Appendix to item 22

FIG Commission 4 on Hydrography

Work Plan 2023–2026

1. Title

Hydrography

2. Terms of Reference

Support for all aspects of the Hydrographic Surveying including, but not limited to:

- Promotion of hydrographic education, training and continuing professional development.
- Review and update of standards and guidelines.
- Blue Surveying and Hydrospatial data management.
- Climate change and its adaptation.

3. Mission statement

- To promote the aims and objectives of FIG to hydrographers through the active involvement of national delegates from member associations and other interested parties in the activities of the Commission.
- To assist international bodies such as the United Nations and the International Hydrographic Organization (IHO) in the protection of the marine environment and promotion of safe navigation.
- To develop guidelines and standards that will assist hydrographers in the provision of their services considering the current trends and requirements.
- To disseminate the information and the latest innovations on the profession through participation in international meetings, conferences and committees.

4. General

Commission 4 strategies are aligned with the vision and objectives of the FIG. Further, FIGs agenda is underpinned by the need for a sustainable profession that delivers in a sustainable manner and addresses the global sustainable agenda to address the climate action. Further to that, it also include:

- Support for the Hydrography profession internationally including development of best practice guides, certification pathways and advocacy.
- Support the International Hydrographic Organization (IHO) and associated United Nations programmes.
- International Board on Standards of Competence for Hydrographic Surveyors and Nautical Cartographers (IBSC).
- Cooperation with other FIG Commissions, Task Force and Networks.
- Cooperation with sister organisations and other appropriate bodies.

5. Working Groups

Working Group 4.1 – Hydrographic Standards and Guidelines

Policy Issues
- Systematic data processing for safe retention of redundant soundings.
- Additional data layers in standard final survey data transfer formats (BAG/HDF).
- Signing and validation of datasets for nautical charting.

Chair – Mr. Geoff Lawes (Australia)
Co-chair - Ms. Tanja Dufek (Germany)

Specific project(s)
- Addition of data density layer to (Bathymetry Attributed Grid) BAG datasets, in conjunction with the Open Navigation Surface Working Group (ONSWG). We will be generating a specification change proposal for the ONSWG following the BAG format v2.0 merge. Geoscience Australia/AusSeabed have offered to assist with developer support to help create new format specification and library modifications for the next BAG format merge.
- Drafting of new publication on data processing with statistically redundant data - aims to address potential risks and provide workflow guidance for deterministic approaches and machine learning approaches to processing, verifying and presenting bathymetric surfaces from highly redundant sounding datasets. Aiming to build this with some assistance from CCOM (and hoping UNH/CCOM will see some benefit in becoming and Education/Institutional member of FIG).
- Recruitment and re-engagement drive - although I have had fleeting interest from people in assisting the working group, I currently only have two volunteers in addition to myself to assist and everyone is rather time poor! Additionally, I would like to try to encourage some institutional memberships for global bodies who generate defacto standards for hydrography (UNH/CCOM being one example).

Workshop(s)
- Locate23 (SSSI and SS+NZ annual conference).
- AMSA (joint annual conference - Australian and New Zealand Marine Sciences Associations).
- 9th Shallow Survey conference (delayed due to Covid) may be held later this year or early 2024.
- FIG WWs.

Publication(s)
Aim to publish new guideline on processing with redundant data by end 2023.

Timetable
- BAG format change submission will commence on the next version release of BAG - for hopefully inclusion in the following release. About 1 year to 18 months from now.
- Redundant data publication - Q4 this year.
- Several other activities are wide spread throughout the upcoming 4 years term.

Beneficiaries

- Hydrographic offices that seek to use a cryptographically signed surface as their final survey deliverable - but are using unsigned proprietary formats at the moment so that sounding density data can be included.
- Users of MBES systems and LiDAR systems with rapid large area capture (AUV, UAV, USV, SAS etc.) who need to utilise data redundancy to process data on an area basis, but wish to retain an unmodified record of the underlying sounding data.

Working Group 4.2 – Sustainable Oceans and Hydrography

Policy Issues

- The United Nations Development Programme Sustainable Development Goal 14 (SDG 14) advances the sustainable use and conservation of the oceans and requires effective strategies and management to combat adverse effects on the oceans through overfishing, growing ocean acidification and worsening coastal eutrophication. This top level statement gives encouragement to Ocean policy makers to develop sustainable projects and paths to develop innovative and effective solutions related to Climate Change, Food Security, Safe Maritime transport and use of the oceans as well as a fundamental appreciation of the importance of our seas and Oceans.
- The Sustainable Ocean and Hydrogrpahy work plan is based upon the ongoing work of Commission 4. It is a diverse and wide ranging topic but the primary focus for Working Group 4.2 is the development and promotion of capacity, skills guidelines to manage our oceans and seas in a sustainable manner based upon accurate data, sound environmental principles and good management practices.
- 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.

Chair- Mr. Gordon Johnston (UK)
Co-chair- *TBC*

Specific project(s)

The Working Group 4.2 shall seek to promote and engage with international government and non-governmental organisations to increase the understanding and awareness of the importance of the marine and ocean areas. In particular, the use of new technologies that will impact on the efficiencies and the future workforce requirements is important. There are several formal project planning tools and a further area to develop will the use of a formal standardised tool to identify the benefits and outcomes of Hydrographic related projects across the broader socio-economic and regional communities. Not just the entity that may have applied to undertake some works.

Workshop(s)

High on the agenda will be to engage with UN-FAO and World Bank to determine how these organisations perceive the importance and benefits of developing the capacity and skills to collect and manage the marine and ocean data sets that will underpin our decisions relating to the Circular Blue Economy areas. An area that is developing is around the automation and use of remote controlled unmanned systems to collect data efficiently and with a lower carbon footprint. This trend will have huge implications on our Professional Sector and will be the subject of certain key events related to the systems but also the Future Workforce concept.

Publication(s)

A key area will be to collaborate with other Commissions at FIG Working Weeks to develop mutual understanding and output. This will include Technical Papers on specific issues and presented by Working Group Members and other invited experts. In addition, it is planned that additional joint events may be organised to further the work and to generate a short briefing note and relevant proceedings. These may be with other NGO and IGO's interested and working in the area.

Timetable

WG 4.2 will participate in seminars, conferences and Technical Sessions at FIG events each year to support and promote the importance of surveying and surveyors for the seas and oceans. It is likely that this initiative will have certain key events such as the WW in Ghana 2024 to generate increased awareness and build on the themes.

Beneficiaries

- FIG member associations.
- National FIG Working Week organisations and countries.
- The international hydrographic surveying profession.
- National surveying, charting and mapping agencies.
- Academia.
- Individual hydrographic surveyors.

Working Group 4.3 – Mapping the Plastic

Policy Issues

- The effects of plastic pollution on the Earth's oceans are well documented, potentially catastrophic and increasing exponentially year on year. Almost every piece of plastic ever made is still on our planet in one form or another and UN estimates suggest that more than 75% of all the plastic produced since 1950 is now waste, with most of it discarded into landfills or dumped into marine environments2 . The UN Environment Programme (UNEP) has conservatively calculated that each year more than 8 million tonnes of plastic ends up in our oceans. That is roughly 15 tonnes of plastic entering our oceans every minute.
- Eighty per cent of all litter in our oceans is now made of plastic and, without action, the WWF estimates that by 2050 there will be more plastic in the sea than fish, by weight.
- Because fossil fuels are heavily used to create plastics and transport them to their points of sale, the climate change implications of plastic production are also not insignificant.

Chair - Simon Ironside (New Zealand)
Co-chair- Dr. Gordana Jakovljevic (Bosnia and Herzegovina)

Specific project(s)

- The Mapping the Plastic Working Group (WG 4.3) was formed at the 2018 Istanbul Congress as a combined initiative of the FIG Young Surveyors Network and Commission 4 (Hydrography) as FIG's response to this issue. The question of course is how we surveyors and spatial science professionals can best contribute to the global plastic battle.
- Given our specific GIS, remote sensing, hydrographic surveying, project management and overall measurement science skillsets, we decided to focus on better understanding the quantity and type of plastic waste being transported in waterways before they reach our oceans. Rivers are a recognised contributor to the ocean plastic problem. Plastic waste floats on the surface and upper limits of rivers or settles on banks, estuaries and coast lines during the transportation process.
- Remote 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. We have focussed on harnessing the potential of remote sensing and developed survey and processing methodologies to accurately survey/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 GIS tools in near real time.

Workshop(s)

The WG 4.3 focus over the next work cycle is to put the research and survey methodologies we have developed into practice. To enable us to get 'runs on the board' we will focus on three main objectives i.e. resourcing, collaboration and raise awareness.

Publication(s)

Several publications and technical papers are under planning in relation to our activities.

Timetable

WG4.3 activities are wide spread throughout the next 4 years term 2023-2026.

Beneficiaries

1. Resourcing

We are all volunteers and donate our time and expertise to this project willingly because we are passionate about solving this problem. Unfortunately, a lot of the plastic 'hotspot areas' are in countries whose governments don't have the necessary budgets to fund this work and neither do we. Therefore, a significant amount of effort will be directed at securing funding from the donor community to enable us to 'map the plastic'.

2. Collaboration

Remote sensing-based identification of plastic waste combined with near real time automated image analysis represents a breakthrough in the global plastics battle. The algorithms and methodology we have developed enable us to accurately map plastic waste in river systems and coastal areas, both on land and in the water. However this is not something that we can (or intend to) do by ourselves.

2.1 Academic partnerships

The success of our work to date is due the support of our academic partners the University of Banja Luka (UBL), Bosnia and Herzegovina and the University of Novi Sad (UNS), Serbia and the work of Dr Gordana Jakovljević (UBL) our lead researcher and Prof. Miro Govedarica (UNS). They are key members of our working group and their enthusiasm and dedication to ongoing research has been instrumental in developing the methodologies we are able to offer in the fight against global plastic pollution. We intend to strengthen this relationship over this work cylce and develop others as circumstances arise.

2.2 Governmental & Non-governmental organisations

Relationships formed with GreenHub, a dynamic environmental Vietnamese NGO, and Australia's Commonwealth Scientific and Industrial Research Organisation (CSIRO) at the 2019 FIG Working Week in Hanoi have endured and we are currently exploring ways in which we can work with them on plastic surveys. Other relationships, such as those as formed with the Aotearoa Plastic Pollution Alliance (APPA) (NZ), Ocean Cleanup (The Netherlands) and Open Oceans (US) will be reinvigorated, and new ones developed.

2.3 FIG Young Surveyors Network

As we move from research to implementation over this work cycle we anticipate that YSN involvement in this project will increase quite noticeably. The YSN, in conjunction with other volunteers, would be involved in field survey work in the particular country we are operating in. The YSN's interconnecting networks reach into each of the more than 100 FIG Member Associations and the FIG academic, corporate and affiliate memberships and their assistance is crucial.

2.4 Industry Partners

Prior to the Covid pandemic, Trimble kindly donated surveying hardware and software to the Mapping the Plastic working group to enable field work, data ground truthing and UAV orthophoto processing. This equipment is under the stewardship of UBL and was used in Dr Jakovljević's research work. We intend to reinvigorate this relationship with Trimble and develop others as circumstances arise.

3. Raise Awareness

The fundamental objective of WG 4.3 (and by extension FIG itself) is to control and ultimately eradicate plastic pollution in our oceans. With the support of the international surveying community, our networks within the plastics 'movement', our academic and industry partners and the donor community we can contribute meaningfully to this goal. Raising awareness of the issue is a key component of this. As we undertake more plastics surveys, refine our methods and techniques (and generally gain more traction) we will be able (funding permitting) to offer support to more countries and regions inundated with plastic pollution.

Raising awareness we involve publishing technical papers detailing our successes (and possibly some failures), presenting our findings at working weeks, congresses and other international fora, keeping our work updated on the FIG website and other sites, connecting locally with member organisations, NGO's and concerned 'citizen science' groups and the media to 'get the word out' to as many people as possible. We will also invite our partners who work with us to publicise this work through their networks.

FIG and the international surveying community would feature prominently in our communications, which is a great way to publicise what we are able to achieve on this (and potentially other) issues. We would also highlight any business opportunities for surveyors that may arise as a result of our work.

Working Group 4.4 – Hydrospatial Domain and Marine Administration

Policy Issues

- Assist in the development of an indigenous hydrospatial data infrastructure management (HDI/MSDI).
- Assist in the development of institutional policy and framework.
- Assist in the development of conceptual and technical standards, guidelines and practice.

Chair- Dr. Kelvin Tang Kang Wee (Malaysia)
Co-chair- Mr. Denis Hains (Canada)

Specific project(s)

- The Working Group 4.4 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.
- Review of national and international hydrospatial domain and marine administration policies, standards and guidelines.
- Suitable awareness, catalyse alliances, instigate sustainable collaboration by promoting best practices in the hydrospatial domain development and administration.

Workshop(s)

- Participate in FIG Working Weeks, Congresses, and other major Commission 4 events.
- Representing Working Group 4.4 to other FIG Networks and Task Forces.
- Participate in seminars, conferences and technical sessions to support and promote the importance of hydrospatial domain and marine administration.
- US Hydro, Euro Conferences, Canadian Hydrographic Conference and etc.
- Hosting a special Session/workshop on the Hydrospatial domain during one of the upcoming FIGWWs (Australia 2025!).

Publication(s)

- FIG Working Weeks will include technical papers and/or reports presented by Working Group 4.4 members and other invited experts.
- In addition, it is planned that additional joint events may be organised to further the work and to generate a short briefing note and relevant proceedings.
- FIG and other international publications on Hydrospatial aspects.

Timetable

- Working Group 4.4 Chair will report at FIG Working Weeks (2023-2026).
- Working Group 4.4 to present a final report at FIG Congress, 2026, South Africa.
- WG4.4 activities are spread throughout the 4 years term 2023-2026.

Beneficiaries

- FIG member associations and International Hydrographic Organization (IHO).
- Sister organisations and associated national surveying, mapping and charting agencies and relevant international non-governmental organisations.
- Maritime and hydrospatial domain including industry, government, education and academia.
- The Nippon Foundation, GEBCO, Seabed 2030 Project.
- The United Nations Decade on Ocean Science for Sustainable Development.

Working Group 4.5 – Climate Change induced Sea Level Rise and Adaptation

Policy Issues

According to the United Nations Framework Convention on Climate Change (UNFCCC) each country should set its own Nationally Determined Contribution (NDC) on the impacts, adaptation and vulnerabilities associated with the impacts of climate change. This is particularly relevant for coastal and island states which have set some of their NDC related to sea level rise (SLR), prediction of its trend according to the IPCC's projections, and evaluation of the impact through potential inundation of low lying coastal regions. However, at most places, a number of problems limit successful outcomes, mainly due to the lack of long term-tidal data, accurate digital elevation models (DEMs) over coastal areas, etc. Since this is a global challenge, it is preferable to develop guidelines aligning with global standards, which can support everyone working in this domain.

Chair - Dr. Mick Filmer (Australia)
Co-chair - Dr. Ashraf Dewan (Australia)

Specific tasks and objectives

- Review existing practices, tools and techniques to monitor and analyse sea level rise and associated issues.
- Identify existing, and further develop best practice, 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 altimetry data for improved sea-level-rise estimation as well as QA/QC for long term tidal data such as IB correction/land subsidence, etc., and also to use high-resolution remote sensing images, UAV sensors and GIS tools for coastal inundation modelling.
- Examine adaptation options to regional sea level rise and support research (e.g., case studies) to determine location-specific adaptation needs.
- Establish links and collaboration with existing sea level research groups, building on previous work.
- Explore funding opportunities to support tasks and objectives.

Workshop(s)

- Regional capacity development workshops on Climate Change induced Sea level rise and Adaptation.
- FIG Working Weeks.
- Representing Working Group 4.5 with other commissions (C5, C6), FIG Networks and FIG Task Force on Climate Compass.

Publication(s)

FIG publications on best practices in SLR estimation, coastal subsidence and adaptation.
Some scientific papers and presentations.

Timetable

- WG4.5 activities will be spread throughout the 2023-2026 period. Project work is subject to funding and in-kind time contributions from working group members.

Beneficiaries

- United Nations Framework Convention on Climate Change (UNFCCC).
- Small island nations through mitigation and adaptation measures for relative sea level rise induced.
- Multiple stakeholders (e.g., governments, research organisations, etc.)

6. Co-operation with Other Commissions and organisations

The proposed Commission 4 activities having certain overlaps with the other FIG Commissions such as C1,C2,C5,C6,C8, several Task Forces and its Networks, therefore it's good to have a closer collaborations with them.

7. Co-operation with United Nation Organisations, Sister Associations and other Partners

- International Hydrographic Organisation (IHO).
- International Maritime Organization (IMO).
- Intergovernmental Oceanographic Commission (IOC) of UNESCO.
- United Nations Framework Convention on Climate Change (UNFCCC).
- Nippon Foundation, GEBCO, Seabed 2030 Project.
- United Nations Decade on Ocean Science for Sustainable Development.

8. Commission Officers

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Dr. M.D.E.K. Gunathilaka
Chair, FIG Commission 4
30/03/2023