Report to the General Assembly
FIG Congress 2022, Warsaw, Poland

FIG Commission 4 - Hydrography

Report of Activities 2019-2022

Commission Chair

Dr. Mohd Razali Mahmud
Faculty of Built Environment and Surveying
Universiti Teknologi Malaysia
81310 Johor Bahru
MALAYSIA
Email: razali.mahmud@gmail.com

1. Terms of Reference and Mission Statement

1.1 Terms of Reference

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

- Promotion of hydrographic education, training, Continual Professional Development (CPD) and career pathways within the profession;
- Protection of the marine environment;
- Coastal Zone Management (CZM) including Ports & Harbours;
- Offshore Construction Surveying;
- Nautical charting for safe navigation/bathymetric mapping – analogue and digital including Electronic Navigational Charts;
- Data processing and management of hydrographic data;
- Review and update of standards and guidelines.

1.2 Mission Statement

Commission 4 is commited to:

- Promoting 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;
- Fostering closer links with all sister organisations currently active within the global hydrographic community;
- Developing guidelines and standards that will assist hydrographers in the provision of their services;
- Disseminating information relevant to the profession through participation in international meetings, conferences and committees;
- Assisting 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.

1.3 General

Commission 4 is committed to achieving both the long term and immediate aims and objectives of FIG. Its strategy for the term 2019-2022 is aligned with that of the FIG Council and 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;
- Cooperation with other FIG Commissions, including joint working groups;
- Active support and participation in FIG regional events;
- Cooperation with sister organisations and other appropriate bodies;
- Cooperation with national surveying and mapping agencies; and,
- Respond to directions from FIG Council to address emerging issues as required.

2. Working Groups

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 Plastic
d) WG 4.4 – Marine Development and Administration

The Chairs for WG 4.1 is Mr. Geoff Lawes (taking over from Mr. Neil Hewitt in February 2021), 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.

2.1 WG 4.1 – Standards and Guidelines for Hydrography

Chair: Neil Hewitt (Australia) from January 2019 until February 2021
Geoff Lawes (Australia) from February 2021

The new Chair of this WG 4.1 is Mr. Geoff Lawes (Australia). Mr. Lawes took over from Mr. Neil Hewitt in February 2021 when Mr. Neil Hewitt take on the role as SSSI Hydro Commission Chair.

The Chair is a member on the HSPT working group for the review of IHO S-44 and has been include on all correspondence for the review of this document. This involved the review and comment on IHO S-44 update. In September 2020, IHO published the 6th edition of the IHO Standards for Hydrographic Surveys.

The work of the International Board on the Standards of Competence for Hydrographic Surveyors and Nautical Cartographers (IBSC) meets annually to both review submissions from academic and naval institutions. The ten Board members are distributed worldwide 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. FIG Commission 4 is represented by four (4) members: Mr. Gordon Johnston (United Kingdom), Mr. Adam Greenland (New Zealand), Mr. Sobri Syawie (Indonesia) and Professor Dr. Harald Sternberg (Germany). In 2020, the 43th meeting of the IBSC was held at Cartagena de Indias, Colombia from 9 March to 20 March 2020. In 2021, IBSC44 meeting was conducted via VTC from 19 April to 30 April 2021. This year the IBSC45 meeting was held in hybrid mode from 28 March 2022 until 8 April 2022 in Cadiz, Spain

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

Chair: Gordon Johnston (United Kingdom)

In the last year very little has been completed due to the impact of the Pandemic on the events and potential work related activities. The existing WG that concerns itself with the Blue Economy and the UN SDG 14 in relation to our oceans has maintain a networking activity with numerous webinars and virtual meetings.

Dialogue with the UN-GGIM experts to enable the Commission 4 SME's on the Marine Geospatial theme has been established and it remains now to work with the FIG President's office to secure routine involvement and inclusion on the UN-GGIM Working Group on Marine Geospatial Information.

One notable success for the Commission 4 WG was to lead the creation of an Atlantic Mapping Roadmap or vision statement.

The Vision Statement arises from the activities of the Atlantic Seabed Mapping International Work Group (also known as the AORA Seabed Mapping Working Group), conducted through the Atlantic Ocean Research Alliance (AORA) between Canada, the European Union and the United States of America. The progress and vision towards achieving a baseline seabed and habitat map of the Atlantic Ocean, was presented at the All Atlantic Ocean Research Forum, 6-7 February 2020, in Brussels, Belgium in support of the Atlantic Ocean Research Alliance in connection with the Galway Statement (Canada, EU & USA are signatories).

The roadmap, published by the Marine Institute Ireland can be downloaded from here: https://oar.marine.ie/handle/10793/1596

2.3 WG 4.3 – Mapping the Plastic (Joint Commission 4 and Young Surveyors Network)

Chair: Simon Ironside (New Zealand)

Overview

Millions of tonnes of plastic waste end up in our oceans every year and constitutes an environmental problem of global proportions with hugely significant negative impacts. Most plastic is not biodegradable and over time breaks down to microplastics, thereby exacerbating the problem.

Rivers are a significant enabler of the plastic ending up in the world's oceans. The UN Environment Programme (UNEP) estimates that just ten major river systems carry more than 80% of the plastic waste that ends up in the Earth's oceans,

The lack of a means to analyse the spatial and temporal extent and quantum of plastic waste at specific 'hot spot' locations, or on a regional or global level and the tools for ongoing monitoring is a significant obstacle to eradicating plastic waste from waterways.

Working Group 4.3, a joint Commission 4 and Young Surveyors Network undertaking, is FIG's response to this overwhelming plastics problem. Our objective is to enable the accurate mapping of plastic waste within waterways and provide regulators with reliable spatial information with which to identify unsustainable waste disposal practices, infrastructure shortcomings and inform robust land use controls with the goal of eradicating the dumping plastic waste into rivers.

Remote sensing data from satellites, airborne platforms and unmanned aerial vehicles (UAV's) in different spatial, spectral and temporal resolutions can provide suitable data for the mapping of floating plastic waste at specific 'hot spots'. 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. Research by WG 4.3 members at partner universities has resulted in 1) the development of an algorithm to detect floating plastic in freshwater, based on Artificial Neural Networks and high-resolution multispectral WorldView-2 satellite images and 2) the development of deep learning algorithms to distinguish plastics from surrounding litter/debris classes from UAV orthophotos, enabling identification of plastic debris in water 1 cm^2 in area. These algorithms, particularly are world-leading, enabling the mapping of floating plastic by UAV surveys.

Partnerships and Work to Date

The (anti) plastics 'movement' world-wide is concerned/angry, highly motivated and growing rapidly. The problem is huge, if not overwhelming, and one of the things WG 4.3 has learned is that forming alliances with groups within the plastics and wider environmental movement is the most effective way to directly influence positive outcomes. It also enables us to understand where and how we as spatial professionals can contribute most effectively.

Trimble has very kindly donated hardware and software to assist with field survey work in 'hot spot' areas, which will be used to augment UAV remote sensing data. Young Surveyors Network volunteers will be involved with plastics surveys where possible, as loosening of travel restrictions permit.

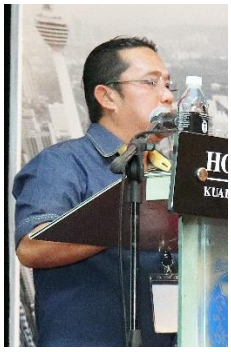
Relationships with GreenHub, a dynamic environmental Vietnamese NGO, and Australia's Commonwealth Scientific and Industrial Research Organisation (CSIRO) were formed at the 2019 FIG Working Week in Hanoi have endured, as has the relationship formed with the Aotearoa Plastic Pollution Alliance (APPA) in New Zealand.

WG 4.3/Surveying+Spatial New Zealand involvement with the NZ Marine Geospatial Information Working Group has resulted in plastic waste being added as a database input of the national MGI inventory.

In May 2020, WG 4.3 and Greenhub submitted a proposal for the Plastics Monitoring in Vietnam Rivers Pilot Study to the World Bank and the Ministry of Natural Resources and Environment of Vietnam. This project is a pilot study of plastic pollution assessment using UAV/remote sensing techniques. Unfortunately, our bid this time was unsuccessful.

Working Group 4.3 has also established close relationships with the Faculty of Technical Science at the University of Novi Sad, Serbia and the Faculty of Architecture, Civil Engineering and Geodesy at the University of Banja Luka, Bosnia and Hezegovina.

2.4 WG 4.4 – Marine Development and Administration



Chair: Abdullah Hisam Omar (Malaysia)

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.

In 2019, WG 4.4 has presented a paper in international conference KL GeoHydro 2019 that focused on the role of marine cadastre towards nation development. This paper provides the potential, requirements and challenges on the realization of marine cadastre worldwide and how marine cadastre can be a catalyst to nation development. The framework of marine cadastre is also highlighted to facilitate the concept of marine cadastre

The one of abovementioned framework is expressed in KL GeoHydro 2020 conference. WG 4.4 has presented a paper that intended to highlight the roles of hydrographer on managing and administering the marine environment using multicriteria decision analysis. The challenge of marine development and administration in the 21st century is concluded. Hydrographer should be able to adopt the potential of Industrial Revolution 4.0 and emerging drivers, explore the new potential sectors that required marine spatial literacy & proficiency and empower new knowledge in data science and data analytic towards transformation of data provider to analytic provider.

The Royal Institution of Surveyors Malaysia (RISM) has conducted a regional Surveyors Congress 2022 in Sarawak , Malaysia in 22 March 2022. WG 4.4 has presented a paper on Cadastre Modernization in 21st Century. This paper highlighted the new vision, modern cadastre and the way forward. Marine cadastre is one of the new branch that need to be explored in modern cadastre especially in south east asian region.

WG 4.4 will be presenting a keynote paper at International Virtual Course: Land and Marine Administration Toward Better Disaster Risk Managment organised by Bandung Institute of Technology, Indonesia on 1 August 2022.

3. Cooperation

Cooperation with IHO in developing S-44. This is completed with the publication of the IHO Standards for Hydrographic Surveys (S-44), 6th edition, September 2020.

Cooperation with IBSC:. 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.

Pre-collaboration between ASEAN educational institution (Malaysia and Indonesia) and non-government organisation 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. Conferences

Omar, A.H. (2020). Marine Administration: Role of Hydrographer on Multi-Criteria Marine Spatial Risk Assessment. Presented at the KL GeoHydro 2020, Johor Bahru, 7-8 December 2020.

Mahmud, M.R. (2020). Realisation of the Challenges in Fulfilling the Hydrographic Prospects due to Covid-19. Presented at the KL GeoHydro 2020, Johor Bahru, 7-8 December 2020.

Hewitt, N. (2019). Hydrographic Surveyors Certification. Presented at the KL GeoHydro 2019, Kuala Lumpur, 18-19 November 2019.

Ironside, S. (2019). Mapping the Plastic – A Surveyor's Response. Presented at the KL GeoHydro 2019, Kuala Lumpur, 18-19 November 2019.

Johnston, G. (2019). Blue Growth, Developing the Blue Economy and the Surveyors' Contribution. Presented at the KL GeoHydro 2019, Kuala Lumpur, 18-19 November 2019.

Mahmud, M.R. (2019). Empowering Marine Knowledge through Hydrographic Professional Programmes at Universiti Teknologi Malaysia. Presented at the KL GeoHydro 2019, Kuala Lumpur, 18-19 November 2019.

Omar, A.H. (2019). Roles of Marine Cadastre for Nation Development: Potential, Requirement and Challenges. Presented at the KL GeoHydro 2019, Kuala Lumpur, 18-19 November 2019.

Mahmud, M. R., Hewitt, N., Johnston, G, Ironside, S. and Omar, A. H., (2019). FIG Commission 4 Work Plan (2019-2022), International Federation of Surveyors.

5. Publications

Chair of WG4.3, 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.

The followinng are two (2) articles published in GIM International and International Hydrographic Review (IHR) on the work of FIG Commission 4:

a) Contribution of Hydrography towards Sustainable Water Management (M. R. Mahmud, N. Hewitt, G. Johnston, S. Ironside, A. H. Omar), May 2020, GIM International.

b) FIG Commission 4: Hydrography Work Plan (2019-2022) and Commission Activities (M. R. Mahmud, N. Hewitt, G. Johnston, S. Ironside, A. H. Omar), November 2020, International Hydrographic Review.

6. Event Hosted by FIG Commission 4

FIG Commission 4, The Association of Authorised Land Surveyors Malaysia (PEJUTA) and Universiti Teknologi Malaysia (UTM) organised the KL GeoHydro 2019 Conference from 18-19 November 2019 in Kuala Lumpur, Malaysia and KL GeoHydro 2020 from 7-8 December 2020 in Johor Bahru, Malaysia. The event in 2019 was held physically and the event in 2020 was held via online platform. The Commission 4 Chair and all Working Group Chairs attended and presented in the 2019 Conference while in the 2020 Conference, the Commission Chair and the Chair of Working Group 4.4 attended and presented in the Conference.

Figure 1: KL GeoHydro 2019: Standing third from Left to Right, Gordon Johnston, follow by Mohd Razali Mahmud, standing seventh from Left to Right, Simon Ironside, follow by Neil Hewitt as invited speakers at KL GeoHydro 2019.

Figure 2: KL GeoHydro 2020 was held online in Johor Bahru, Malaysia. Committee members comprising of FIG Commission 4, PEJUTA and UTM.

7. Conclusions

More complete and detail work through physical meetings and the organisation of workshops, seminars, surveys, etc. can be carried out for all the Working Groups if not for the pandemic of covid-19.

Commission 4 will assist and participate in the United Nations programmes on guidance by the FIG Council and in circumstances where Commission expertise can contribute towards successful programme outcomes.

8. Acknowledgements

My sincere thanks to all the Chair of the Working Groups and their members in trying their utmost best to accomplish the work plan under difficult challenges and environment due to the pandemic of covid-19. The continued support and assistance from the FIG Council and FIG Office especially the President, Vice-Presidents and FIG Director is acknowledged and most appreciated.

Dr. Mohd Razali Mahmud
Chair of Commission 4
13 June 2022