International Federation of Surveyors
Fédération Internationale des Géomètres
Internationale Vereinigung der Vermessungsingenieure

FIG COMMISSION 4

Hydrography

ANNUAL REPORT – 2011

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Chair (2011-2014), Commission 4, International Federation of Surveyors (FIG)
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The end of the year 2011 marked the end of the 1st year of Commission 4's 2011-2014 term. The Commission continues to pursue significant contributions to hydrography and hydrography-related activities. Specific contributions and achievements for 2011 are outlined in this report.

WORKING GROUPS

Work Group 4.1 Ellipsoidally Referenced Hydrographic Surveys (ERS)

The objectives of Commission 4.1 for 2011-14 included:

1. Study and report on the technical aspects of using GNSS to vertically reference hydrographic surveys to the ellipsoid
2. Catalog the methods used to conduct a vertical datum transformation from the ellipsoid to vertical datums used for hydrographic and offshore surveying
3. Develop uncertainty models for both of the above

Objective #1: A questionnaire related to Ellipsoidally Referenced Surveys (ERS) practices was distributed in the summer of 2010 under the auspices of FIG Commission 4 Working Group 4.1. This followed a much narrower information gathering exercise which was initiated in the summer of 2009 prior to the formation of WG 4.1. The findings from the results of both stages of information gathering were summarized in a paper that was presented at the U.S. Hydrographic Conference 2011 in Tampa, Florida and subsequently published in the November 2011 issue of the International Hydrographic Review: Dodd, D. and Mills, J. (2011) Ellipsoidally Referenced Surveys: Issues and Solutions.

Objective #2: During 2011 the Working Group has been gathering information on the methods used by various nations to conduct vertical datum transformation from the ellipsoid to the chart datum. The resultant vertical separation model (SEP) will enable ellipsoidally referenced coherent hydrographic survey data sets to be referenced to the nautical chart datum. The compilation of the Working Group's findings will be presented at the FIG Working Week 2012: Dodd, D. and Mills, J. (2012) Ellipsoidally Referenced Surveys (ERS) Separation Models.

Objective 3: Some minor progress has been made in the U.S. for determining the uncertainty of both Ellipsoidally Referenced Surveys and vertical separation models. Much more work is yet to be done.

Next Steps:

1. Engage the international hydrographic community in identifying and refining "best practices" for (a) the use of GNSS in vertical positioning relative to the ellipsoid for hydrographic surveying, (b) the development of vertical separation models and (c) the determination of uncertainty models for both of the above.
2. Publish an FIG Publication on the above "best practices" and make a proposal to the International Hydrographic Organization (IHO) to include the information in this publication in the IHO Manual on Hydrography.

Work Group 4.2 Standards and Guidelines for Hydrography

This working group's aim is to:

- Assist in the development and recognition of standards of competency;
- Assist in the development of technical standards and guidelines;
- Cooperation with sister organizations and other appropriate bodies.

The working group continues to seek to:

- Promote the use of standards and guidelines to the surveying community;
- Review Standards coming from ISO TC211 (and other reputable sources) for relevance to Hydrography;
- Assess the impact of international standards on current industry practice;
- Represent Commission 4 on the FIG Standards Network;
- Promote recognition of professional pathways;
- Review IHO and other Manuals of Hydrography in conjunction with WG 4.3.

WG activity in 2011 was somewhat limited to tasks undertaken by the chair on a national level where priorities called for efforts related to Standards and Guidelines be directed closer to home.

Late in 2010, a brief summary of the new Guidelines for Individual Recognition, part of the Edition 10 Standards of Competence for Hydrographic Surveyors and Nautical Cartographers (S-5 and S-8) was prepared for the Canadian Institute of Geomatics (CIG) Hydrography Committee and published in Lighthouse the journal of the Canadian Hydrographic Association. The report promoted the value of hydrographer certification programs, particularly in fostering CPD and IBSC-accredited training courses worldwide. Additionally the report identified an important element of these Guidelines which is the requirement for a joined-up approach between the surveying profession, government, academia and industry towards implementing a national certification scheme. Upon release of S-5 and S-8, beginning early in 2011, the chair continued to promote the Guidelines to both the CIG and the Association of Canada Lands Surveyors, the latter having previously published a model for certification in many ways compliant with the IBSC Guidelines.

While unable to attend WW2011, on behalf of the chair of WG4.2, Mr. George MacFarlane, president of the Canadian Hydrographic Association, represented Commission 4 in the 2011 Standards Network meeting at WW2011.

In the wake of a busy 2011 field season, in particular the chair's recent involvement leading a multidisciplinary, multi-departmental and multiplatform Arctic charting and mapping pilot project has lead to a recent review of IHO S-100. Perhaps out of an immediate need to develop a more integrated and systematic approach to marine-related data management and a practical requirement to develop guidelines for the creation and distribution of marine information specific to environmentally sensitive areas, initial findings tend to point towards further study of the S-100 to support a specification for an environmental layer.

With the upcoming Canadian Hydrographic Conference (CHC) 2012 a great deal of 2011 effort has been focused on chairing the technical committee in evaluating abstracts and developing the technical program for this bi-annual meeting.

Working Group 4.3 Multi-Sensor Systems for Hydrographic Applications

The stated foci of this working group are to:

- Assist in the development of technical guidelines for sensor integration (best practises);
- Cooperate with sister organizations and other appropriate bodies (e.g., IHO, IMO);
- Cooperate with other FIG Commissions.

Stated specific objectives are to:

- Liaise with working group 4.2 to upholding the standards of hydrography;

- Report on the development, possibilities and limitations of new technologies;
- Organize a Symposium with the working title "Integrating Sensors in Hydrography";
- Assist in the development of technical guidelines for sensor integration.

A questionnaire was distributed in summer 2010. The main goals were to contact with interested persons and establish an efficient working group. Responses to the questionnaire didn't meet expectations but the working group is active and is communicating via email and ftp. An ftp website for the distribution of information was announced to collect the description of problems, international, national and institutional standards and presentations/papers regarding the use of multi-sensor systems. New approaches shall be taken into account.

A new German report was distributed which deals with uncertainties in Hydrography, implemented as part of a new quality management system of the German water- and shipping authorities. Presentations and papers can be expected in the near future. Several discussions clarified that one focus of the working group shall lie on the positioning, attitude determination and calibration of MBES and MLS onboard (patch test).

Related literature in 2011:

- V. Böder, T.P. Kersten, T. Thies, A. Sauer (2011): Mobile laser scanning on board hydrographic survey vessels - applications and accuracy investigations -. FIG Working Week 2011, Marrakech.

Related Sessions FIG Working Week 2011, Marrakech:

- TS05J – Hydrography in Practice

Related Sessions FIG Working Week 2012, Rome:

- TS04J - Hydrographic Technologies (TS03C - Multi-Sensor Systems, TS04H - Measurement Applications of Unmanned Vehicles)

Next steps:

- The ftp site has to be filled up with information, published to interested user and later be switched to a website.
- The IHO Manual will be investigated regarding possible additions.
- Beside the FIG Working Week in Rome some aspects of multi-sensor systems for hydrographic applications will probably be presented at the Hydro12 conference in Rotterdam (NL) in November 2012 (hydro12.com).

Work Group 4.4 Maritime and Marine Spatial Information Management

This working group's aim is to participate in co-operation with United Nations agencies on topics that are related to commission expertise (e.g. marine cadastre, data framework for e-Navigation etc.) and on guidance by FIG Council. Specifically the working group aims to:

- Cooperate with, and represent the interests of FIG Commission 4 to, IMO in the development of an e-Navigation data framework (e.g., harmonization of data models among stakeholders).
- Cooperate with IHO on the continuing development and expansion of S-100 to support hydrographic- and hydrographic-related spatial information management.
- Cooperate with appropriate stakeholders (e.g., IHO-MSDIWG) on the development of concepts and principles that impact and are impacted upon by hydrography (e.g., MSDI, marine spatial planning and management, marine data models and applications, marine cadastre etc.).
- Present and promote the above concepts, principles and outcomes to the international surveying community.

In 2011 some changes were made to the structure of the working group - two new study groups were created:

- Study Group 4.4.1 Marine Spatial Data Infrastructure ; and
- Study Group 4.4.2 Remote Sensing of Coastal and Marine Waters.

The study groups were created to take advantage of international hydrography-related initiatives (such as the International Hydrographic Organization's (IHO) interest in Marine Spatial Data Infrastructure and data structures) and

other special research focus of concern to Commission 4. Additionally, there was a "changing of the guards" among officers of the working group:

- Professor Dr. Jonathan Li, Professor of Geomatics, Department of Geography & Environmental Management, University of Waterloo, Canada replaced Dr. Michael Sutherland (Trinidad and Tobago, and Canada) as Chair, Working Group 4.4, Maritime and Marine Spatial Information Management;
- Professor Li was also approved as Chair, Study Group 4.4.2 Remote Sensing of Coastal and Marine Waters; and
- Dr. Bheshem Ramlal, Head of Department, Department Geomatics Engineering and Land Management, The University of the West Indies, St. Augustine, Trinidad and Tobago was approved as Chair, Study Group 4.4.1 Marine Spatial Data Infrastructure.

The late changes to the structure of the working group mean that there was some delay in pursuing the group's objectives. Members of the working group will collaborate with the IHO and IMO and report to FIG on issues and developments affecting hydrography at the international level. The working group will also consider a publication on issues relating to remote sensing of coastal waters.

Work Group 4.5 Hydrography in Africa

The stated foci of this working group are to:

- Raise the awareness of hydrography in all African countries.
- Make available its potentials to various countries (Africa).
- Enunciate its potentials as a vital component and catalyst to nation building.
- Promote free exchange of information among all those engaged in Hydrography.

Stated specific objectives are to:

- Organize seminars and workshops on the potentials of hydrography in several countries.
- Promote recognition of hydrography by organizing charity walks.
- Communicate the activities of Commission 4 and other FIG events to African member countries.
- Liaise with working group 4.2 to uphold the standards of hydrography.

This working group continues to push for increased recognition in Africa of the important contributions of hydrography to society's objectives, and to ensure that this discipline receives the public funding and support that it deserves. The main work carried out in 2011 includes meetings with high level government officials, and the organization of a workshop on hydrography and national development, held in Lokoja, Nigeria between 24th and 26th October 2011. Details of the workshop are outlined in the section on conferences, workshops and symposia, and in a report published on Commission 4 website. The working group also continues to work with FIG Africa Task Force.

CONFERENCES, MEETINGS, WORKSHOPS AND SYMPOSIA

Hydrography Awareness Workshop in Nigeria (Organized by Working Group 4.5 Hydrography in Africa)

As a response to the lack of hydrography awareness in Africa, Commission 4 Working Group 4.5 (Hydrography in Africa) organized a 3-day workshop in Lokoja, Nigeria between 24th and 26th October 2011. The theme of the workshop was "Hydrography and National Development". Participants came from as far away as Ghana and Canada. The welcome address was given by workshop organizer and Chair, Working Group 4.5, Surv. (Mrs.) Angela Kesiena Etuonovbe. In her address, she highlighted the importance of hydrography to national development and encouraged participants to appraise where they are now with regard to hydrographic practice in Africa, and to consider where they ought to be in the next century.

Some Attendees at the Workshop on Hydrography Awareness, Lokoja, Nigeria.
Chair, Working Group 4.5 and workshop organizer, Mrs. Angela Etunovbe stands at the center

The workshop was supported by the Chair, Commission 4, International Federation of Surveyors, His Excellency, Governor Ibrahim Idris, represented by Surv. M. O. Abolarin, Deputy Surveyor-General of Kogi State, the Honourable Minister of Transport, Sen. Idris Umar, represented by the Managing Director, National Inland Waterways Authority (NIWA), Arc. Ahmed Aminu Yar'adua , The President, Nigerian Institution of Surveyors (NIS), Surv. Chief Yakubu Maikano, the President, Surveyors Council of Nigeria, (SURCON), Sur. G. A. Agunbiade, the Nigerian Port Authority (NPA), the Hydrographic Society of Nigeria and the Hydrographer of the Nigerian Navy.

Four technical papers were presented by resource persons drawn from Nigeria, Ghana, and Canada. The full workshop report is to be found on Commission 4 *Reports from Events* website.

FIG Working Week 2011, Marrakech, Morocco

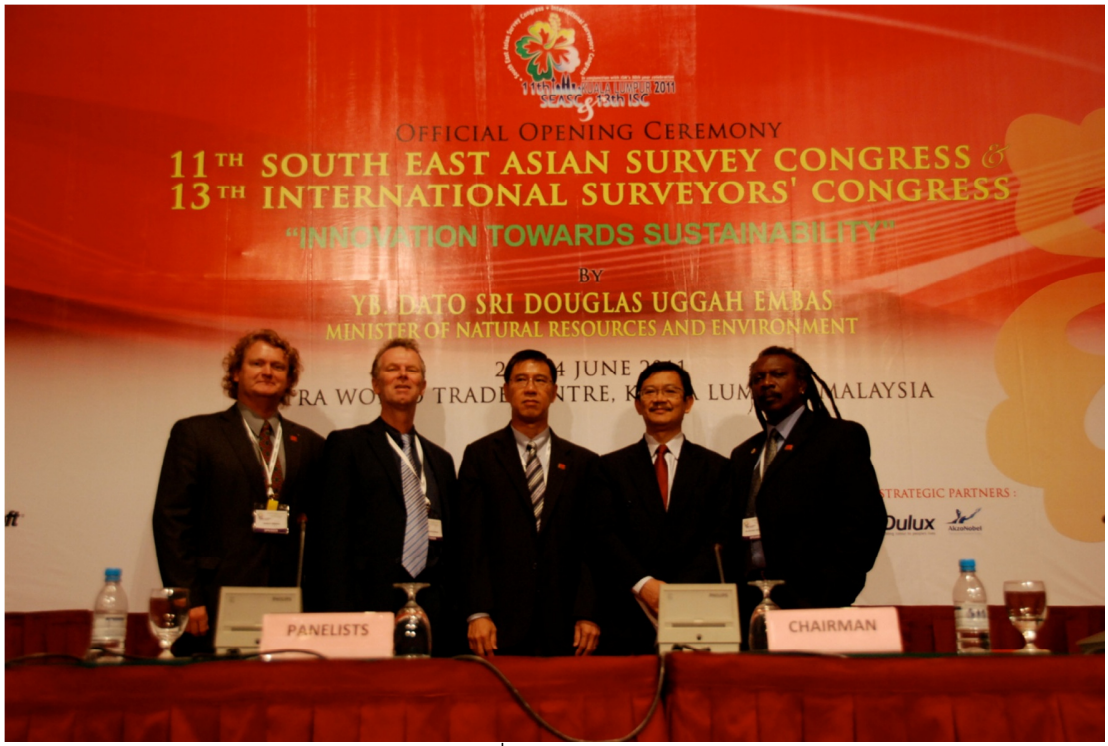
In May 2011 (18^{th} – 22^{nd}) FIG held its Working Week in Marrakech, Morocco. Notwithstanding some no-shows, Commission 4 technical sessions comprised approximately 26 papers and covered general themes such as:

- Hydrography-Assisted Monitoring;
- Hydrography in Practice;
- Hydrography and the Environment; and
- Marine\Coastal Modelling and Technology.

The technical sessions were well attended, and attendees made significant contributions through questions, comments, and commitments. Of significance was the participation of "Young Hydrographers" as part of FIG's Young Surveyors' Network.

Commission 4 Delegates in Marrakesh, Morocco

11th South East Asian Survey Congress, Kuala Lumpur, Malaysia



The FIG Delegation with Surveyor Fauzi bin Nordin (2nd right) Chairman, Organizing Committee, 11th South East Asian Survey Congress

The 11th South East Asian Survey Congress was held in Kuala Lumpur, Malaysia during the period June 22nd to 24th 2011. The Chair of FIG Commission 4 was among other FIG officers invited as special guest speakers. The Chair addressed the plenary session on the topic of implementing a marine cadastre. The concept of the marine cadastre continues to be of importance to jurisdictions in South East Asia, and hydrography plays an important role in developmental strategies.

IHO - IMO - IOC – WMO – IALA - IAEA 5th Capacity Building Coordination Meeting

The IHO - IMO - IOC – WMO – IALA - IAEA held their 5th Capacity Building Coordination Meeting at IALA Headquarters, Saint Germain en Laye, Paris, France during the period October 27-28 October 2011. Commission 4 was in attendance by special invitation and was represented by Vice-Chair Administration and Communication, Mr. Gordon Johnston, Commission 4's *de facto* liaison to IHO. Commission 4's participation represents evidence of its commitment to cooperate with sister organizations, outlined in section 6 of its work plan.

The organizations meet with the freedom of not having established any formal terms of reference for this event. This enables the participants to express their views and indicate potential (as well as real activities) that illustrate how they each work and where some lessons may be gained for other organizations. The role of FIG and Commission 4 was outlined citing various publications and meetings as the key deliverables relating to Capacity Building and proposed a more coordinated schedule of meetings, possibly as joint events, to better reach our audiences.

Other Conferences, Meetings and Symposia

During 2011 Commission 4 officers and members attended other meetings or presented papers at a number of conferences of importance to hydrography:

- Hydro 2011 in Fremantle, Western Australia, 7th – 10th 2011;
- Second International FIG Workshop on 3D-Cadastres, 16-18 November 2011, Delft, the Netherlands;
- 11th International LiDAR Mapping Forum 2011, 07-09 February, New Orleans, Louisiana, USA;
- Ocean Business 2011, 5-7 April, Southampton, UK;
- U.S. Hydrographic Conference 2011, 25-28 April, Tampa, Florida U.S.A;
- 6th International Shallow Survey Conference 2012, Wellington, New Zealand.

BOARDS, COMMITTEES AND LIAISONS

FIG/IHO/ICA International Board on Standards of Competence for Hydrographic Surveyors and Nautical Cartographers (IBSC)

Commission 4 continues to represent FIG on the FIG/IHO/ICA International Board on Standards of Competence for Hydrographic Surveyors and Nautical Cartographers (IBSC) jointly with IHO and ICA. Commission 4 has four representatives on the Board, these being: Gordon Johnston (UK), Dr. Razali Mahmud (Malaysia), Adam Greenland (New Zealand). In June 2011, Dr. David Neale, former Commission 4 Vice-Chair Administration and Communication, and former Commission 4 representative on IBSC, lost his battle with cancer. The hydrographic community lost a stalwart. Subsequently Dr. Neale has recently been replaced by Dr. Keith Miller as the 4th FIG member on the Board. Keith is from the Department of Geomatics Engineering and Land Management, University of the West Indies, St. Augustine, Trinidad and Tobago.

The Late Dr. David Neale

At the IBSC meeting, held in New Orleans the Board reviewed 8 submissions, granting immediate recognition to 4 and requesting further input on the others. AAA full list of the current Recognised Courses is available on the IHO website at: http://www.iho.int/srv1/index.php?option=com_content&view=article&id=440:ibsc&catid=64:4ircc&Itemid=398
The aim for the 2012 meeting will be to update the Standards themselves for their technical content in relation to a syllabus.

IHO Liaison
IN 2011 a dialogue started between FIG Commission 4 and the IHB of the IHO with an aim to creating a possible dual hosted event. This is a work in progress. Meanwhile FIG has been included in the invitations to a couple of Regional Hydrographic Commission events.

PUBLICATIONS

FIG Publications
No Commission 4 supported FIG publications were made during 2011.

Newsletters
Commission 4 continued to publish newsletters in *Hydro International* on a regular basis. Newsletters were also published in *Geomatica* (the official publication of the Canadian Institute of Geomatics) and *Lighthouse* (the official publication of the Canadian Hydrographic Association) upon request. A newsletter was also published on Commission 4 website
(http://www.fig.net/commission4/newsletters/newsletters.htm).

Other Publications
In 2011 Commission 4 members made contributions to hydrography and hydrography-related issues *via* publications in journals and other related media. The importance of these publications, when not directly about hydrography, is that they demonstrate the importance of hydrography as applied to the social, economic, political and environmental objectives of society at large. Some of these publications include:

- Sutherland, M. (2011). "Sea Level Rise Modelling in a Caribbean Small Island Developing State". In *Hydro International*, 2011, Volume 15, Number 6.
- Sutherland, M. (2011). "Improving the administration of marine and coastal spaces". In *Coordinates Ezine*, November 2011, http://mycoordinates.org/improving-the-administration-of-marine-and-coastal-spaces/.

- Sutherland, M. (2011). "Marine Cadastre." In *Geospatial World*, November 2011, pp. 38-42.
- Dodd, D. and Mills, J. (2011). "Ellipsoidally Referenced Surveys: Issues and Solutions." In the *International Hydrographic Review*, November 2011, pp. 19-29.
- Hare, Eakins, Amante (2011): Modelling Bathymetric Uncertainty. *International Hydrographic Review*, Nov. 2011.
- T. Hiller, T. B. Reed, A. Steingrimsson (2011): Producing Chart Data From Interferometric Sonars on small AUVs. *International Hydrographic Review*, Nov. 2011.
- C.Whittaker, S. Sebastian, D. H. Fabre: Multibeam Sonar Performance Analysis - Value and Use of Statistical Techniques. *International Hydrographic Review*, May 2011.

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