

## GENERAL INFORMATION

# FIG Commission 4 Work Plan 2023–2026: Targeting the next challenges in the hydrospatial domain

### Authors

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## Abstract

The evolution of hydrographic science and technology is continually shaped by emerging trends and challenges, influencing our comprehension and governance of marine environments. Commission 4 (Hydrography) of the International Federation of Surveyors (FIG) is charged with anticipating the impact of these developments on hydrospatial professionals and addressing emerging issues in its forthcoming four-year work plan. This necessitates staying informed about the latest advancements and navigating the interplay of factors within the hydrospatial domain. Commission 4 also aims to engage with the hydrospatial community to gain insights into the effects of current trends on global hydrospatial work at various levels. Establishing collaborations with key organisations, including the International Hydrographic Organization, professional bodies, standards bodies, global taskforces, and other FIG commissions and networks, is integral to ensuring the hydrospatial community can deliver the highest level of professional output for global hydrospatial information users. This article seeks to enhance community awareness and understanding of the roles played by FIG Commission 4 and its associated working groups. It provides an update on the changes and goals outlined in the FIG Commission 4 work plan for the term 2023–2026, introduces the term "hydrospatial" in lieu of "geospatial" for ocean and related domains, and introduces a new working group (WG 4.5) focused on addressing the impacts of climate change.

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## 1 Introduction

The International Federation of Surveyors (FIG), founded in 1878, is a United Nations (UN) and World Bank recognised non-governmental international professional organisation. FIG member organisations include professional bodies and academic institutions in over 120 countries, representing those who measure, locate, map, value, plan, construct, develop and manage the land, the seas, and any human-built structures with a vision to extend the usefulness of surveying for the benefit of society, the environment, and the economy.

FIG's technical work is led by ten Commissions. FIG Commission 4 is focused on the field of hydrographic surveying and includes the entire hydrospace domain (Hains et al., 2022). There are also several Task Forces (TFs) that have been established within FIG to research and advise on matters of an administrative or general policy nature to FIG; and several Networks comprising industry professionals, organisations, and affiliated institutions, serving as a platform for collaboration, knowledge exchange, and advocacy in the surveying, geospatial and hydrospace community.

According to its constitution, in each four-year term, the FIG council must develop a new work plan. Subsequently, each commission generates subordinate plans to align with the FIG council's plans, considering the latest trends in their scope. Led by the newly elected commission chair, and several new team members, FIG commission 4 has developed a new work plan that reflects a forward-looking approach to address evolving challenges in the hydrospace domain (FIG, 2023).

## 2 Future challenges

The hydrospace domain is undergoing a transformative impact of automation that reaches all areas of the blue planet, including the blue zone and contiguous zones. Consequently, the routine of the hydrographic surveyor is likely to change radically over the next four years with more remote operations and autonomous systems, including Autonomous Underwater Vehicles (AUVs), Uncrewed Surface Vehicles (USVs) and Uncrewed Airborne Vehicles (UAVs) as well as a variety of remote-sensing systems such as Satellite Derived Bathymetry (SDB) undertaking hydrospace data acquisition.

It is also likely that Artificial Intelligence (AI) will be used in some aspects of data processing and more types of spatiotemporal data from novel sources will permeate the hydrospace domain, leading to an increase in data volumes and changes in data management, storage, and use.

Climate change poses significant challenges and opportunities in the hydrospace domain, especially where ocean circulation and the coastal zone are affected by rising sea levels and increased frequency of extreme weather events.

By recognising the interplay between global issues and the hydrospace domain, we can better leverage interdisciplinary collaborations to work toward holistic solutions to address the complex socio-environmental challenges facing the marine environment.

## 3 New plan

During the previous term (2019–2022), FIG Commission 4 operated four working groups (WGs), namely *WG 4.1 – Standards and Guidelines for Hydrography*, *WG 4.2 – Blue Growth & UN Sustainable Development Goal 14*, *WG 4.3 – Mapping the Plastic* and *WG 4.4 – Marine Development and Administration*. The terms of reference for the existing working groups have been updated for the new term (2023–2026), and a new *WG 4.5 – Climate Change induced Sea Level Rise and Adaptation* has been established.

We report and discuss progress at our annual event the *Working Week*. The next two of these events being FIG Working Week 2024 in Accra, Ghana<sup>1</sup> and FIG Working Week 2025 in Brisbane, Australia<sup>2</sup>.

Also invite you to join our commission LinkedIn page and keep in touch with us<sup>3</sup>.

### 3.1 WG 4.1 – Hydrographic Standards and Guidelines

Hydrographic standards and guidelines are developed and maintained through international collaboration among national hydrographic offices, maritime organisations, standards bodies, and industry stakeholders. By adhering to standardised practices and procedures, stakeholders can ensure the integrity and utility of hydrographic data for supporting safe navigation, sustainable resource management, environmental protection, and disaster preparedness and response efforts. WG 4.1 aims to engage with standards organisations and stakeholders to ensure that the

<sup>1</sup> <https://www.fig.net/fig2024/> (accessed 18 February 2024).

<sup>2</sup> <https://www.fig.net/fig2025/> (accessed 18 February 2024).

<sup>3</sup> <https://www.linkedin.com/showcase/fig-commission-4-hydrography> (accessed 18 February 2024).



Commission Chair Eranda Gunathilaka (left) and Vice Chair Gordon Johnston (right).

concerns and experience of hydrospatial professionals are heard when standards are being developed or considered for adoption within the hydrospatial domain.

During the 2023–2026 term, WG 4.1 seeks to encourage and advocate for open standards that help to ensure transparency, traceability, posterity, and integrity of hydrospatial data. One such example is the Bathymetry Attributed Grid (BAG) format, which is under consideration as an Open Geospatial Consortium (OGC) community standard. WG 4.1 is represented in the Open Navigation Surface Working Group (ONSWG) and continues to advocate for the needs of hydrospatial professionals in relation to data transfer standards such as BAG.

In keeping with this theme of encouraging open standards and transparency, WG 4.1 aims to develop a new guideline during this term, focussed on processing of bathymetric data with significant data redundancy. This is an area where repeatable spatial processing methodologies and human-based manual processes are being challenged by large data volumes and AI-based processing approaches. WG 4.1 seeks to establish useful and practical guidance for surveyors to create awareness and build the trust necessary to effectively deploy emerging technology in this area.

### 3.2 WG 4.2 – Sustainable Oceans and Hydrography

WG 4.2 aims to foster collaboration with international governmental and non-governmental entities to enhance understanding and awareness of the significance of marine and oceanic environments. Emphasis is placed on the integration of emerging technologies to improve operational efficiency and anticipate future workforce needs. Additionally, WG 4.2 will explore the utilisation of established project planning methodologies and intends to develop a standardised tool to evaluate the socio-economic and regional impacts of hydrographic projects comprehensively. The surveyor, and in particular, the hydrographic surveyor has a key role in developing an understanding of our seas and oceans for the wider social benefits and Commission 4 aims to promote this role, the benefits and offer case studies of participation and support. WG 4.2's work is related to the United Nations Sustainable Development Goal 14: *Life Below Water*.

### 3.3 WG 4.3 – Mapping the Plastic

WG 4.3 was formed in 2018 as an initiative of the FIG Young Surveyors Network (YSN) and Commission 4 (Hydrography) as FIG's response to the issue of plastic pollution. The question that is posed to WG 4.3 is: how can spatial science professionals best contribute to the global plastic battle? Almost every piece of plastic ever made is still on our planet in some form and UN estimates suggest that more than 75 % of all the plastic produced since 1950 is now waste, with most discarded into landfills or dumped into marine environments. The UN Environment Programme (UNEP) has conventionally calculated that each year more than eight million tonnes of plastic ends up in our oceans. Therefore, given our specific spatial information, remote sensing, hydrographic surveying, project management and overall measurement

science skillsets, WG 4.3 is decided to focus on better understanding the quantity and type of plastic waste being transported in waterways before they reach our oceans.

Plastic waste floats on the surface and upper limits of rivers or settles on banks, estuaries, and coastlines during the transportation process. Here, sensing data from satellites and airborne platforms available in different spatial, spectral, and temporal resolutions has long been recognised as a potentially reliable source of long-term qualitative and quantitative information over large geographic areas. WG 4.3 has focussed on harnessing the potential of remote sensing and developed survey and processing methodologies to accurately map floating plastic in rivers and the surrounding environment at localised ‘hot spot’ areas using data from UAV orthophotos combined with artificial intelligence algorithms and software tools in near real time. The fundamental objective of WG 4.3 is to generate methodologies to control and eradicate plastic pollution in our oceans (Jakovljevic et. al, 2020). With the support of the international surveying community, our networks within the plastics movement, our academic and industry partners and the donor community FIG can contribute meaningfully to this goal. Raising awareness of the issue is a key component of this and we undertake more plastics surveys, refine our methods and techniques, WG 4.3 will be able to offer support to more countries and regions inundated with plastic pollution.

### 3.4 WG 4.4 – Hydrospatial Domain and Marine Administration

WG 4.4 was renamed to incorporate the term hydrospatial in recognition of a broader context. It shall seek to promote and engage with international government and non-governmental organisations to increase the understanding and awareness of the importance of the hydrospatial domain and marine administration. This includes assisting in the development of indigenous hydrospatial data infrastructure management, assisting in the development of institutional policy and frameworks, assisting in the development of conceptual and technical standards, guidelines and practice, reviewing of national and international hydrospatial domain and marine administration policies, standards and guidelines and finally to instigate sustainable collaboration by promoting best practices, including citizen science activities, such as Crowd-Sourced Bathymetry (CSB) for development of information and knowledge in the hydrospatial domain. The beneficiaries include global governments and associated national mapping and charting agencies; and relevant international non-governmental organisations, hydrospatial industry and academia.

### 3.5 WG 4.5 – Climate Change induced Sea Level Rise and Adaptation

Climate change induced sea level rise refers to the gradual increase in the average global sea level because of climate change, primarily driven by the thermal expansion of seawater and the melting of glaciers and polar ice caps. The consequences of sea level rise are significant, impacting coastal communities, ecosystems, and infrastructure. Coastal areas are particularly vulnerable to the effects of sea level rise, facing increased risks of flooding, erosion, saltwater intrusion, and coastal inundation during storm events. Low-lying islands and coastal cities are at elevated risk of displacement, loss of habitat, and damage to critical infrastructure.

However, in most of the developing countries, there is no accurate estimation of sea level rise rates and prediction of its trend according to the IPCC’s projections, and evaluation of the impact through potential inundation of low-lying coastal regions. At several places, problems limit successful outcomes, often due to the lack of long-term tidal data and/or accurate digital elevation models (DEMs) over coastal areas.

Since this is a global challenge, Commission 4 established a new WG 4.5 to undertake planning and development of guidelines aligned with global standards to support hydrospatial professionals working in this domain.

WG 4.5 seeks to:

- Review existing practices, tools, and techniques to monitor and analyse sea level rise and associated issues;
- identify existing, and further develop best practices, tools and capacity related to the quantification and analysis of climate change consequences such as mean sea level (MSL), local/regional relative sea level rise estimation and coastal inundation;
- support multidisciplinary collaboration between surveying, geospatial sciences, hydrography, and oceanography;
- use satellite data for improved sea level rise estimation and use high resolution remote sensing images, UAV sensors and GIS (Geospatial Information System) tools for coastal inundation modelling; and establish links and collaboration with existing sea level research groups, building on previous work.



Some events represented by the FIG Commission 4 (left: Hydro 2023, right: Geo Connect Aisa 2024).

## 4 Summary

FIG Commission 4 has developed a forward-looking work plan for 2023–2026 to tackle emerging challenges in the hydrospatial domain. These challenges encompass the transformative impact of automation, the integration of Artificial Intelligence (AI), and the effects of climate change. The new plan includes five working groups (WGs) focusing on standards and guidelines, sustainable oceans, plastic pollution mapping, hydrospatial domain and marine administration, and climate change-induced sea level rise and adaptation. Emphasising open standards, sustainability, and effective response to sea level rise, FIG seeks to foster interdisciplinary collaboration and contribute significantly to societal, environmental, and economic betterment in the hydrospatial field. Hydrospatial professionals are encouraged to contact the commission representatives and actively get involved in these crucial initiatives.

## References

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