**Joint IHO-Singapore Innovation & Technology Laboratory**

**Strategic and operative considerations**

1. The Joint IHO-Singapore Innovation & Technology Laboratory (IHO-Singapore Lab) was established based on the proposal of Singapore and USA to the 2nd IHO Assembly (A-2) in November 2020. The proposal was supported Brazil, Canada, Denmark, France, Germany, Indonesia, Italy, Malaysia, Netherlands, Norway, Portugal, South Africa, Spain, United Kingdom and Uruguay and unanimously approved by A-2.

**Rationale**

1. There is a critical need to coordinate international efforts to develop and harness emerging hydrographic-related technologies that support safe maritime navigation and protection of the marine environment. The IHO as a technical standardization body is confronted with the challenge to harness the rapidly evolving technologies. These, in turn, will drive the ever-accelerating transformation processes on the roles and services of Member States hydrographic offices. In support of the Sustainable Development Goal 14 and in line with the intentions of the UN Decade of Ocean science for sustainable development, it is timely that the IHO examines ways for a faster transition of knowledge into the standardization process and – in turn - accelerated application of the resulting new standards to enable extended use of hydrographic products and services. This strategy of closer linkage of the standardization process with emerging technical solutions is seen as a more efficient way to deliver extended benefits on hydrographic aspects to users and society in navigational and non-navigational areas.

**OBJECTIVE AND SCOPE**

1. The mission of IHO is to create a global environment in which Member States provide adequate and timely hydrographic data, products and services to ensure the widest possible use.
2. The IHO Vision is to be the authoritative worldwide hydrographic body which actively engages all coastal and interested States to advance maritime safety and efficiency and which supports the protection and sustainable use of the marine environment.
3. Towards achieving this end, the Lab has the following objectives:
4. Facilitate the conduct of innovative or investigative projects in the laboratory and/or test bedding in the field proposed by IHO Member State(s), IHO organs, or other stakeholders.
5. Enable knowledge creation and foster collaboration to evaluate specifications of global standard setting within the scope of IHO standardization activities at the request of e.g. IHO Member State(s) in order to explore their faster transition, application and development of technologies enhancing safety at sea; and
6. Foster a multidisciplinary and collaborative environment for investigators such as technical experts, scientists, engineers and user communities to interact, learn and promote new solutions and technologies, including collaboration and cooperation with other international organizations research and development bodies active in the maritime domain.

**IHO LAB STRUCTURE AND COMPOSITION**

1. In order to provide leadership and set direction, the IHO Lab is managed by a General Manager and overseen by a Governing Board. The Governing Board is composed of the IHO Director in-charge of the IHO Work Programme II, the Chair of the Hydrographic Services and Standards Committee (HSSC), the Chair of the Inter-Regional Coordination Committee (IRCC) and up to three (3) representatives with administrative and/or technical expertise nominated by the host country Singapore. Chairmanship of the Governing Board should be for two years and rotate between the IHO office bearers and the host Country.
2. The Governing Board will endorse the host country´s proposal for the post of the Lab General Manager. The General Manager maintains an annual Lab Work Plan based on mutual consent to be endorsed by the Governing Board.
3. The Chair of the Governing Board, assisted by the General Manager, reports to the IHO Council annually on the Lab Work Plan, activities and outcomes.

1. The IHO Council advises the Lab on themes and projects regarded as supportive to the IHO Work Programme.

1. Singapore provides the administrative support to the Governing Board.

**Concept approach**

Every process of project work to be done at the IHO-Singapore Lab should follow a coherent strategy along the following sequential steps:

Test setup in the operational environment

Description of the application of a technology

Proof of the functionality of a technology

Experimental setup in the laboratory

The proposal made for the installation of the IHO-Singapore Lab included several project ideas. In view of the implementation of S-100 roadmap as a major strategic target of the IHO the reality check of the standard conformant

* production and maintenance,
* interoperability,
* dissemination,
* presentation, and
* interpretation.

of S-100 based data products appears the most required project. The waters of Singapore, Singapore harbor and the adjacent Malacca Strait offer an excellent test area and will definitely be of interest for stakeholders. Special emphasis should be put on the strategic goal to arrive to full coverage rapidly with S-101 ENCs through native production and S-57 upgrade conversion. In order to address the specifics of Singapore Harbor, funds should be allocated to define and produce S-131 Marine Harbor Infrastructure data sets. This would also gain the interest of the associated service providers so far not in reach of the S-100 framework.

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| **R&D Area** | **Project** | **Potential Partners** |
| S-100 standards implementation and testing | **S-100 Products Reality Check**  Test bedding in the Singapore and Malacca Straits the following S-100 products:  S-101 – Electronic Navigational Chart (ENC)  S-102 – Bathymetric Surface  S-104 – Water Level Information for Surface Navigation  S-111 – Surface Currents  S-122 – Marine Protected Areas  S-123 – Marine Radio Services  S-124 – Navigational Warnings  S-128 – Catalogue of Nautical Products  S-129 – Under Kiel Clearance Management  S-131 – Marine Harbor Infrastructure | * Indonesia * Malaysia * Singapore MPA * Rep of Korea * Other IHO member states and their network of Research Centres and Innovation Labs. * RENCs * Industry Stakeholders e.g. OEMs and others tbd * CSMART and equivalent (training and simulator centres) * Autonomous Shipping Initiatives * EU DG Research&Innovation (funding) |
| Test bedding a dual fuel hybrid ECDIS with capabilities of displaying S57 & S101 in support of IHO’s roll out implementation plan for the S-100 products and services.  Test bedding of S-100 ECDIS using S-101 ENCs (native + S-57 converted) | * Industry Stakeholders * IMO, IEC and other certification authorities to ensure compliance with safety standards. |
|  | Testing of data production tools, focusing on data converters and compilation guidance | •Industry Stakeholders |
|  | ~~Propose/ develop Capacity Building initiatives~~ | ~~Industry Stakeholders~~  ~~IHO Member States~~ |

**Next steps**

* Installation of the Lab General Manager
* Initial considerations on IHO Research and Innovation Strategy to address the following questions:
  + Are the projects oriented short-terms and key components of operational development, or mid-term (5-6 years), technologies incubators, long term?
  + Are the projects oriented to safety of navigation, autonomous shipping, efficient harbor operations in priority, or protection of environment, marine knowledge in general, data re-use for supporting marine activities to address the wider scope of the UN Ocean Decade / SDG14?
* Discussion of project priorities between Governance Board members
* Global survey of ongoing and planned projects addressing similar aims to avoid double effort.
  + Expected outcome: Global mapping of existing Research Projects that can be complementary or key enablers.
* Identification of one or more projects promising the desired impact
* Development of a project plan including but not limited to
  + Project targets.
  + Available and required resources.
  + Potential partners
  + Milestones
  + MOUs/Agreements with participants/stakeholders. Rules of Procedure and terms of use and re-use of the outcome of the Lab (licensing, open-source, …).
* Branding & Communication (targets, etc.).
  + Logo. Projects naming, website (IHO or specific for the Lab), social media
  + IHO Secretariat to inform EU DG Research&Innovation through the IHO IENWG.
* Official opening of the Lab