

Positioning the World for the Future



FIG Commission 5 focuses on meeting the highest level of accuracy for Positioning and Measurement. It provides the tools, techniques and procedures to educate and train surveying professionals everywhere. Appropriate methodology for data collection and processing are required to be successful in an era of global, integrated geospatial data.

The body of work

Commission 5 focuses on the science of measurement (instrumentation, methodology and guidelines). Its six WG's focus on application of geodetic standards under ISO TC211 and TC176-SC6 to position within geometric and vertical reference frames using GNSS observations combined with multi-sensor systems to be as cost-effective as possible. The [Work Plan](#) for the period 2019-2022 highlights the efforts of the individual WG's but also their synergistic whole. They work with the Standards Network; Commission 2 and Young Surveyors Network regarding Education, Training and Capacity Building (ETCB); Commission 4 regarding Hydrographic Surveying on the Ellipsoid; Commission 6 and

ISPRS on Laser Scanning as well as on Deformation Monitoring; and Commission 7 and 3 on Cost-Effective Positioning. Commission 5 liaises with [IAG](#) and the [IGS](#) on GNSS and positioning and with the UN in support of the [UN OOSA ICG](#), [UN GGIM](#) and [UN-SCoG](#). In particular, Commission 5 works with UN SCoG WG ETCB on education and training as noted above. Commission 5 normally holds a Reference Frames in Practice (RFIP) Seminar annually to provide practical surveying education. The next of which is scheduled in Bolivia in November 2020 prior to the [SIRGAS](#) meeting.

FIG 2020 Working Week – Themes and Sessions

Commission 5 was involved with nine different sessions for the FIG Working Week 2020, which had a central theme of [Smart Surveyors for Land and Water Management](#). This was broken down into three subthemes:

- Smart Surveyors,
- Integrated Land and Water Management, and
- Ten years to go to achieve the Sustainable Development Goals.

Commission 5 broadly supports each of the subthemes by providing the applications and technology to enable smart surveyors in accomplishing their work. Additionally, these apply both on land and water – enabling the integration of offshore bathymetric data with onshore terrain models into a seamless whole for improved coastal and emergency management. In developing these technologies, the most efficient means are sought to enable developing countries to better access their respective geospatial information at similar levels of accuracy to those of more developed nations. The nine Commission 5 sessions were grouped into the subthemes and an overview provided below.



Reference Frames in Practice (RFIP) Technical Seminar scheduled in November 2020 during the SIRGAS meeting in Bolivia.

Smart Surveyors

Smart Surveyors know that innovative surveying approaches and technologies aid in managing rapid urban growth, smart energy, cleaner mobility, and 'land rights for all.' Three Commission 5 sessions focused on such technologies:

- [TS03B](#): Deformation Modeling for Smarter Surveying (Joint Commissions 5 and 6),
- [TS07G](#): Cost Effective Technology for Surveying with Smart Phones and Crowd Sourced Data, and
- [TS08G](#): Refinements in Multi-GNSS for Smarter Surveying.

Smart Surveyors realize that the positional coordinates for a building or a road are not likely to stay fixed on the dynamic surface of the

earth. Be it for a building or a road, techniques and tools are needed to model such deformation in order to compare surveys from different times in the same place. Session [TS03B](#) represented the overlap in skills and interest for both Commissions 5 and 6 – using precise positioning to perform engineering surveys in deformational environments. Session [TS07G](#) focused on potential technologies that would make surveying more practical to more of the world – not just open to those with the most expensive equipment. Finally, session [TS08G](#) focused on ways to get even more precision and accuracy from broadly used GNSS technology.

Integrated Land and Water Management

Integrated land and water management is crucial, because most people live on or near water. Climate change increases the risks of sea and riverine floods and extended drought periods and complicates this management task. Coastal and emergency planners need to have information from both land and water integrated into a seamless whole. These four sessions explored how best to make such an integration effort:

- [TS03G](#): Geospatial Reference Systems for Integrated Land/Water Management,
- [TS04G](#): Heights and Height Systems for Change Monitoring in Land/Water Systems,
- [TS04F](#): Hydrographic Surveys (Joint Commissions 4 and 5), and
- [TS05G](#): Multisensor Systems for Integrated Land and Water Management.

Session [TS03G](#) covered the practical application of geometric reference frames to land and sea with case studies in New Zealand, Papua New Guinea, Abu Dhabi, Europe and Greenland. Sessions [TS04G](#) and [TS04F](#) both emphasized the links and interactions between land elevation, bathymetry, and the water surface. The latter was jointly held with Commission 4, which focuses on hydrographic surveys and provides a different perspective than that of Commission 5. Finally, Session [TS05G](#) tested location based services, inertial measurement units (IMU's), photogrammetry and other alternative PNT technologies to better integrate information in all environments.

10 Years to Achieve the SDGs

Commission 5 focuses broadly on practical aspects of surveying that support many of the UN Sustainable Development Goals (SDGs) including Clean Water and Sanitation (Goal 6); Industry, Innovation and Infrastructure (Goal 9); Sustainable Cities and Communities (Goal 11), Climate Action (Goal 13) and Life on Land (Goal 15). These SDGs are the blueprint to achieve a better and more sustainable future for all, and surveying professionals have a key role to play over the next decade. Two sessions were led by Commission 5 and the FIG Asia-Pacific Capacity Development Network (AP CDN):

- [TS01G](#): Geodetic Capacity Development 1 (Joint Commission 5 and AP CDN) and
- [TS02G](#): Geodetic Capacity Development 2 (Joint Commission 5 and AP CDN).

Representatives from the [UN ICG](#), [UN-SCoG](#), and the [UN-GGIM](#) Regional Committee for the Asia/Pacific (UN-GGIM-AP). These groups came together to provide guidance on Education, Training and Capacity Building efforts. The FIG AP CDN has been a showcase for aiding developing countries threatened by sea level rise. ETCB has been a central area of emphasis for Commission 5, and the many direct links connect it with the efforts by these UN organizations.



The UN SCoG WG on ETCB is a critical component in the Global Geodetic Reference Frame (GGRF) Roadmap.

Inspirational Short Session

The time during a Working Week is short and the number of submissions are large. Many worthwhile submissions were made that were consistent with Engineering and Geodesy related applications consistent with both Commissions 5 and 6. These papers were collected into one ISS session: [TS06G](#): Geodesy and Engineering. Many of the papers in this session were consistent with the three subthemes. Others focused on improving methodology for the use of GNSS, data analysis, equipment calibration, etc. All of these are critical to obtaining precise positioning and removing inconsistencies in engineering surveys.

Conclusion

FIG Commission 5 remains focused on the science of positioning and measurement. It seeks to develop the tools, techniques and procedures necessary to achieve the highest level of accuracy for a wide variety of surveying disciplines. Applications are developed and studied that can assist in all fields of hydrographic and engineering surveying. These applications also provide the geospatial detail needed to integrate land and water management. All of these efforts contribute to work on realizing five out of the 17 UN Sustainable Development Goals (SDGs). During the FIG Working Week 2020, Commission 5 participated in 10 separate sessions – of which nine directly related to the three subthemes of the meeting. UN organizations rely on FIG to provide the education and training necessary to ensure capacity building in developing countries around the world. The next event in the ETCB series will be the Reference Frames in Practice Seminar during the [SIRGAS](#) meeting in Bolivia during in November 2020.

Further readings:

[FIG Working Week 2020 Proceedings](#)
[FIG Surveyors Reference Library](#)
[FIG Peer Review Journal](#)
[FIG Publications](#)

FIG Commission 5 sessions:

- [TS01G: Geodetic Capacity Development 1 \(Joint Commission 5 and AP CDN\)](#)
- [TS02G: Geodetic Capacity Development 2 \(Joint Commission 5 and AP CDN\)](#)
- [TS03B: Deformation Modeling for Smarter Surveying \(Joint Commissions 5 and 6\)](#)

- [TS03G: Geospatial Reference Systems for Integrated Land/Water Management](#)
- [TS04F: Hydrographic Surveys \(Joint Commissions 4 and 5\)](#)
- [TS04G: Heights and Height Systems for Change Monitoring in Land/Water Systems](#)
- [TS05G: Multisensor Systems for Integrated Land and Water Management](#)
- [TS07G: Cost Effective Technology for Surveying with Smart Phones and Crowd Sourced Data](#)
- [TS08G: Refinements in Multi-GNSS for Smarter Surveying](#)
- [TS06G: Geodesy and Engineering](#)

FIG Commission 5 website:

- [General](#)
- [Work Plan 2019-2022](#)
- [Working Groups](#)
 - [Working Group 5.1 – Standards, Quality Assurance and Calibration](#)
 - [Working Group 5.2 – 3D Reference Frames](#)
 - [Working Group 5.3 – Vertical Reference Frames](#)
 - [Working Group 5.4 – GNSS](#)
 - [Working Group 5.5 – Multi-Sensor-Systems](#)
 - [Working Group 5.6 – Cost-Effective Positioning](#)

[International Association of Geodesy \(IAG\)](#)

[International GNSS Service \(IGS\)](#)

[Sistema de Referencia Geocéntrico para las Américas \(SIRGAS\) 2020 Annual Meeting with RFIP](#)

[UN Global Geospatial Information Management \(UN GGIM\)](#)

[UN GGIM Subcommittee on Geodesy \(UN SCoG\)](#)

[UN Office of Outer Space Affairs \(UN OOSA\) International Committee on GNSS \(ICG\)](#)

<https://www.gim-international.com/content/article/positioning-the-world-for-the-future>
