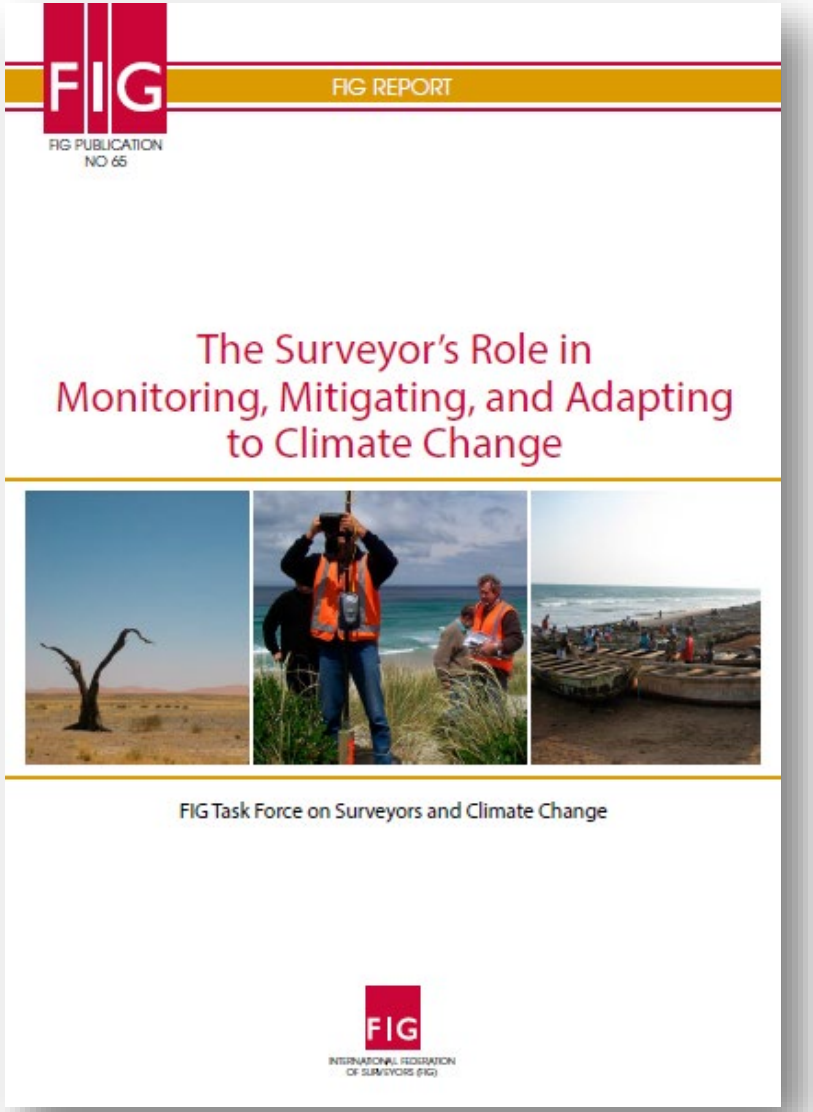


https://www.fig.net/resources/publications/figpub/pub38/figpub38.asp

Capabilities of Surveyors - Publications



https://www.fig.net/resources/publications/Geospatial_societies/Geoinformation_for_Dasaster_and_Risk_Management.pdf



https://www.fig.net/resources/publications/figpub/pub65/figpub65.asp

https://www.undrr.org/publication/strategic-approach-capacity-development-implementation-sendai-framework-disaster-risk#downloads

a vision of risk-informed sustainable development by 2030

Concise Guide

Strategic Approach to Capacity Development for Implementation of the Sendai Framework for Disaster Risk Reduction

CD for DRR Obstacles and Challenges

1. Insufficient understanding/appreciation of DRR-specific CD needs
2. Over-reliance on training and education
3. A lack of access to or existence of facilities, programmes, or resources to support awareness
4. Failing to provide support for or access to CD for DRR
5. Insufficient availability of resources
6. Little or no local ownership of CD programmes and projects
7. Insufficient focus on sub-national capacity
8. Lack of standardized CD for DRR evaluation indicators
9. Lack of general awareness and knowledge of risk drivers and the stakeholders' DRR roles (including at the local level)
10. A lack of understanding of existing legal instruments
11. A focus on non-conflict areas

Strategic Collaboration is the Key !

Co-operate and Communicate with organisations who represent a diverse group of members

*Work **collaboratively** to* build the ***capabilities*** of geodetic and geospatial professional to meet the ***challenges of the future***

Insights

Being able to communicate your needs, your skills and the benefits that geodesy can provide, is critical BEFORE asking for CD Support

- **Human** - technical training and review on CORS network design
- **Fiscal** - funds (how much, by when) needed to upgrade CORS to multi-constellation
- **Equipment** - IT infrastructure and data storage required to support new CORS
- **Expertise** - in field installation of CORS and IT; configuration
- **Data** - new archiving and QC; data sharing with IGS / regional partners; data analysis, determining geodetic products; scientific and societal applications
- **Planning** - consider the Joint Global Geodesy Development Plan

Capacity Development Requests - terms to include

- **Request | Purpose | Partners | Benefits | Quantity | Why | Cost**

If you require support to summarise your needs, the GGCE is here to help

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Useful Contacts to first approach for CD

ORGANISATION	TYPE	COMMENTS
UN-GGIM Regions Americas, Africa, Asia Pacific, Europe	NGO	Reaching out to regional neighbours is the first recommendation
IUGG-IAG IGS	NfP Association	
FIG and its regional networks	NGO, Not for Profit	As a Volunteer organisation,
Surveying Associations	Typically private	Usually have deep contacts at a national level with working groups

For all of these, feel free to ask the GGCE to assist with the connections

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Partners - some may have funding capacity

International bodies

UNITED NATIONS

UN-GGCE

THE WORLD BANK

UN-GGIM
UNITED NATIONS INITIATIVE ON GLOBAL GEOSPATIAL INFORMATION MANAGEMENT

FAO
FIAT PANIS

GLTN
GLOBAL LAND TOOL NETWORK

UN HABITAT
FOR A BETTER URBAN FUTURE

Organisations

IAG

ICA
ACI

IGU
UGI

GRSS

IMIA

ISDE

isprs

IUGG
UGGI

FIG

PGSC
Pacific Geospatial and Surveying Council

Other International Organisations

STAND FOR HER LAND

Habitat for Humanity

SOLID GROUND

Summary - Capacity Development

''Building capabilities (skills) will develop capacity''

- Groups are out there in countries, regions and internationally
- Collaboration is the main catalyst in Capacity Development

Main Takeaways

- Assistance is always available - just ask around
- Asking for it is not a weakness
- Be clear and objective about what you are asking for
- Communicating a clear request for CD is important
- Communicating the clear offer of CD is important
- Reach out, participate, collaborate
- Craft a pragmatic Business Case for investment (*tomorrow*)

Communications and Marketing is critical to crafting a successful 'request/offer' of assistance

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Further Actions

Publications

- Various publications mentioned, including DRR
- Australian Geospatial Reference System Compendium

Websites?

Videos?

Please share your Case Studies with us!

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