

**Report to the 43rd General Assembly
FIG Working Week 2020, Amsterdam, the Netherlands**

FIG Commission 4 - Hydrography

Report of Activities 2019_20

1. General

Altogether there are four (4) Working Groups for Commission 4 as listed below:

- a) WG 4.1 – Standards and Guidelines for Hydrography**
- b) WG 4.2 – Blue Growth & UN Sustainable Development Goal 14**
- c) WG 4.3 – Mapping the Plactic**
- d) WG 4.4 – Marine Development and Administration**

The Chairs for WG 4.1 is Mr. Neil Hewitt, WG 4.2 is Mr. Gordon Johnston, WG 4.3 is Mr. Simon Ironside and WG 4.4 is Dr. Abdullah Hisam Omar. While WG 4.1, WG 4.2 has been in existence for some time, WG 4.3 and WG 4.4 are new in Commission 4. Also, the Chairs of WG 4.1 and WG 4.4 are new to Commission 4.

2. Working Groups

2.1 WG 4.1 – Standards and Guidelines for Hydrography

The Chair of this WG was appointed in early 2019.

The Chair is a member on the HSPT working group for the review of IHO S44 and has been include on all correspondence for the review of this document. This involved the review and comment on IHO S44 update

2.2 WG 4.2 – Blue Growth & UN Sustainable Development Goal 14

The 2019-2020 year has been a busy one with the WG focussing on representing FIG at a number of events and forum to gain insight to develops generally and also to deliver and present on the work of Commission 4.

The Blue Economy is important as it provides a vital source of food and benefits from a host of industry sectors, technology and innovation. It can provide a valuable Return On Income (ROI) for investors. The UN SDG's, especially SDG-14 cannot be obtained without a much more systematic survey coverage of our oceans. The GEBCO Seabed 2030 project has this objective. (See: <https://seabed2030.gebco.net/>).

The pressures on limited ocean and sea resources continue. Resilience to the impact of man, climate or natural disasters needs to be developed and enhanced. Fifty years ago the Ocean was considered non-finite and extractive. Today the Ocean is finite, considered an ecosystem that requires management to enable Ocean Health to be sustainable. These are real challenges.

Relating the SDG's to aspects of the Blue Economy:

It is an enormous, growing market

Every 2nd breath of Oxygen we take is from ocean organisms

Fundamentally:

Food: aquaculture/mariculture essential to feed humanity

Water: 97% of earth's water in the ocean

Ocean energy: inexhaustible, clean, renewable energy

Medicine: Exploring for organisms to seed new drug research e.g. Seabiotech & Pharmasea in Europe NOAA scientists have also extracted chemicals from corals & sponges that fight some of the worst infectious bacteria.

Real estate: Especially around our coasts with water rising...much infrastructure will float



- 1,2,5,11,15,16 are directly related to Land issues
- New Urban Agenda & Rapid Urbanisation
- 1,2,3,6,7,12,13,14 are related to seas and oceans

The WG aim to publish a short paper on the Blue Economy, the role of surveying and the Hydrographic surveyor in delivering a sustainable clean ocean for the benefit of all. This aligns with the UN's SDG's.

2.3 WG 4.3 – Mapping the Plastic

Since its inception at the FIG Congress 2018 in Istanbul, Working Group 4.3, a joint undertaking of Commission 4 and the Young Surveyors Network, has been very active and there is every indication that its workload will only increase. The effects of plastic pollution on the Earth's oceans are well documented, potentially catastrophic and increasing exponentially year on year. The UN Environment Programme (UNEP) has calculated that only nine per cent of the nine billion tonnes of plastic produced throughout the world has been re-cycled and each year more than 8 million tonnes of plastic come to reside in our oceans. Eighty per cent of all litter in our oceans is made of plastic. This is an intolerable problem that needs immediate and far-reaching action to remedy. Eric Solheim, Head of UN Environment, speaking at the launch of the #CleanSeas campaign argued that it was past time to tackle the plastic problem that blights our oceans. 'We've stood by too long as the problem has gotten worse' he said, 'it must stop'. We agree.

Rivers have been identified as a significant contributor to, and enabler of, the plastic pollution problem affecting our oceans. UNEP estimates that just ten major river systems carry more than 80% of the plastic waste that ends up in the Earth's oceans. Much of the available information relating to the scale of the plastic pollution problem is based on relatively crude modelling. Plastic litter is predominantly concentrated on banks, coastal beaches and in the upper limits of surface water bodies. The lack of a means of comprehensive analysis of the spatial and temporal extent and quantum of plastic waste at a specific site, or on a regional or global level and the tools for ongoing monitoring represents a significant obstacle to addressing and eradicating the plastic waste 'explosion'.

Working Group 4.3 has been formed to better understand plastic pollution in waterways by providing accurate and reliable information of the magnitude of the problem at source, thereby highlighting unsustainable practices, identifying infrastructure shortcomings and informing robust land use controls with the ultimate goal of eradicating the dumping plastic waste into rivers. As surveyors and spatial professionals, we have the requisite skills and expertise to determine the vectors, quantum and frequency of plastic passing through waterways and to accurately quantify the amount and type of plastic litter on riverbanks, coastlines and estuarine areas.

Remote sensing data from satellites and airborne platforms available in different spatial, spectral and temporal resolutions has the potential to be a reliable source of long-term qualitative and quantitative information over large geographic areas. Research by members of the Mapping the Plastic working group at universities in Bosnia and Herzegovina and Serbia are currently underway to distinguish plastics from surrounding litter/debris classes using remote sensing techniques and the results are very promising.

Assessment of the spatial extent and variability of plastic is possible due to the unique spectral signature of polymers in the near-infrared part of the electromagnetic spectrum and we are looking at defining the data acquisition technology and identification methodology that will enable identification of plastic debris down to 1 cm² in size.

A combination of high resolution satellite and drone data has been processed using the developed algorithms to detect floating plastic in surface water, combined with 'ground truthing' land surveying measurements, bathymetric and water current data. This data will enable teams of volunteers to accurately map plastic concentrations at global 'hot spots' to enable regulators to better understand the extent of the phenomenon they are dealing with and inform decisions that impact the potential solution.

In order to undertake the field work required to infill gaps in the satellite/drone data, Trimble has kindly donated a suite of surveying hardware and software to the Mapping the Plastic working group and on behalf of FIG I would like to express my gratitude to Trimble for their assistance. This equipment will be of enormous benefit and is greatly appreciated. Negotiations are ongoing to secure a drone to assist with the plastic surveys.

2.4 WG 4.4 – Marine Development and Administration

The management of good governance of marine space administration has been debated since at least the 2000s. An extensive literature and research report, it is hardly surprising that this marine space is under serious threat from a myriad of overlapping and conflicting interests, where the evidence of change is compelling and manifest. Therefore it is imperative to manage, administer and govern the coastal zone in a considerable, sustainable and structural manner as well as to protect and nurture the environment we live in. Failure to do so may have disastrous consequences for future generations. This includes polishing the management system, particularly the governance of marine space administrative to support marine

rights. Marine space administration and management can help to improve our governance and information systems on coastal and marine areas.

The intention of the establishment of Working Group 4.4 is to assist the development of institutional policy and framework as well as the development of conceptual, technical standards, guidelines and practice. WG 4.4 will provide the necessary guideline of land and sea governance for marine cadastre and marine administration. Marine managed areas, in the widest sense, are geographic areas designed to protect or manage resources within the marine environment. Any agency that has jurisdiction in the marine environment can create marine managed areas. Framework of marine development and administration comprise of institutional, technical and socio-economic components. The entities of the framework will include custodian, implementers, technical support and data centre, policy, stakeholder, facilitator and source of human capital. This framework is applicable and can be adopted by any country.

3. a) Cooperation – WG 4.1

Cooperation with IHO in developing S-44.

3 b) Cooperation – WG 4.2

IBSC

The work of the International Board on the Standards of Competence of Hydrographic Surveyors and Nautical Cartographers meets annually to both review submissions from academic and naval institutions. The ten Board members are distributed world wide so the only practical way to review and maintain the course submissions and the Standards involves a two week annual Board meeting plus the inter-sessional reviews of some 16-18 courses.

A good summary of the work of the IBSC is included in the 2018 IHR International Hydrographic Review published paper, <https://journals.lib.unb.ca/index.php/ihr/article/view/26298/1882519051>

Capacity Development

The Commission 4 maintain a seat on the Capacity Development Forum that includes the IHO, IALA, WMO, IOC, IAEA, and IMO. It meets once a year in Europe and reviews potential opportunities to collaborate on possible development projects and campaigns.

3 c) Cooperation – WG 4.3

The (anti) plastics ‘movement’ world-wide is dynamic, motivated, concerned (verging on angry!), well informed and growing rapidly. The problem is huge, if not overwhelming, and one of the things the surveying profession has learned is that forming alliances with groups within the plastics movement is the most effective way of directly influencing positive outcomes. It also enables the profession to understand where and how we can contribute most effectively. The 2019 FIG Working Week in Hanoi, Vietnam was an opportunity to form a relationship with GreenHub- a young, dynamic and green Vietnamese NGO, and Australia’s Commonwealth Scientific and Industrial Research Organisation (CSIRO) who are doing great work in the plastics field. GreenHub and CSIRO have undertaken a large plastic survey along the coastline near Hanoi and attendees were fortunate that these organizations were able to present the results of their survey at the Mapping the Plastic session in Hanoi. A representative of the Vietnamese government presented a rather gloomy picture of Vietnam’s plastic problem and World Bank representatives in attendance expressed interest in uses of the plastic detection algorithm the working group have developed, particularly the ability to identify individual plastic manufacturers. One of the ‘hot spot’ areas the working group would like to survey with GreenHub and the Vietnamese

government is the Mekong Delta in the south of Vietnam. Unfortunately, there are no shortage of hotspots that require attention.

3 d) Cooperation – WG 4.4

Pre collaboration between ASEAN educational institution (Malaysia and Indonesia) and non-government organization such as World Wide Fund for Nature (WWF) on marine administration and marine space management is a promising opportunity towards the development and implementation of marine cadastre and marine administration framework to all other members in FIG.

4 a) Events – WG 4.1

Presentation at KL GeoHydro 2019 in Kuala Lumpur, Malaysia on the Australian Hydrographic Surveyors Certification.

4 b) Events – WG 4.2

Geospatial Commission Marine Forum, UK, Feb 2019

One day seminar to review the UK's GeoSpatial policy with respect to the marine and offshore sector. Various business, professional and sector representatives met to discuss issues around the creation, management of marine and offshore spatial data.

Ocean Survey Conference, April, UK 2019

A two day seminar that covers a wide range of Hydrographic topics. The conference included a presentation on the FIG WG Mapping the Plastic effort

North Atlantic Seabed Mapping Work Group and the All Atlantic research Alliance, February 2020

This Work Group aims to develop a sustainable approach to mapping deep ocean and high seas areas. The WG comprises mainly national agencies and government groups from Canada, EU and U|SA and some professional groups, FIG included. It has had some success in also engaging with students and early career professionals. The percent of mapping has increased since the WG started and will continue to do so until 2030.

Site visit to Category B hydrographic Course October, 2019

As a member of the IBSC (See IBSC report section) the work to maintain standards and to encourage and facilitate organisations to develop and provide courses according to their standards is critical to ensure a skills gap is avoided.

GOSE Workshop November, 2019

A two day event that developed themes around Hydrographic Survey and its promotion to the wider population. Ocean Literacy is a key element that we in FIG could consider how best to engage and support.

KL GeoHydro November, 2019

The annual Commission 4 event allowed some promotion of the work and success of the various WG's.

4 c) Events – WG 4.3

- A very well received technical session at the 2019 Working Week in Hanoi

- Chair Simon Ironside presented a paper at the KL GeoHydro 2019 conference in Kuala Lumpur in November 2019
- Simon Ironside & WG 4.3 member Paula Gentle hosted a successful Mapping the Plastic workshop in Wellington, New Zealand in December 2019 in conjunction with the Aotearoa Plastic Pollution Alliance (APPA)
- A plastics survey of a canal/waterway to train volunteers and raise awareness and a plastics mapathon/workshop will be held as part the pre-events at the 2020 Working Week in Amsterdam. These events will involve experienced professionals from CSIRO, GreenHub and APPA who will train our YSN volunteers
- A Mapping the Plastic technical session will also be held at the 2020 Working Week

4 d) Events – WG 4.4

KL GeoHydro 2019

Research collaboration activities among education institutions in ASEAN

Development of Marine Cadastre Institutional Framework for participating country (pilot project in Asean)

Indigenous marine management study

5 a) Communication and publications – WG 4.1

Draft publication of the IHO S-44.

5 b) Communication and publications – WG 4.2

Although not specifically a Blue Economy and Hydrography paper the sustainable economic growth from ocean and sea related activity will likely be under-pinned by a more complete systematic mapping. The sub group including FIG, generated a peer reviewed paper for the initial Decade of the Ocean kick off event at Ocean Obs 2019. See: Seafloor Mapping – The Challenge of a Truly Global Ocean Bathymetry at <https://www.frontiersin.org/articles/10.3389/fmars.2019.00283/full>

A good summary of the work of the IBSC is included in the IHR International Hydrographic Review published paper, <https://journals.lib.unb.ca/index.php/ihr/article/view/26298/1882519051>

5 c) Communication and publications – WG 4.3

Chair Simon Ironside has had two Mapping the Plastic articles published in professional magazines; Geoconnexion and Survey & Spatial New Zealand in December 2019 and January 2020 respectively.

5 d) Communication and publications – WG 4.4

In 2018/2019 , there is 1 paper published in Marine Policy journal and 3 paper in international Scopus level journals. All papers highlighted the marine development and marine administration components and entities.

6 Other highlights

The Annual Meeting of Commission 4 was held in Kuala Lumpur during the conference of KL GeoHydro 2019. All four (4) WG Chairs including the Commission Chair attended the meeting.