UNITED NATIONS GLOBAL GEODETIC CENTRE OF EXCELLENCE

MODERNISING GEOSPATIAL REFERENCE SYSTEM CAPACITY DEVELOPMENT WORKSHOP

Opening, Overview and Introduction

Nicholas Brown
Head of Office, UN-GGCE

Why are we here?

Bringing together geodetic professionals to advance collaboration and modernize geospatial reference systems

STRONGER.
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The UN-GGCE envisions…

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… future where ALL countries have strong political support for geodesy …

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.. to assist with the implementation of UN General Assembly Resolution 69/266

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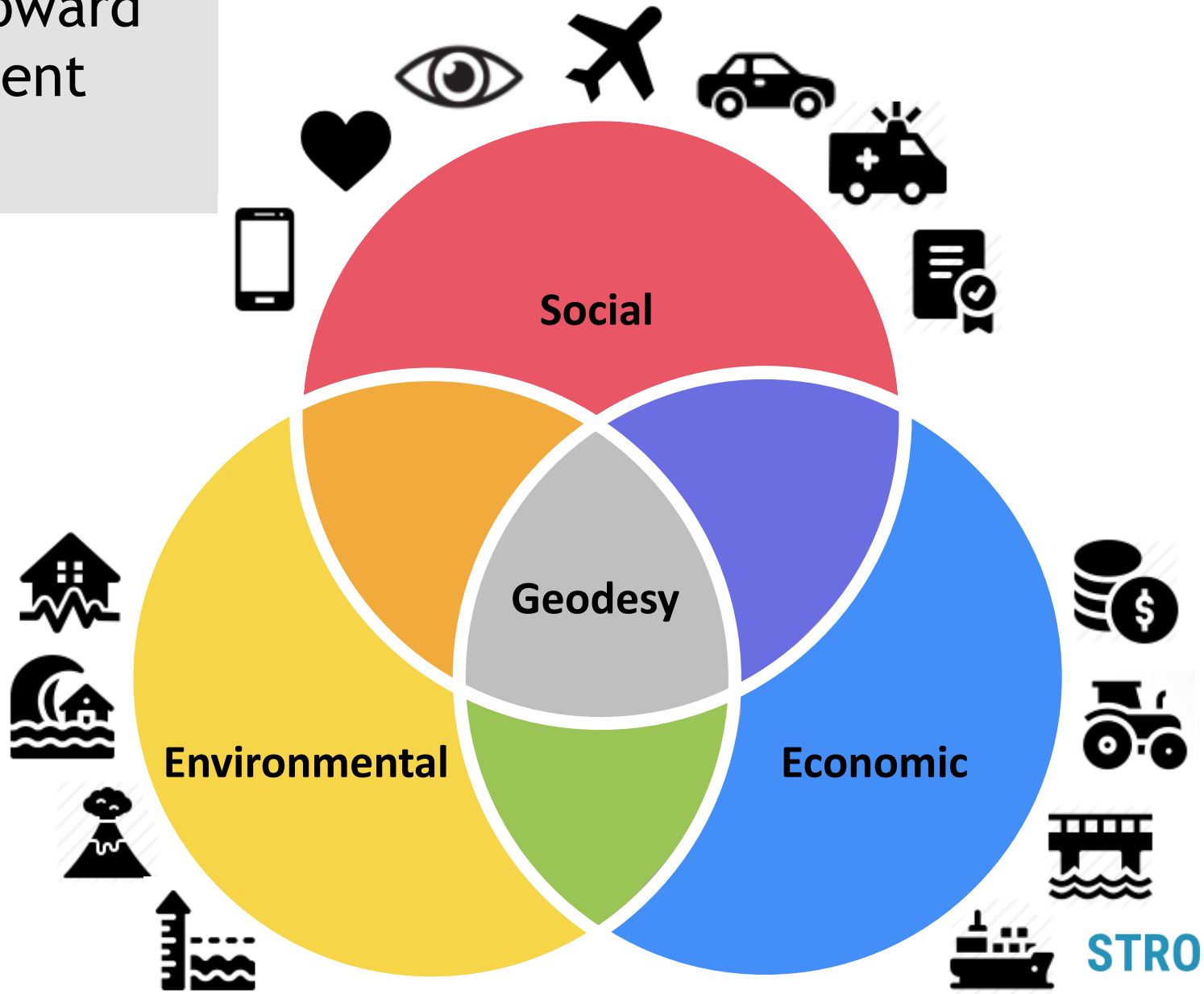
… accelerating progress toward the Sustainable Development Goals (SDGs)…

Geodesy

"Science of measuring the **shape**, **orientation** and **gravity field** of the Earth and how it changes over **time**."



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Workshop style

Interactive and Informal

- The agenda and PowerPoint slides are GUIDANCE for us.
- If you have something to contribute, please raise your hand and whoever is leading the discussion will invite you to contribute.
- There will be times the presenter will ask who has experience on a topic and invite you to give examples.

Collaborative

- Build teamwork and networks
- Share ideas
- Collective problem-solving

Workshop Components

WHY?

Evidence about the Importance of Geodesy

- Highlight the value of geodesy to decision-makers
- Support efforts to secure increased investment in geodetic infrastructure and capacity

HOW?

Modern Geodetic Reference Systems (GRS) and Technical Guidance

- Introduce concept of a modern GRS
- Provide step-by-step guidance on creation, access, use and sustainability
- Examples of key processes: geodetic adjustments...
- Standards

WHAT?

Capacity Development Needs

- Geodesy Initiatives and Partners

WHERE?

Communications and Stakeholder Engagement

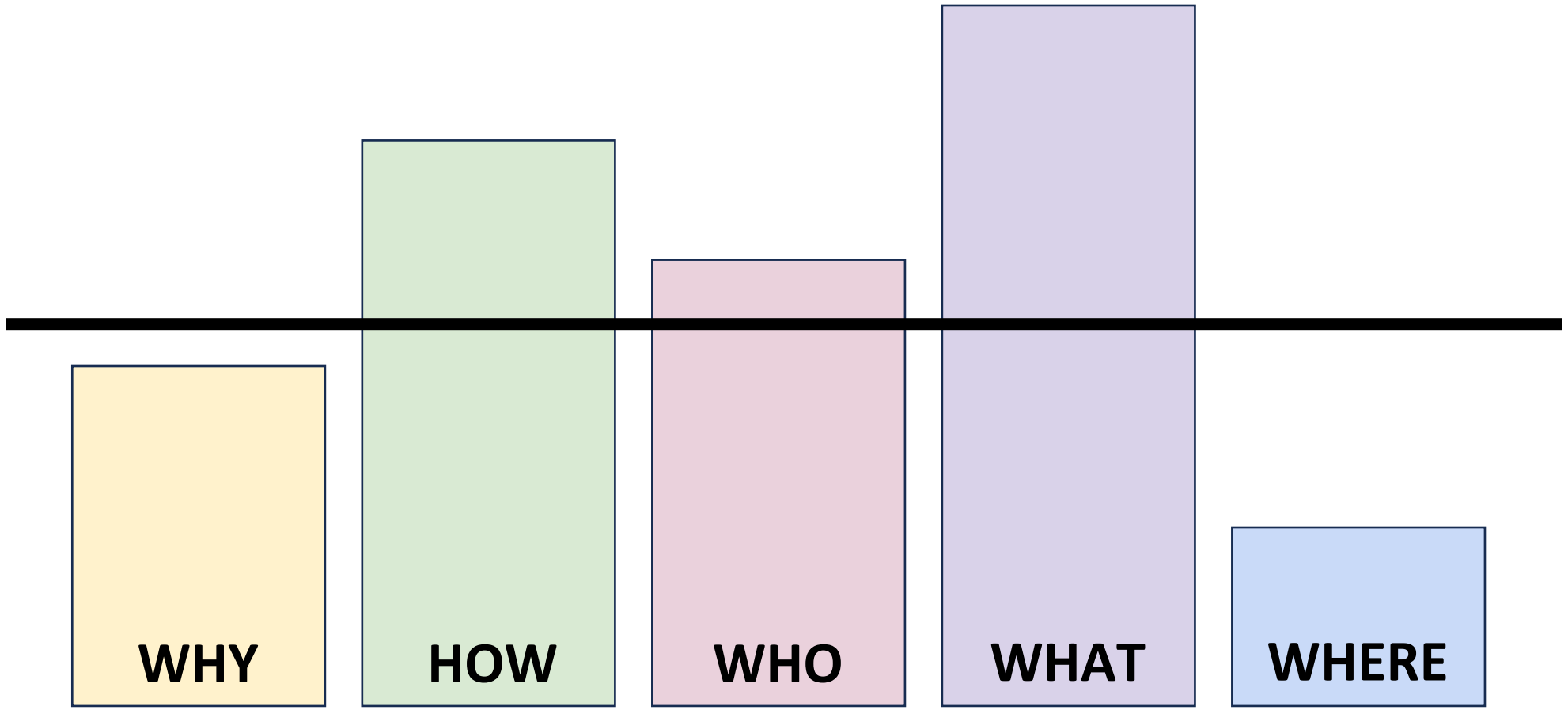
- Support in creating an engagement plan to involve stakeholders

WHO?

Governance Structures and Geodetic Collaborations

- Guidance on building governance frameworks to manage GRS modernization

Workshop Components



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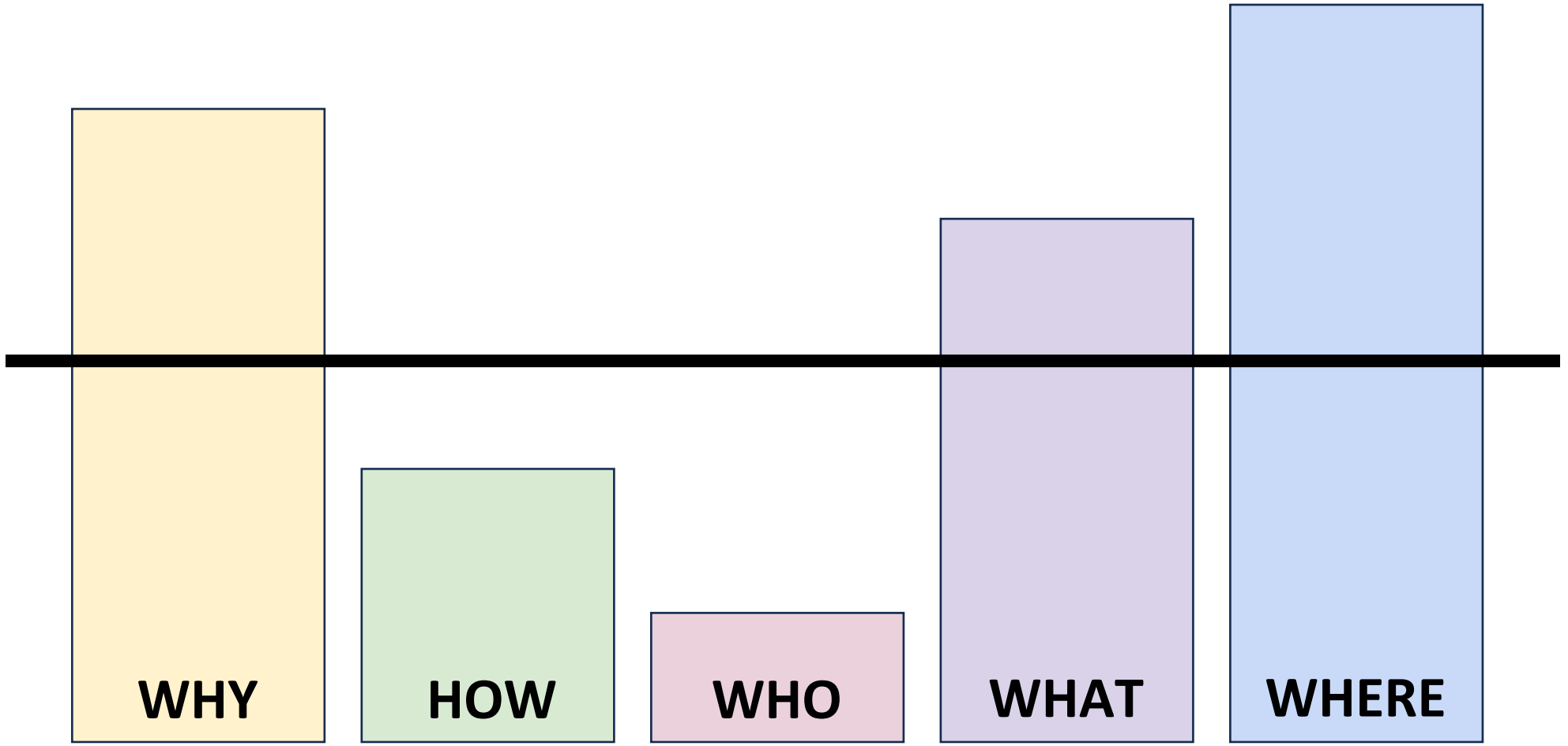
Workshop Components



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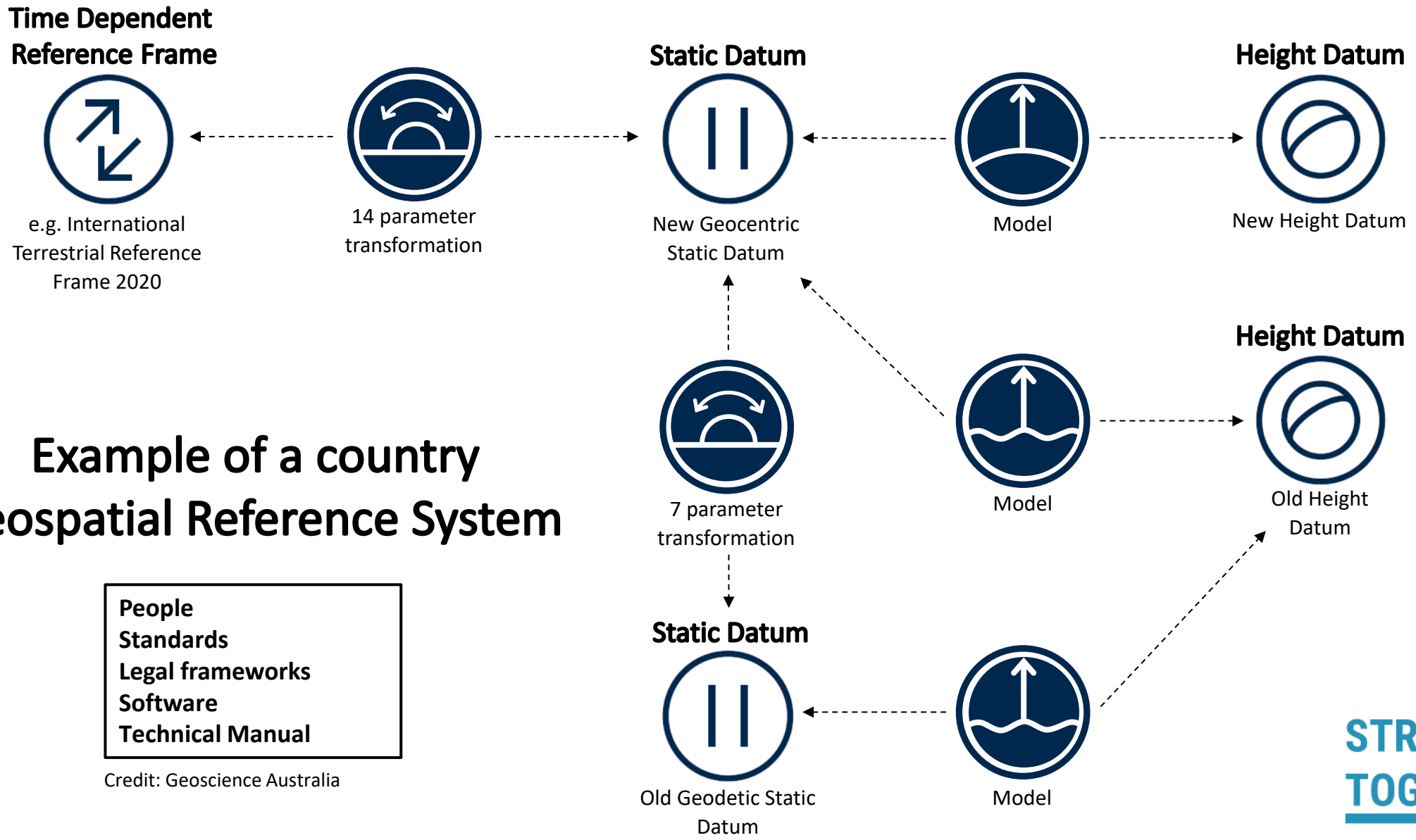
Geospatial Reference System



Example of a country Geospatial Reference System

People
Standards
Legal frameworks
Software
Technical Manual

Credit: Geoscience Australia

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Housekeeping

Mobile Phones:
- Please keep your phones on silent during sessions to avoid disruptions.

Water Stations:
- Complementary bottled water throughout the workshop

Safe Space:
- This workshop is a safe space. We encourage respectful, open dialogue. Please report any concerns to the support team.

Daily Signature:
- Sign the attendance sheet with administrative officer.

Evaluation forms:
- Will be distributed Day 1 and Collected Last Day of Workshop (5) to assess the content and delivery of each session.

Mentimeter Tool:
- For interactive polling and discussions at www.menti.com

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Timing

Security and Registration:

- 08:30 – 09:00 am each day

Workshop Timings:

- **Start**: 9:00 am each day
- **End**: 5:00 pm each day

Breaks:

- **Morning Break:** 10:30 – 11:00 am
- **Lunch:** 12:30 – 1:30 pm
- **Afternoon Break:** 3:00 – 3:30 pm

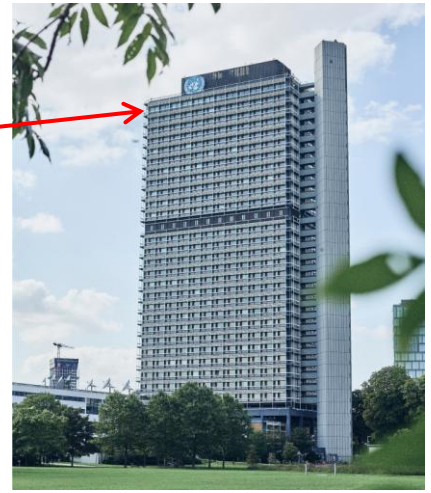
Venue information

At Our Conference Building (Climate Tower) > First Floor

- First Aid: Room: F-1-202 (First Aid Room)
- Vending Machine
- All-Gender / Disabled Restrooms available on ground floor

For Lunch: will be served on the 29th Floor at the **Langer Eugen (LEU)** Building. At LEU:

- Vending Machine 026
- First Aid: Room: 031
- Restrooms available at ground and 29th floors
- Meditation and prayers room at ground floor (next to Lounge)



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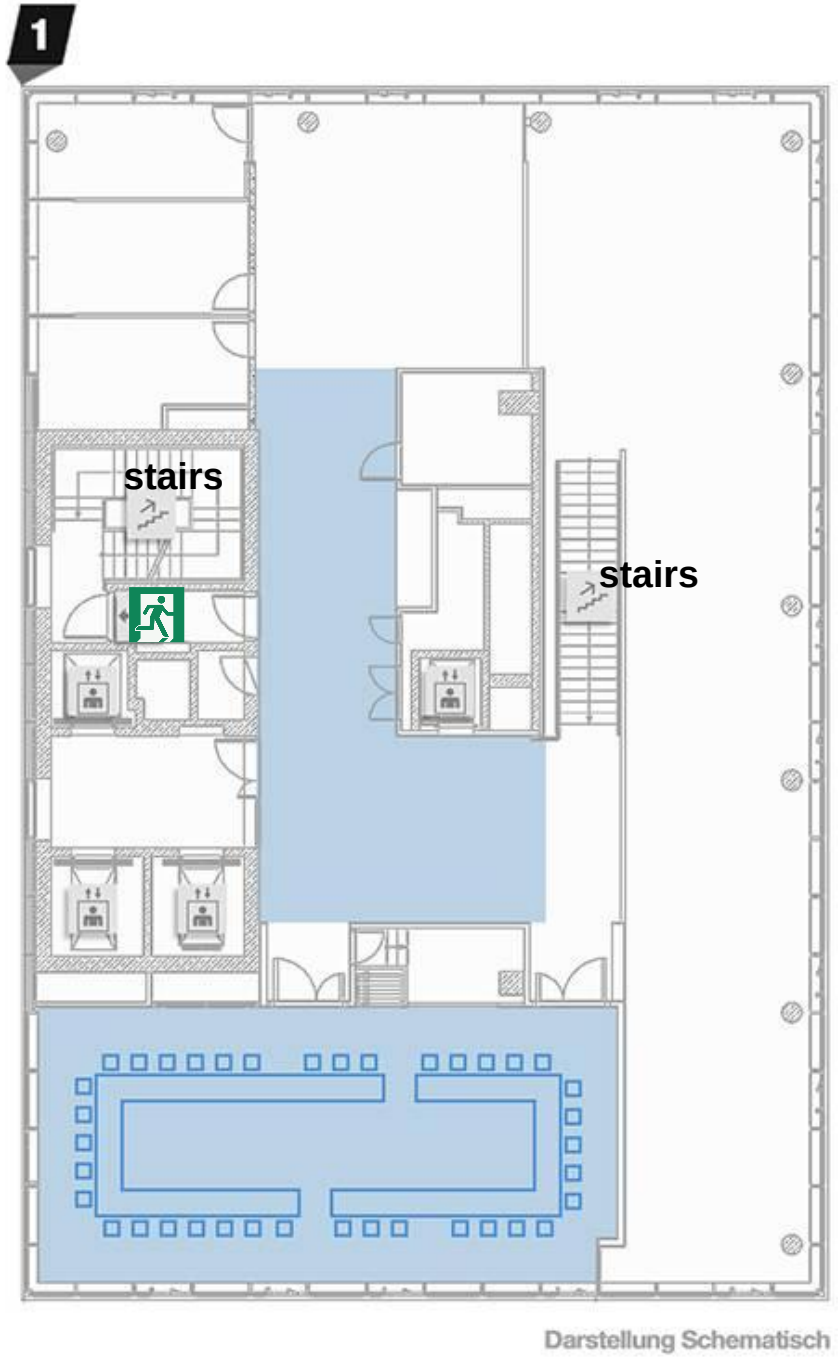
Emergency

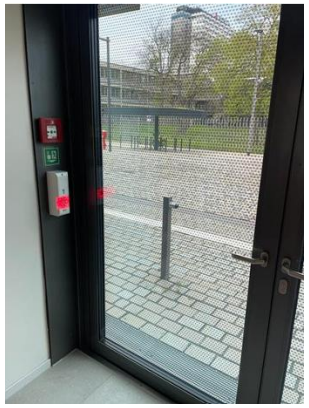
In case of an emergency, please follow the **exit signs** and instructions from the safety personnel.

Emergency exits are highlighted on the right map

First Aid kit is Available in kitchen



Proceed down the emergency stairwell.



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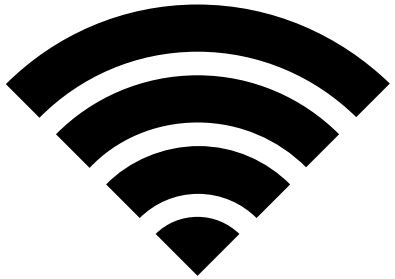
Wifi

Open network available

Network SSID

- At conference building: **PlugNPlay**
- At restaurant: **UN Bonn**



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Local Support Contacts

Local Support: For any immediate security assistance, please contact security team at registration booth (Entrance).

Or contact workshop focal point:

Mr Nicholas BROWN
Substantive Officer and overall event coordination
+61 413 857 609 (WhatsApp)

Ms Walaa ALLAHHAM
Available for assistance with logistics, participant check-ins, attendance records, and technology-related issues, including Wi-Fi, audio-visual equipment, and other technical or administrative support needs.
+49 151 70 11 3382 (WhatsApp + Calling)

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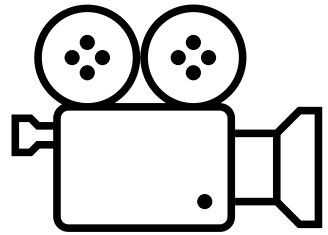
Consent

Consent on Recording:

- This workshop is recorded. Recordings will be published on the UN-GGCE website.
- If you don't want your voice, image or comments shared online, please let Nick or Walaa know and we will ensure you are removed in the editing process.



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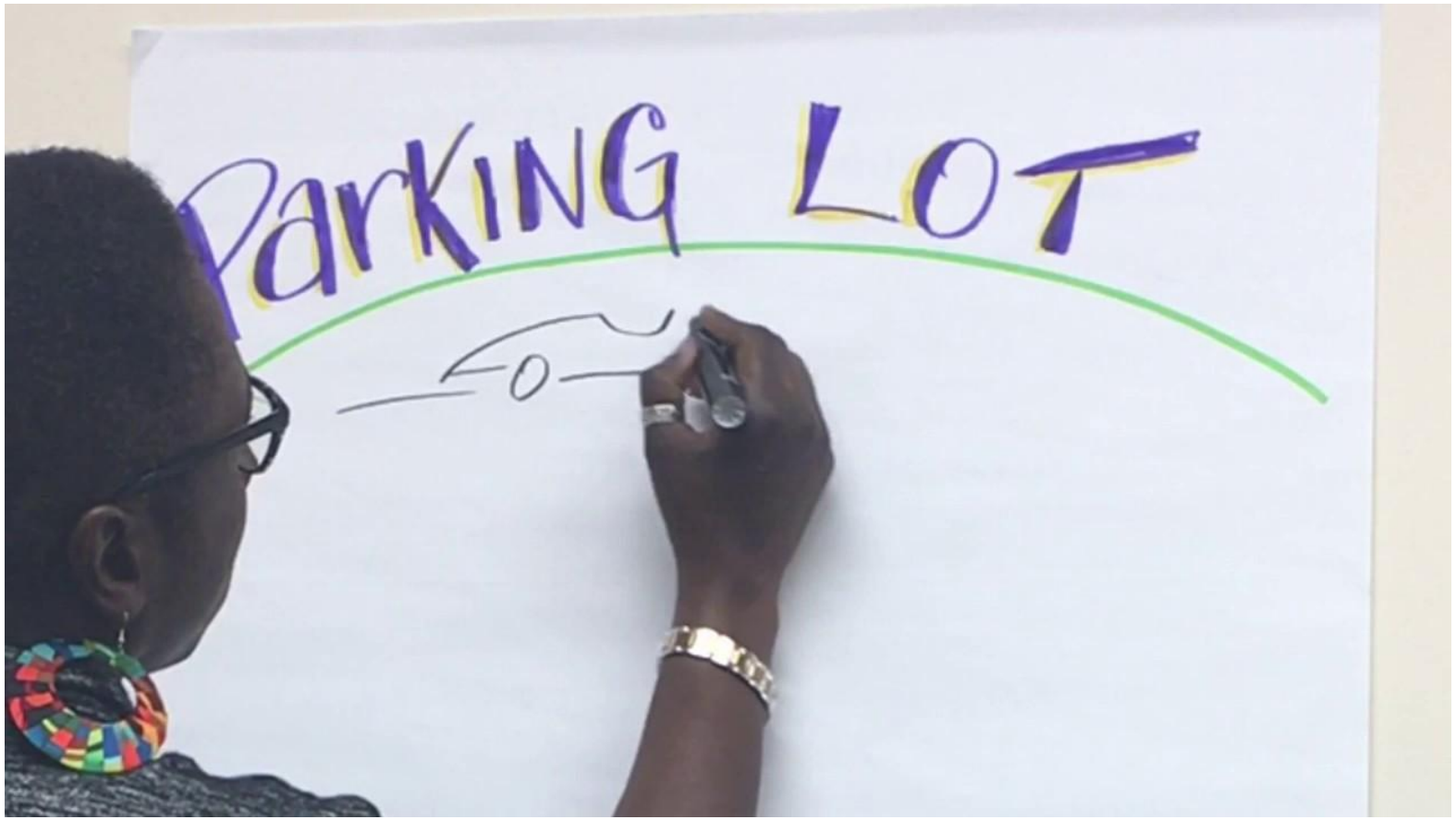
Parking Lot



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Ice breaker!

- Name
- Country
- Role
- Want to get out from this week
- Favourite movie

Photo time!

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MODERNISING GEOSPATIAL REFERENCE SYSTEM CAPACITY DEVELOPMENT WORKSHOP

DAY 1

The importance of a Geospatial Reference System [NB]	1.2.1	11:00-11:30 am
Introduction to Geospatial Reference System infrastructure [NB]	1.2.2	11:30 am-12:00 pm
Aligning national datums to the International Terrestrial Reference Frame [NB]	1.2.3	12:00-12:30 pm
LUNCH		12:30-1:30 pm
European Terrestrial Reference System 1989 + discussion [JV]	1.3.1	1:30-2:30 pm
Regional collaboration + discussion [NB]	1.3.2	2:30-3:30 pm
BREAK		3:30-4:00 pm
ACTIVITY: Mapping national of Geospatial Reference System + discussion [NB]		4:00-4:45 pm

UNITED NATIONS GLOBAL GEODETIC CENTRE OF EXCELLENCE

MODERNISING GEOSPATIAL REFERENCE SYSTEM CAPACITY DEVELOPMENT WORKSHOP

DAY 2

DISCUSSION: Regional Geospatial Reference System mapping [NB]		9:00-10:00 am
What is a geodetic adjustment? [NB]	2.1.2	10:00-10:30 am
BREAK		10:30-11:00 am
How to undertake a national geodetic adjustment? [NB]	2.2.1	11:00-11:30 pm
ACTIVITY and DISCUSSION: National Geodetic Adjustment planning		11:30 am-12:30 pm
LUNCH		12:30-1:30 pm
Introduction of data standardisation and data sharing policies [LP]	2.3.1	1:30-2:30 pm
Tools for standardization [NB]	2.3.2	2:30-3:30 pm
BREAK		3:30-4:00 pm
Data registers and data sharing policies [NB]	2.3.3	4:00-4:30 pm

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MODERNISING GEOSPATIAL REFERENCE SYSTEM CAPACITY DEVELOPMENT WORKSHOP

DAY 3

Transformation parameters, plate motion models and deformation models [NB]	3.1.1	9:00-9:45 am
EXAMPLE: Creating transformation parameters [NB]	3.1.2	9:45-10:30 am
BREAK		10:30-11:00 am
Height datums and geoid models [NB]	3.2.1	11:00-11:45 am
Steps in geoid modelling [NB]	3.2.2	11:45 am-12:30 pm
LUNCH		12:30-1:30 pm
Capacity Development needs in geodesy for the region [RK]	3.3.1	1:30-2:00 pm
Capacity Development use cases [RK]	3.3.2	2:00-2:30 pm
International Geodesy initiatives [RK]	3.3.3	2:30-3:30 pm
BREAK		3:30-4:00 pm
The actions of the UN-GGCE [NB]	3.4.1	4:00-4:30 pm
Alumni [WA]	3.4.2	4:30-4:45 pm

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MODERNISING GEOSPATIAL REFERENCE SYSTEM CAPACITY DEVELOPMENT WORKSHOP

DAY 4

Making geodesy understandable [AJ]	4.1.1	9:00-10:30 am
BREAK		10:30-11:00 am
ACTIVITY: Communications [AJ]		11:00-11:30 am
Developing business cases in geodesy [RK]	4.2.1	11:30 am-12:00 pm
ACTIVTY: Drafting business cases [RK]		12:00-12:30 pm
LUNCH		12:30-1:30 pm
Governance structures [NB]	4.3.1	1:30-2:30 pm
ACTIVITY: Future GRS [NB]		2:30-3:30 pm
BREAK		3:30-4:00 pm
PARKING LOT DISCUSSIONS		4:00-4:45 pm

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MODERNISING GEOSPATIAL REFERENCE SYSTEM CAPACITY DEVELOPMENT WORKSHOP

DAY 5

PARKING LOT DISCUSSIONS		
PARKING LOT DISCUSSIONS		
BREAK		10:30-11:00 am
PARKING LOT DISCUSSIONS		
PARKING LOT DISCUSSIONS		
LUNCH		12:30-1:30 pm
Future Directions for Geodesy [RK]	5.3.1	1:30-2:00 pm
Roadmap for a GRS document [NB]		2:00-2:30 pm
Feedback on the workshop [NB]		2:30-3:30 pm
BREAK		3:30-4:00 pm
Summary and next steps [NB]		
Certificates		

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MODERNISING GEOSPATIAL REFERENCE SYSTEM CAPACITY DEVELOPMENT WORKSHOP

The importance of Geospatial Reference Systems

Nicholas Brown
UN-GGCE

WHY

Day 1, Session 2 [1_2_1]

UNITED NATIONS GLOBAL GEODETIC CENTRE OF EXCELLENCE

MODERNISING GEOSPATIAL REFERENCE SYSTEM CAPACITY DEVELOPMENT WORKSHOP

Introduction to Geospatial Reference Systems infrastructure

Nicholas Brown
Head of Office, UN-GGCE

HOW

Day 1, Session 2 [1_2_2]

UNITED NATIONS GLOBAL GEODETIC CENTRE OF EXCELLENCE

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Aligning national geodetic datums to ITRF

Nicholas Brown
Head of Office, UN-GGCE

HOW

Day 1, Session 2 [1_2_3]

UNITED NATIONS GLOBAL GEODETIC CENTRE OF EXCELLENCE

MODERNISING GEOSPATIAL REFERENCE SYSTEM CAPACITY DEVELOPMENT WORKSHOP

Introduction to the European Terrestrial Reference System 1989 (ETRS89)

Jeffrey Verbeurgt
Belgium

HOW

Day 1, Session 3 [1_3_1]

UNITED NATIONS GLOBAL GEODETIC CENTRE OF EXCELLENCE

MODERNISING GEOSPATIAL REFERENCE SYSTEM CAPACITY DEVELOPMENT WORKSHOP

DISCUSSION: European Terrestrial Reference System 1989 (ETRS89)

Jeffrey Verbeurgt
Belgium

WHERE

UNITED NATIONS GLOBAL GEODETIC CENTRE OF EXCELLENCE

MODERNISING GEOSPATIAL REFERENCE SYSTEM CAPACITY DEVELOPMENT WORKSHOP

Introducing regional collaboration in geodesy

Nicholas Brown
Head of Office, UN-GGCE

WHO

Day 1, Session 3 [1_3_3]

UNITED NATIONS GLOBAL GEODETIC CENTRE OF EXCELLENCE

MODERNISING GEOSPATIAL REFERENCE SYSTEM CAPACITY DEVELOPMENT WORKSHOP

DISCUSSION: Regional Collaboration

Moderated by: Jeffrey Verbeurgt

WHO

Discussion topics

1. What benefits have you seen in your country/member state, resulting from the regional collaborations?
2. Does it impact on your daily/regular business/activities/processes?
3. Recommendations for starting collaborations
4. If you could do it all again, what would you do differently? or do first?
5. How can we anticipate and mitigate the effects of geopolitical changes or conflicts on the continuity of regional geodetic collaborations?
6. What happens if geopolitical changes disrupt current regional geodetic collaborations—are we prepared to handle such risks, or is the system too fragile?
7. What role do international organisations (e.g., UN-GGIM, IAG) play in shaping the future of regional geodetic systems, and how can they support national initiatives?

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ACTIVITY: National Geospatial Reference System mapping

Nicholas Brown
Head of Office, UN-GGCE

WHO

Day 1, Session 4 [1_4_2]

Activity – National GRS Mapping

Purpose

- To identify and showcase the national GRS and capabilities of your country.
- To create a shared understanding of Member States capabilities, needs and motivations.

Your Task

- Go to https://www.un.org/geospatial/mapsgeo/generalmaps get a map of your country.
- Work with other people from your country
- Create a single page – graphic representing your country, including all elements of your country's GRS:
  - Geodetic Infrastructure (CORS stations, SLR, VLBI, etc.)
  - Data processing/analysis centres (collecting, processing, analysing, CORS control etc.)
  - Governance and Training facilities (governance structures, training centers, universities etc.)
  - Motivations for Geodesy Investment (e.g. landslides, sea-level rise, infrastructure, resources etc.)

Time

- 30 min

Activity – Factbook (add to a online form)

- **See CIA Factbook for ideas**
- **Categories**
- **Geodetic Observatories**
- **Data Centres; Analayis Centres; Geodetic Products; Space Segment; User Segment**
- **Capacity / Partners**
- **Governance**
- Datum and epoch
- Reference Ellipsoid
- Fiducial points used for datum definition
- Geoid model
- Height datum
- Defined in legislation or regulations?
- Geodetic infra (GNSS CORS, GNSS BMs, other BMs, gravity markers, tide gauges)
- Geodetic training institutes (Uni, Tech courses, regional development bodies)
- Data processing groups
- Government priorities / projects
- Growth areas / industries
- Top three economic contributors to economy?
- Most urgent geodesy needs (e.g. geoid model)
- Geodetic governance?
- Other (who do you collaborate with; who do you engage with internationally; upload additional information)

Activity – National GRS Mapping

Example
(just for presentation purposes ONLY!)

Training Center

Geodetic Headquarter

VLBI station

CORS station

Motivation

Data Center

Offices

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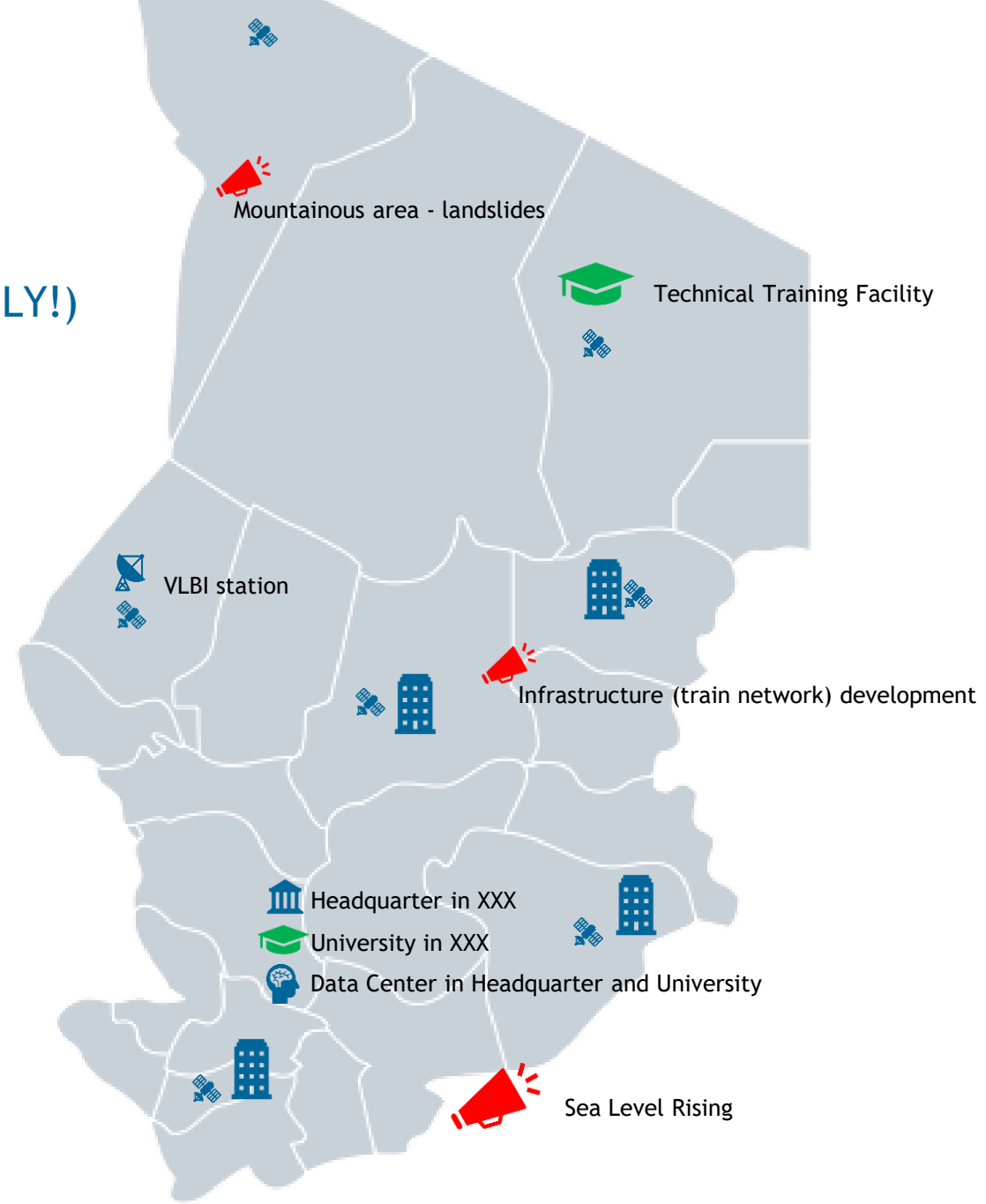
Example
(just for presentation purposes ONLY!)



Offices incl. surveying offices, CORS station maintenance etc.

CORS established with X stations all operating (cooperation with partner)

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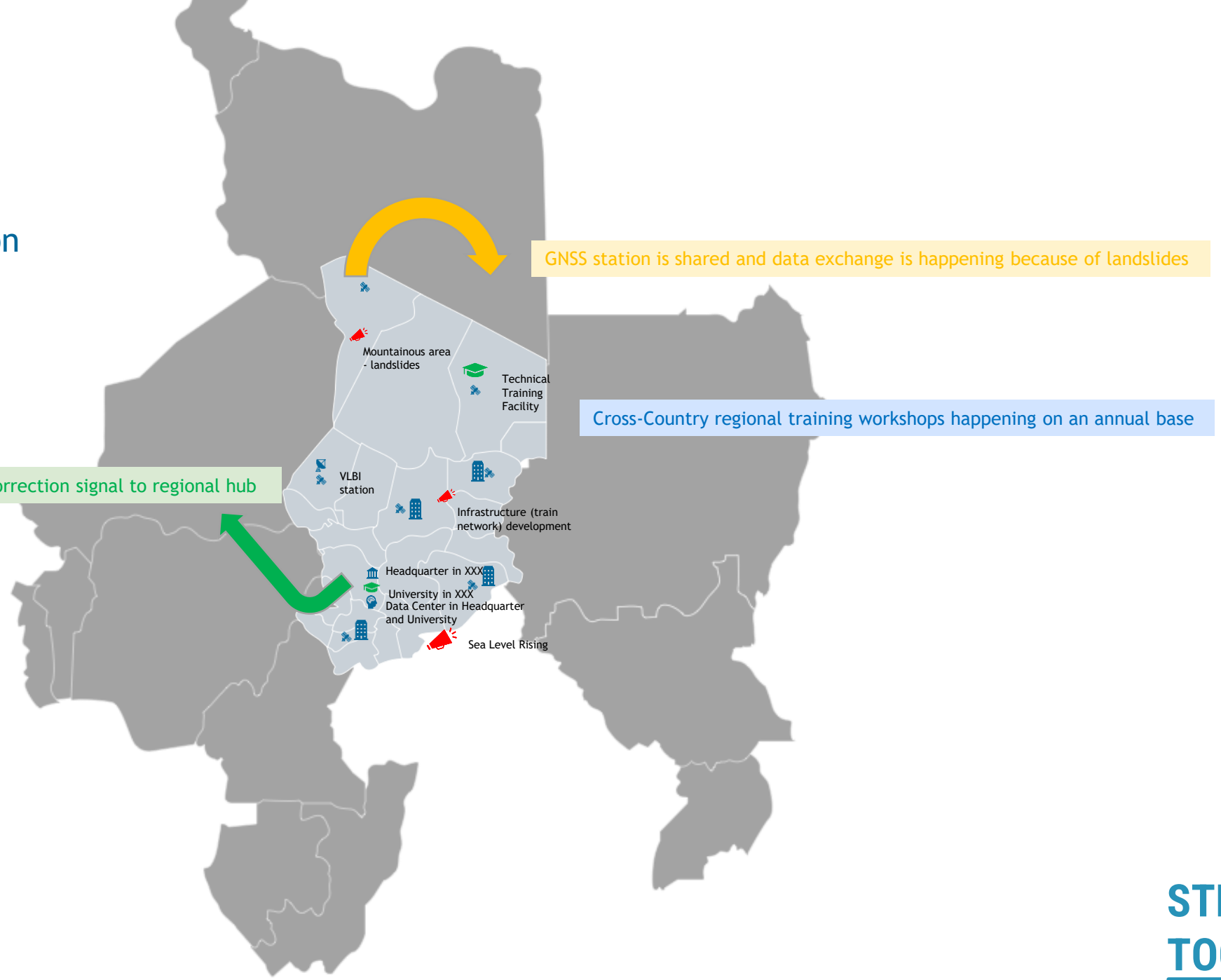
Discussion – National GRS Mapping

- What strengths do you have?
- What weaknesses do you have?
- What can be done about it?

Example
(just for presentation purposes ONLY!)



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Day 1 summary

- Summary of Day 1
- Highlights / Feedback
- Overview of Day 2
- Evening plans

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DAY 2

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Tools for standardization [NB]	2.3.2	2:30-3:30 pm
BREAK		3:30-4:00 pm
Data registers and data sharing policies [NB]	2.3.3	4:00-4:30 pm

Discussion – Regional GRS Mapping

- Merge together all the country images
- What strengths do you have?
- What weaknesses do you have?
- Is the regional / global supply chain robust
- What advice would you give to initiate successful collaborations?
- What could be shared that isn't being shared?
- If you could start again, what would you do differently?
- What do your neighbours / partners in the region do well?
- What does Europe not have enough of?
- What can be done about it?
- Is any of this not captured in the 1st Joint Development Plan for Global Geodesy?

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What is a geodetic adjustment?

Nicholas Brown
Head of Office, UN-GGCE

HOW

Day 2, Session 1 [2_1_2]

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How to undertake a national geodetic adjustment?

Nicholas Brown
Head of Office, UN-GGCE

HOW

Day 2, Session 2 [2_2_1]

Activity – National Geodetic Adjustments

- Break into groups of between 3-5
- Identify which one of your countries needs to modernise their datum the most and spend 30 mins discussing your approach to modernise.

- What can the country use as constraint (ITRFxxxx, ETRSxx)?
- What GNSS CORS data is available?
- What other data sets are necessary to be included?
- What epoch should be chosen? Pros and cons of that epoch?
- What datums do surrounding countries use? Is that a consideration?

Discussion – National Geodetic Adjustments

- Informally present their individual approaches to modernisation

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Introduction of data standardisation and data sharing policies

Liubov Poshyvailo-Strube
UN-GGCE

HOW

Day 2, Session 3 *[2_3_1]*

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Tools for standardisation: Data formats and metadata

Nicholas Brown
Head of Office, UN-GGCE

HOW

Day 2, Session 3 [2_3_2]

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Data registers and data sharing policies

Nicholas Brown
Head of Office, UN-GGCE

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Day 2, Session 3 *[2_3_3]*

Day 2 summary

- Summary of Day 2
- Highlights / Feedback
- Overview of Day 3
- Evening plans

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DAY 3

Transformation parameters, plate motion models and deformation models [NB]	3.1.1	9:00-9:45 am
EXAMPLE: Creating transformation parameters [NB]	3.1.2	9:45-10:30 am
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Capacity Development use cases [RK]	3.3.2	2:00-2:30 pm
International Geodesy initiatives [RK]	3.3.3	2:30-3:30 pm
BREAK		3:30-4:00 pm
The actions of the UN-GGCE [NB]	3.4.1	4:00-4:30 pm
Alumni [WA]	3.4.2	4:30-4:45 pm

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Transformation parameters, plate motion models and deformation models

Nicholas Brown
Head of Office, UN-GGCE

HOW

Day 3, Session 1 [3_1_1]

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EXAMPLE: Creating transformation parameters

Nicholas Brown
Head of Office, UN-GGCE

HOW

Day 3, Session 1 [3_1_2]

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Height datums and geoid models

Nicholas Brown
Head of Office, UN-GGCE

HOW

Day 3, Session 2 [3_2_1]

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Steps in geoid modelling

Nicholas Brown
Head of Office, UN-GGCE

HOW

Day 3, Session 2 [3_2_2]

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Capacity development needs in the region

Ryan Keenan
Positioning Insights

HOW

Day 3, Session 3 *[3_3_1]*

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CASE STUDIES: Capacity development

Ryan Keenan
Positioning Insights

HOW

Day 3, Session 3 *[3_3_2]*

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The actions of the UN-GGCE

Nicholas Brown
Head of Office, UN-GGCE

Day 3, Session 4 [3_4_1]

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Alumni of the workshop

Walaa ALLAHHAM
Programme Management Assistant, UN-GGCE

Day 3, Session 4 *[3_4_1]*

Alumni

Building Global Geodesy Alumni Network

Stay connected:

- **Microsoft Teams Channel** – Collaborate, exchange files & discuss projects
- **LinkedIn Group** – Share updates, opportunities & insights (links coming soon)
- **Global Alumni Map** – Get mapped by expertise & location for networking (add details to forms)

Build Capacity:

- Access all materials on the UN-GGCE website
- Share workshop materials & insights with colleagues
- Engage in peer mentoring & knowledge sharing

Stay connected. Build capacity. Strengthen global geodesy—together!

Day 3 summary

- Summary of Day 3
- Highlights / Feedback
- Overview of Day 4

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DAY 4

Making geodesy understandable [AJ]	4.1.1	9:00-10:30 am
BREAK		10:30-11:00 am
ACTIVITY: Communications [AJ]		11:00-11:30 am
Developing business cases in geodesy [RK]	4.2.1	11:30 am-12:00 pm
ACTIVTY: Drafting business cases [RK]		12:00-12:30 pm
LUNCH		12:30-1:30 pm
Governance structures [NB]	4.3.1	1:30-2:30 pm
ACTIVITY: Future GRS [NB]		2:30-3:00 pm
Kazakstan presentation		3:00-3:30 pm
BREAK		3:30-4:00 pm
		4:00-4:45 pm

UNITED NATIONS GLOBAL GEODETIC CENTRE OF EXCELLENCE

MODERNISING GEOSPATIAL REFERENCE SYSTEM CAPACITY DEVELOPMENT WORKSHOP

Making geodesy understandable to society

Anne Jorgensen
UN-GGCE

WHERE

Day 4, Session 1 *[4_1_1]*

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Developing business cases

Ryan Keenan
Positioning Insights

HOW

Day 4, Session 2 *[4_2_1]*

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ACTIVITY: Drafting business cases

Ryan Keenan
Positioning Insights

HOW

Day 4, Session 2 *[4_2_2]*

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Governance structures

Nicholas Brown
Head of Office, UN-GGCE

WHO

Day 4, Session 3 [4_3_1]

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Future GRS?

Nicholas Brown
Head of Office, UN-GGCE

WHO

Day 4, Session 3 [4_3_2]

Future GRS

Purpose of the Group Activity

To envision and design a ‘Future GRS’ that addresses emerging needs
To project the GRSs development 10 years into the future

Your Task

- Evaluate how the current governance structure can be enhanced
- Propose ways to streamline workflows/improve efficiency
- Explore partnerships with new stakeholders
- Suggest collaboration methods, data sharing agreements, funding/financing strategies
- Identify potential challenges

Time
Prepare: 30min

Mountain of Tomorrow

1 Basecamp: Assess Current State

Where are we now?
Reflect on the current state of the governance structure
Strengths/Weaknesses

2 Midpoints: Chart the Path Forward

What Needs to Change? What climbing equipment?
New Services/Datasets
What data? What Skills needed?
Governance of new services
New Partnerships? how managed?

3 Summit: Future GRS

Where Do we want to be?
Ultimate vision for the GRS in 10 years

Day 4 summary

- Summary of Day 4
- Highlights / Feedback
- Overview of Day 5

STRONGER.
TOGETHER.

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DAY 5

Joining Land and Sea		09:00 am
Robust Global Geodesy Supply Chain (including: Governance (IAG Services); Risk Management; Project Management; Training); AI; Business Case Templates.		
BREAK		10:30-11:00 am
cont …		
LUNCH		12:30-1:30 pm
Future Directions for Geodesy [RK]		1:30 pm
Roadmap for a GRS document [NB]		
Feedback on the workshop [NB]		
Summary and next steps [NB]		
Certificates		3:00 pm

Joining Land and Sea using geodesy

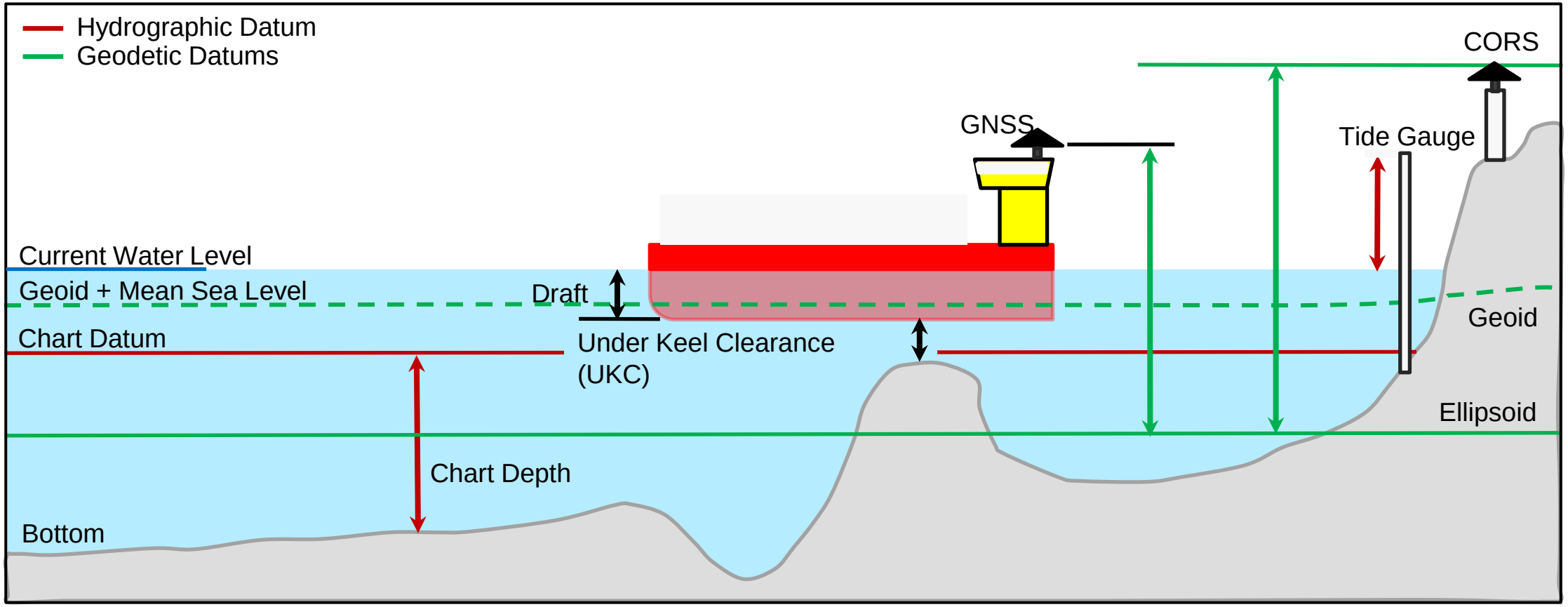
Solution – use the geoid as the primary height reference surface and link all other surfaces (ellipsoid, MSL, HAT, LAT, MDT …) to the geoid.

- POSITIVES
  - Physical height reference surface – water always flows downhill
  - Exists onshore and offshore

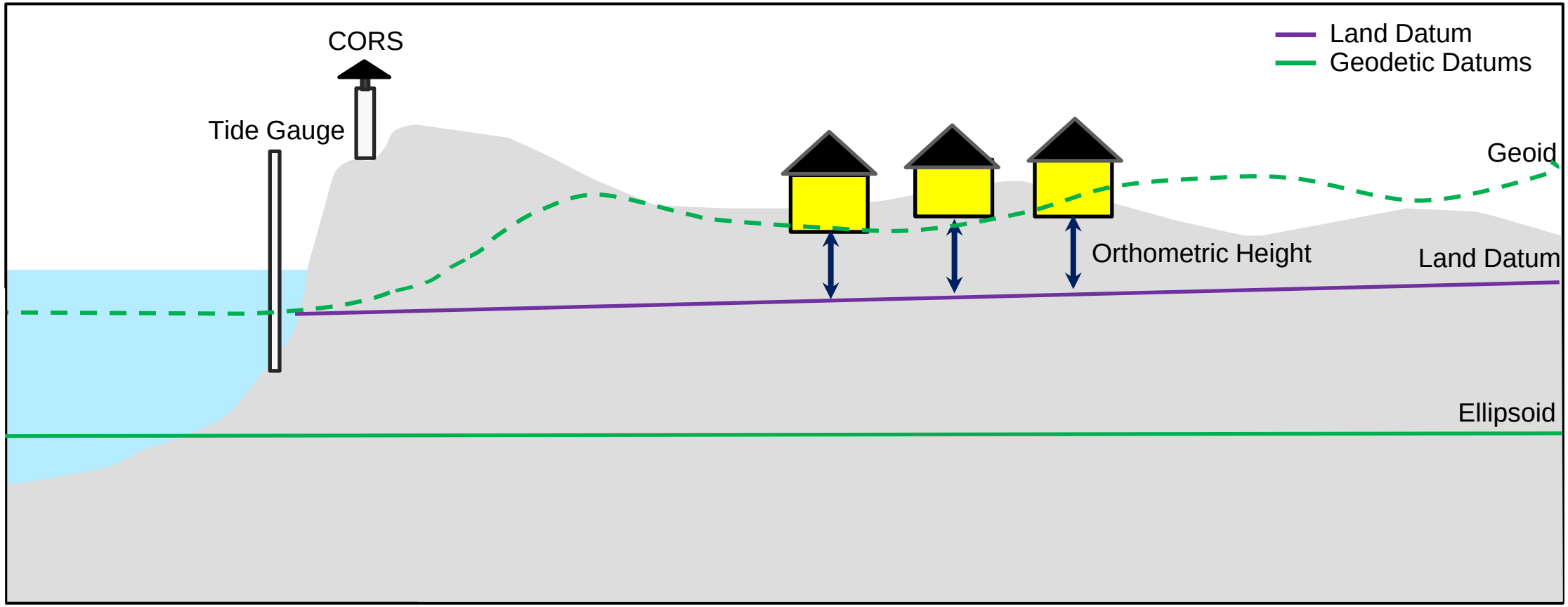
(No other surfaces meet these two criteria)

- CHALLENGES
  - Global geoid model has absolute accurate of ~20 cm (relative accuracy is better than this)
  - Local / Regional geoid models require airborne and terrestrial gravity data which can be expensive
  - Development of hydroid models to convert between MSL, LAT etc. and the geoid are challenging (but necessary for every primary reference surface)

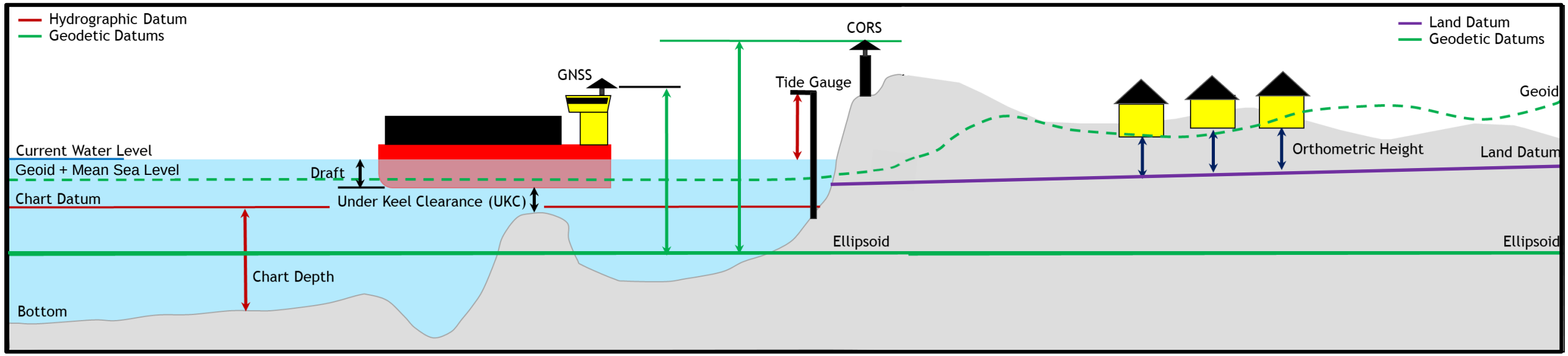
The Sea


Hydrographic Datum
Geodetic Datums
CORS
GNSS
Tide Gauge
Current Water Level
Geoid + Mean Sea Level
Draft
Chart Datum
Under Keel Clearance
(UKC)
Geoid
Ellipsoid
Chart Depth
Bottom

The Land


CORS
Tide Gauge
Land Datum
Geodetic Datums
Geoid
Orthometric Height
Land Datum
Ellipsoid

Joining Land and Sea using geodesy



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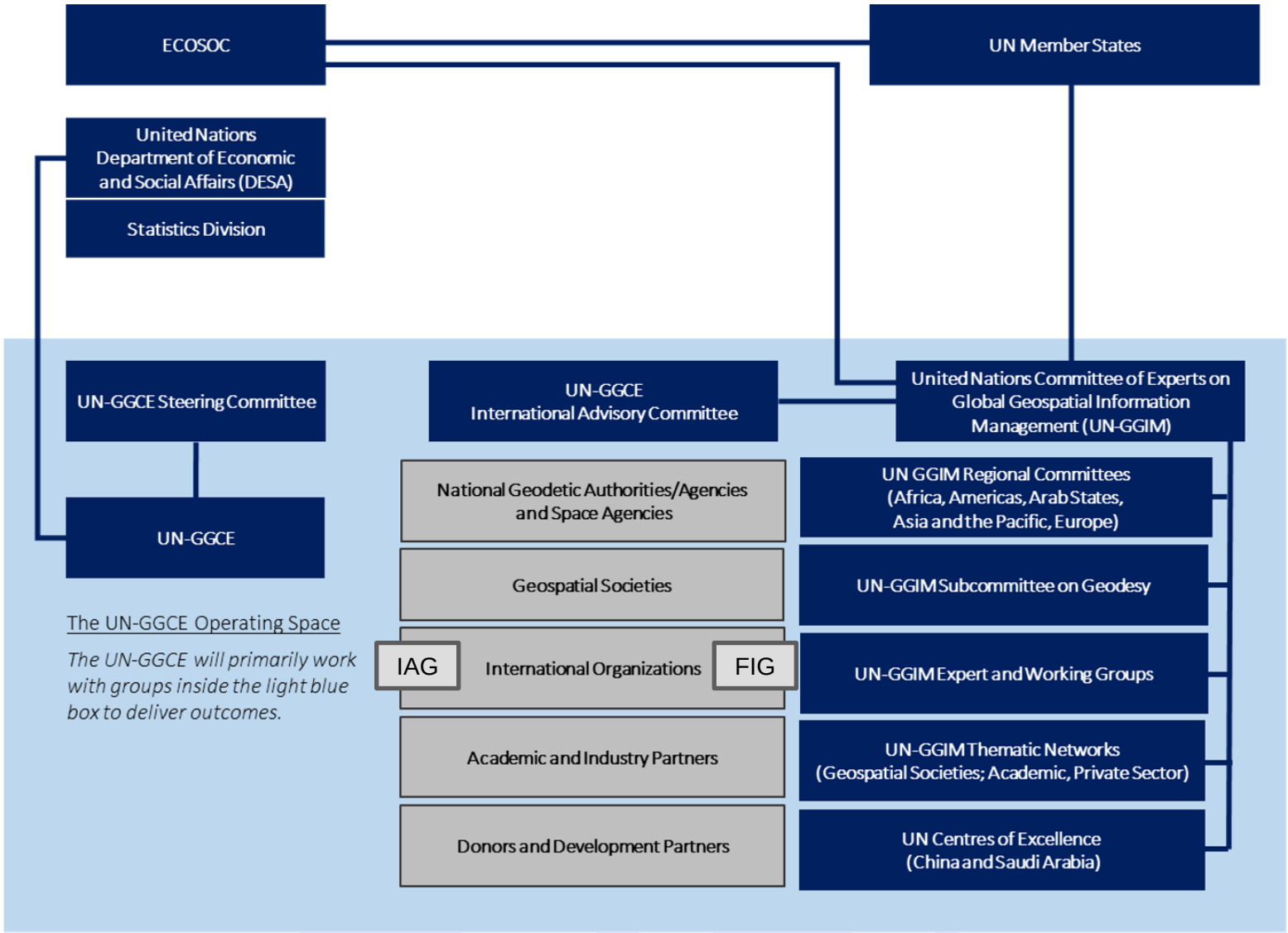
TOGETHER.


Federated Marine Spatial Data Infrastructure Pilot:
Data Integration at the Land-Sea Interface
FMSDI Pilot Phase 5
Open Geospatial Consortium

UN-GGCE Operating Model



DRAFT 06.03.2024

Stronger. Together.

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Future directions of geodesy

Nicholas Brown
UN-GGCE

WHY

Day 5, Session 1 *[5_1_1]*

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Roadmap for a modern GRS

Nicholas Brown
UN-GGCE

WHY

Day 5, Session 1 *[5_1_2]*

PARKING LOT


UN-GGCE

Session ?

WHO

Session Title

<<Name>>

((compiled by ??))

Session ?

WHY

Session Title

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Session ?

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ALUMNI

Sustaining Alumni Networks After the Workshop

<<Walaa>>

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TOGETHER.