Assessment of the performance of the International Training Centre for Operational Oceanography (ITCOocean) established as a Category 2 Centre (C2C) under the auspices of UNESCO on 15th June 2018 based at the Indian National Centre for Ocean Information Services (INCOIS) in Hyderabad India

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Contents

Executive summary

This review concludes that the ITCOocean C2C has performed exceptionally well and to above its required level in all respects, and therefore warrants renewal.

The Centre's performance was assessed against the specifications for C2C reviews detailed in UNESCO document 40 C/79 12 November 2019 titled *Strategy for Category 2 Institutes and Centres Under the Auspices of UNESCO (2019)*, which lists eight ***parameters*** specifying what is expected in a review of a Category 2 Centre at the UNESCO level.

The ITCOocean Centre Agreement between it and UNESCO then specifies at the more operational 'Centre' level eight ***functions*** which the Centre refers to as a guide to set and implement its activities.

The Centre has performed to a high quality and level in respect to each of the UNESCO 40 C/79 (2019) ***parameters***, through achieving what it committed to do and more in each case, through the eight ITCOocean ***functions*** specified in the Centre Agreement.

The Centre's portfolio of courses (68 were run in the period) aligned very well with its mission and its reach was excellent, being numerically and geographically extensive, involving nearly 6000 trainees, from over 45 countries including from beyond the Indian Ocean region, and having a gender distribution recorded as 2172 female and 3589 male. Through pre-course surveys, the themes chosen for the courses were designed to match the priority needs of the regional constituents engaging with the Centre. The courses, as an integrating set, provided training in bio-physical ocean science and applications, through the continuum from observations from above (ie satellite), on and below the ocean surface, through to data and information management and to application of oceanic understanding and prediction thereof for societal benefit.

The Centre's achievements are clearly relevant and supportive of UNESCO's Global Priorities such as with respect to Africa and Gender Equality, and to the specifications in the relevant C5 document for UNESCO's aspirations broadly and IOC's more specifically. The Centre played a valuable role in supporting Agenda 2030, with reference to SDG14 as effected by setting the Centre's mission at the both the course and implementation levels according to UNESCO's and IOC's priorities in that context. This also rendered the Centre relevant and of value to the UN Decade which came into being during the 6-year period, and it is notable that the Centre's forward planning includes a continuing focus on the Decade.

The resources assigned by the Indian Government's Ministry of Earth Sciences through INCOIS as the on-the-ground host of ITCOocean were substantial, enabling a wide range of trainees from a wide range of countries to cost effectively avail themselves of the Centre's training opportunities. The Centre offers easily accessible training opportunities in both in-situ and virtual modes. Hence, the Centre, in the way that it is framed and run, enables many who would not have the means to afford more expensive conventional training/education to further their careers, or indeed even travel to the place of training where everything may be provided free or with minimal on-site costs, to instead be able to participate in training

virtually when they otherwise would have had no means to be able to do so. This is a great contribution to UNESCO and IOC cross-cutting capacity development objectives.

An added virtue of the Centre for the trainees is that by being in the courses at ITCOocean, they are encouraged (and in fact facilitated) to opportunistically join and interact at large gatherings of international scientists / marine managers / decision makers that may happen to be part of relevant conferences at the site: ITCOocean has two in-situ 400+ seating conference rooms. Provision is always made for trainees to be able to attend as observers during such conferences and meetings. Through these coincidences, trainees have been able to interact with prospective mentors, colleagues and avail themselves of opportunities to develop lasting relationships through the vehicle of marine science, possibly assisting with career direction, choice, and opportunities. In the same way, the friendly and collegiate atmosphere created by the trainees living and interacting at close quarters for extended periods on site means that professional relationships can develop across cultures, acting as the foundation for longer lasting relationships that may manifest throughout their respective careers as they cross paths again in bi or multi-lateral initiatives that would benefit from their former experiences and understandings of each other from during their earlier ITCOocean days.

On the issue of resources, it is notable and commendable that the annualised financial input allocated to ITCOocean by the Indian Government well exceeded the set minimum. In fact, compared to its base requirement of 6 x $600K USD for the period, the actual total financial input of ~$8.3M USD represents over 200% of the minimum that was specified. This funding followed the building of the large multi-function administration block specifically as the ITCOocean training facility, including offices, classrooms, modern e-meeting facilities, bio-physical instrument, and wet-dry analysis laboratories, 2 x 400+ seat conference rooms with external areas for displays, expos and catering, and more. That building cost more than $10M USD to build. Furthermore, over 45 senior and associated INCOIS scientific support staff (including IT / comms) and administrative assistants were engaged to be trainers and facilitators, with a further nine senior international scientists also providing their services as trainers during the period. The ITCOocean training facilities in the administration block is complemented by purpose built (for the C2C) on-site accommodation (known as the *guest house)* with associated dining and recreational facilities. It is also to be noted that in addition to the more than 45 scientifically based training related personnel, INCOIS's underpinning operational staff support (housekeeping, cooking, cleaning, transport, security on site etc) amounts to a further substantial contribution of resources in support of ITCOocean resources.

It is notable and commendable how well the Centre coped during the challenging COVID-19 era, maintaining its functionality through running many courses for thousands of trainees using its highly modern and accessible virtual meeting facilities.

The Centre's Governance was well framed and employed throughout, as required and with appropriate representation, due diligence, and regularity of meetings, with accurate recording, financial data and financially auditable reporting characterising its execution.

It was clear to the reviewer that the Indian Government, through INCOIS of the Ministry of Earth Sciences, is strongly and meaningfully committed to ensuring that the Centre continues to function to an even higher level of achievement into the future, and so UNESCO has in this facility a world class C2C as a model champion for its C2C capacity development aspirations.

The qualitative and quantitative benefits to its constituent society when compared to the resources assigned to the Centre would clearly be substantial, and so it would be an interesting and instructive exercise for this to be examined formally through a cost: benefit analysis.

1 Purpose of the review

This review is an external independent assessment of the performance of the International Training Centre for Operational Oceanography (ITCOocean) established as a Category 2 Centre (C2C) under the auspices of UNESCO on 15 June 2018 and based at the Indian National Centre for Ocean Information Services (INCOIS) in Hyderabad, India.

It will contribute to the information sought by UNESCO to consider renewal of ITCOocean as a C2C.

2 Scope of the review

The scope of this review aligns with the specifications for C2C reviews detailed in UNESCO document 40 C/79 12 November 2019 titled *Strategy for Category 2 Institutes and Centres Under the Auspices of UNESCO (2019)*. It responds to the instructions given to the reviewer by the UNESCO IOC Regional Liaison Officer regarding the framework of the task and review report. The review assesses the information gathered in respect to the C2C's performance and makes recommendations relevant to UNESCO's considerations for renewal.

Accordingly, this review focusses on the following parameters listed for external independent reviews of C2Cs in the UNESCO 40 C/79 document, as required through the reviewer's consultancy contract, with reference to 40 C/79→ Annex→ Section E Designation, renewal evaluation and termination→ E.2 Renewal procedure→ (i) Renewal evaluation→ (d)→ Parameters 1, 2, 3, 4, 5, 6, 7, 8, as follows:

1 The extent to which the centre's objectives as set out in the agreement signed with UNESCO were achieved.
2 The relevance of the contribution of the centre's programmes and activities to the achievement of UNESCO's prevailing Approved Programme and Budget (C/5) at the time in which it was designated, including global strategies and action plans as well as sectoral programme priorities (IOC-UNESCO programmes and activities), as defined in the agreement.
3 The relevance of the contribution of the activities of the centre to global development agendas.

4 The quality of coordination and interaction with UNESCO, both at Headquarters and in the field, as well as National Commissions, other thematically related Category 1 and 2 institutes or centres with regard to planning and implementation of programmes.
5 The partnerships developed and maintained with government agencies, public or private and donors.
6 The nature and efficiency of the centre's governance, including organizational arrangements, management, human resources, and accountability mechanisms.
7 The financial resources available for ensuring sustainable institutional capacity and viability.
8 The extent to which the centre enjoys within its territory the autonomy necessary for the execution of its activities and legal capacity to contract, centre legal proceedings, and to acquire and dispose of movable and immovable property.

This report was required to be complementary to another review report, written by consultant to UNESCO Dr B Meenakumari and to be submitted to UNESCO for the purposes of UNESCO's assessment for renewal of ITCOocean as a C2C. Dr Meenakumari's report refers, with respect to the element of collating and assessing performance elements of the ITCOocean C2C from the perspective of trainees who have participated in courses, and trainers and ITCOocean leadership representatives. This review was tasked with complementing Dr Meenakumari's review through respectively examining the workings and performance of the ITCOocean facility with regards to other elements as outlined above, and below in Chapter 3.

3 Methodology

This review undertakes an in-depth analysis and assessment of all available data and information provided by ITCOocean relevant to its activities since inception in the context of it meeting its mission as a C2C, with reference to parameters 1 to 8 in Section 2, above. These included materials such as:

I. Papers, reports, and publications produced by the C2C, including reports of the C2C Governing Board, conclusions and recommendations of conferences, workshops, and training courses, implemented by the C2C;
II. Administrative documentation with metrics in respect to annual financial reports, lists of staff, the C2C management structure, lists of people trained by the C2C, and lists of partners;
III. Collaborative interaction with Dr B Meenakumari with respect to her review of ITCOocean, undertaken for UNESCO in parallel and as a complement to this report.

As per (iii) above, gathering of representative information (through interviews, testimonials, and feedback) was undertaken by Dr B Meenakumari with personnel having been engaged in the C2C's training activities at participant, trainer and ITCOocean leadership levels. Specifically in the context of this element of the review, close collaborative liaison has been undertaken with Dr B Meenakumari to discuss and exchange information complementary to each other's

respective assessments and to avoid unnecessary duplication across the two respective review reports.

Collegiate liaison through meetings, regular consultations, and exchange of information has been undertaken with the IOC UNESCO focal point (the supervisor of this consultancy contract) and any relevant UNESCO staff.

Information was gathered from key C2C leadership and governing personnel, from both the C2C (including Dr Uday, Manager, ITCO ocean), its host agency (including Dr Srinivasa Kumar, Director, INCOIS) and C2C Governing Board representatives. This included face to face meetings, e-correspondences, desk top reviews of reports, meeting minutes etc, as well as the consultant's familiarity with the C2C and its host agency and related facilities, including through site visits by the consultant to the C2C to undertake in-situ surveys across its facilities and staff. For example, the reviewer undertook an extensive personally funded site visit at INCOIS during 23-31 January 2024, meeting with Dr Meenakumari, with ITCOocean leadership personnel and students participating at the time in an ITCOocean course, familiarising with all ITCOocean facilities, and collecting relevant data and information for the review.

4 Findings

UNESCO 40 C/79 Parameter 1

The extent to which the centre's objectives as set out in the agreement signed with UNESCO were achieved.

The eight functions/objectives set out in the ITCOocean C2C 'Agreement' between UNESCO and the Government of India are listed for reference in **Annex 1**. They focus on several key themes across the respective areas of (abbreviated):

(a) Providing advanced training in operational oceanography …

(b) Defining regional and global problems and priorities …

(c) Providing training on generation of data …

(d) Substantially contributing to the activities of numerous users …

(e) Promoting excellence in integrated multidisciplinary oceanography …

(f) Helping scientists to be in a state of preparedness for nowcasting and forecasting …

(g) Promoting the activities of the Centre, UNESCO and IOC …

(h) Organizing assistance to IOC/UNESCO in mobilising human, financial and material resources ...

These are herewith referred to as 'functions. The review finds that, to a high level of performance, all these eight functions are addressed through the materials of the courses and reach to stakeholders, achieved through the substantive national and international

constituency that participated in the training courses. Greater examination is provided below according to each of these eight functions.

Function a

Provide advanced training in operational oceanography for young scientists, technical persons and decision makers/officials from Indian Ocean rim countries, south Asia, Africa on a regular basis.

The achievements are substantive and more than meet expectations.

Annex 2 provides a detailed chronological listing of ITCOocean C2C course titles conducted during 2018-2023, including participation metrics. The information contained in **Annex 2** is, in a complementary manner, also highly relevant in respect to the performance of the other seven functions (b-h, above),

Examining the Centre's performance in terms of courses that were run and their associated metrics, the result is underscored by the following achievements:

- The Centre ran 68 courses during 2018-2023, of which 34 were international and 34 nationals, with notable course continuity achieved during 2020-22 despite these being during the especially challenging 'COVID-19' era:
    - 2018 - 5 Int. and 4 Nat. (total 9)
    - 2019 – 4 Int. and 9 Nat. (total 13)
    - 2020 – 4 Int. and 1 Nat. (total 5)
    - 2021 – 11 Int. and 2 Nat. (total 13)
    - 2022 – 3 Int. and 6 Nat. (total 9)
    - 2023 – 7 Int. and 12 Nat. (total 19)
- There was a total participation of 5761 trainees: 3107 being international and 2654 national. The Centre's excellent data on participation (made available to the reviewer and on the website) shows that they are from early career, technical and decision making/official's cohorts.
- Gender distribution was recorded as 2172 female and 3589 male.
- Participants derived from at least 45 countries (**Annex 3**): from Asia (spanning east to west and to north-east Asia), Africa, SIDS and regions beyond (including Europe, Canada, and a number of South American countries).
- There were also several forthcoming courses scheduled for early 2024 (some had already been run as at the date of this report): Short-term course (4-6 months) for officials from SNOM, Indian Navy; ITCOocean training programme on fishery oceanography for the Ocean Decade; Operational oceanography for coastal applications; OTGA-INCOIS training course: discovery and use of operational ocean data products and services.
- Furthermore, forward plans also include the potential to use research compatible vessels for training from national facilities. INCOIS (for ITCO ocean) has explored the

sourcing of ships for training in coastal observations and analysis from NIOT, the Coast Guard, and from private vessel owners.

- INCOIS (for ITCOocean) is also in collaboration with various coastal universities to enable post graduate students to participate in ITCOocean courses that can be academically accredited as a benefit to their PhD studies.

ITCOocean employs highly effective end-to-end course methodology to design and implement its courses. This includes pre-course phases to set up the courses to be relevant to the priorities of stakeholders, ending with post-course communication and mentoring services to maximise trainees' capacity to effectively apply the new knowledge acquired through their courses. The course design, planning, implementation, and follow-up sequence comprises:

- *ITCOocean staff preparing and disseminating invitations for pre-course surveys to ascertain preferable and high priority topics for prospective trainee groups;*
- *Participant selection based on applicants' motivation and qualifications;*
- *Regular communication to offer assistance;*
- *Pre-course materials provided, with links;*
- *Github (https://github.com/) platform access;*
- *Group-wise min projects and laboratory sessions;*
- *Facilitation of feedback, discussions and evaluations of courses;*
- *Sharing of presentations, video lectures and course materials to facilitate collegiality and knowledge transfer;*
- *After course services including facilitation of student visits and mentoring by faculty.*

Feedback survey material was also provided for this review. As a testament to the interest and engagement of the trainees to date, a good overall level of response was received from trainees upon invitations to them to provide feedback. For example, there was a 94% positive return to the question of '*how much would you recommend ITCOocean to others?*'

Function b

Define regional and global problems and priorities, the solution of which requires regional and international cooperation and assist in the identification of training, education and mutual assistance needs.

The Centre's collaborative international and national associations enabled planning and implementation of courses so that they are well framed with reference to regional and global problems and priorities. These associations included:

- INCOIS: Indian National Centre for Ocean Information Services (Ministry of Earth Sciences) https://incois.gov.in/
- OTGA: Ocean Teacher Global Academy (IOC UNESCO) https://classroom.oceanteacher.org/
- POGO: partnership for Observation of the Global Ocean (a UK based charity organisation) https://pogo-ocean.org/

- IOTIC: Indian Ocean Tsunami Information Centre (IOTIC) (established in Jakarta by UNESCO IOC)
- RCOWA: Category 2 Regional Education and Research Centre on Oceanography for West Asia under the auspices of UNESCO https://rcowa-unesco.ir
- ISBA: International Sea-Bed Authority (an autonomous international organization established under UNCLOS) https://www.isa.org.jm/
- CSSTEAP: Centre for Space Science and Technology Education in Asia and the Pacific (established as a UN initiative) https://cssteapun.org/
- UNDOS: UN Decade of Ocean Science for Sustainable Development 2021-30
- UN-ESCAP: Economic and Social Commission for Asia and the Pacific (UN) https://www.unescap.org/
- SNOM: INCOIS Operational Services Training to Indian Navy Officers (SNOM - Advanced Oceanography Course)
- IOCINDIO (then as the IOC Regional Committee for the Central Indian Ocean, and imminently to be transitioned to the IOC Sub-Commission for the Central Indian Ocean) https://www.ioc.unesco.org/
- IORA: Indian Ocean Rim Association https://www.iora.int/en
- WAGOOS: Western Australian Global Ocean Observing System
- UNESCO IOC Perth Programme Office (to 2021)
- The IOGOOS (Indian Ocean Global Ocean Observing System) and related network of bio-physical ocean observational, research and knowledge-transfer related international alliances, making a significant contribution to the missions of UNESCO/IOC-GOOS, WCRP/CLIVAR, SCOR and IMBeR:
    - IIOE-2 (Second International Indian Ocean Expedition, under UNESCO IOC, SCOR and IOGOOS);
    - SIBER (Sustained Indian Ocean Biogeochemistry and Ecosystem Research, under IMBER and IOGOOS);
    - IORP (Indian Ocean Region Panel, under CLIVAR and IOC-GOOS); and
    - IRF (Indian Ocean Observing System Resources Forum, under IOGOOS.

Function c

Providing training on generation of data using in situ and satellite platforms, transmission of data to operational centres, usage of data in models, and generation of forecasts and dissemination of the same to end users.

With respect to Function c, **Annex 2** provides insight on the subject matters through the titles of the range of courses that were run. Clearly, significant training that more than satisfies the Centre's commitment was undertaken with respect to this objective.

There were three courses explicitly relevant to this theme for international trainees: Discovery and use of operational ocean data products and services; Marine-met data visualization using FERRET; and Emerging trends in ocean observations and ocean data analysis.

There were three explicitly relevant courses for national trainees: Fundamentals of Ocean Data Management; Ocean Observation System and Ocean Data Utilisation; and Sea glider instrumentation, testing, data acquisition, processing and analysis.

Furthermore, a collegiately relevant initiative has been established through the IIOE-2 Project Office hosted at INCOIS and which enables engagement of ITCOocean constituents, being the IIOE-2 Regional Coordination Unit for Data and Information Management. Linked to that Unit's portfolio is the IIOE-2 Data and Information Management Policy, available to all ITCOocean constituents, along with direct access to the Unit's staff through the Unit's Head (Dr Pattabhi Rao of INCOIS). The Policy was designed with input from IOC staff in the context of UNESCO IOC's IODE aspirations and IOC data policy objectives. The Unit is a service to the IIOE-2 international constituency that can provide for capacity building and knowledge transfer in the 'data' realm to all IIOE-2 stakeholders, including its Early Career Scientists Network and IIOE-2 members from the Indian Ocean region, including from SIDS and countries with lesser developed ocean science capabilities.

Function d

Substantially contribute to the activities of numerous users and UNESCO/IOC programmes related to climate change, disasters mitigation, data and information exchange and others.

The Centre's excellent achievement in reaching users is underscored by the wide geographical reach, gender balance and numerous trainees engaged in the many courses that were run. These courses involved (see **Annex 2**) climate change and disaster mitigation through three specifically directed courses for international trainees, and four for national trainees.

With respect to data and information exchange, the Centre's strong performance in that area is highlighted in the narrative for Function c, above.

Furthermore, links and relevancies with UNESCO/IOC programmes include IOC-OTGA, the UNESCO Tsunami programme (including with IOTIC and the IOTWMS), the Global Ocean Observing System, and Second International Indian Ocean Expedition.

Also of note in this area is the recently articulated intention of the Centre (at ITCOocean Board Meeting 2022) to include formulation of activities in reference to priorities under UNDOS. At the 2022 Board meeting, activities were submitted in Annexure 6 of the minutes. Furthermore, INCOIS is now the host of an UNDOS endorsed Decade Collaborative Centre for the Indian Ocean Region (DCC-IOR) which is co-located with the ITCOocean C2C. This thereby promotes linkages between the C2C and DCC-IOR's mission, and the sharing of facilities and integrated programming of priorities and training initiatives of ITCOocean complementary to the DCC-IOR mission.

In the same context of having integrative complementarity with the C2C, of further note from the 2022 ITCOocean Board meeting was an announcement that the Indian Government is to pursue a proposal for ITCOocean to be recognised as an IORA Centre of Excellence.

Function e

Promote excellence in integrated multi-disciplinary oceanography understanding and management of natural resources.

The Centre has delivered what it set out to do in this area. Again, as above, it is clear through the multi-disciplinary nature of the range of courses run at the Centre and the clearly integrating nature of the themes across the course network, along with the links to multi-disciplinary and multi-national programs (eg IIOE-2 and related alliances, IOCINDIO, IOGOOS, OTGA, IORA, UNDOS), that integration and multi-disciplinarity are key underpinning motivations of the course framework. It is notable that the themes span the continuum from observations to characterisation of environmental processes, to modelling, to fundamental and applied applications and finally through to the use of knowledge and information thereof for societal benefit.

The courses that were run also provided trainees with a better understanding of natural resource management, highlighted for example by the themes in courses for: fishery oceanography for future professionals (NRM of fish stocks), ocean colour remote sensing (primary productivity and algal bloom hazards refer here), fishery stock assessment and ecosystem modelling (NRM of fish stocks), coastal vulnerability and advances in operational oceanography (sustaining coastal habitats for natural marine resources), biological observations in the Indian Ocean (from microbes to megafauna) (understanding the trophic web for NRM), modelling for ocean forecasting and process studies (understanding the bio-physical dynamics of biogeochemical and physical variables relevant to primary productivity and movements of biota, and to applied oceanographic objectives), remote sensing of Potential Fishing Zones and ocean state forecast (supporting management for sustainable fisheries).

Function f

Help scientists to be in a state of preparedness for nowcasting and forecasting the behaviour of the ocean and address the role of ocean science and technology in delivering information critical to safety, commerce and environmental protection.

This function is also well covered by the Centre.

Modelling in the context of nowcasting and forecasting is explicitly addressed in a number of directly relevant courses that were run by the Centre, including:

- numerical modelling of the coastal circulation around India; fundamentals of ocean modelling;
- Indian Tsunami Warning System… (involves modelling of tsunami events);
- fisheries stock assessment and ecosystem modelling;
- modelling for ocean forecasting and process studies; and
- fundamentals of ocean climate modelling at global and regional scales.

Function g

Promote activities of the Centre, of UNESCO and IOC role in marine and coastal matters, raise public awareness concerning the need for sustainable management of the sea and coastal areas, introduce the benefits of national and regional cooperation approach.

The Centre meets its aim well for this function.

During the 2018-2013 period, and through forward looking elements as well, a comprehensive list of actions and initiatives address Function g, including:

- ITCOocean reports were prepared regularly and as required to the UNESCO IOC Assembly (biennially) and Executive Council (annually) sessions through Indian IOC Delegation representatives from the Indian Government and related institutions, including linked to or employed by INCOIS / Ministry of Earth Sciences. By association this then brings awareness and promotion of the Centre's activities relevant to UNESCO and IOC, through the attention of the large constituency of UNESCO IOC Member States (150) and Observers, including: IOC Sub-Commissions (eg IOC AFRICA, IOC WESTPAC, IOC for the central Indian Ocean); IORA; IODE (incl. therefore OTGA).
- ITCOocean website, being a comprehensive and informative modality in support of Function g.
- ITCOocean's collegiate engagement with international stakeholders in the continuum from user/community to science/decision maker levels, as represented within the integrated IOGOOS, IIOE-2, IORP, SIBER, IRF and KUDOS constituency. This includes through collegiate integration of Centre personnel with users, scientists and managers/decision makers at their annual meetings. These meetings are conducted under the auspices of annual *International Indian Ocean Science Conference (IIOSC)* gatherings: Perth 2017, Jakarta 2018, Port Elizabeth 2019, India 2020-22 (virtual due to COVID-19), Perth 2023 and planned for Lombok 2024) and throughout the year through ITCOocean staff engagement in the respective operations and meetings of these alliances.
- Through collegiate engagement with the UNESCO IOC Perth Programme Office (to Sep 2021)
- Through general collegiate engagement with the Centre's international partners (as listed for Function a, above).
- The Centre's stated intended new relationships with international organisations such as IORA.
- Awareness and promotion by virtue of links enabled and established with experts in the Centre's 'Visiting Professorship' program.
- International awareness and promotion gained by the 'national' courses that have the eye of the global community through geopolitical alliances (eg SNOM).
- The co-located and thematically linked new Decade Collaborative Centre for the Indian Ocean Region (DCC-IOR), operating under the auspices of UNESCO and providing a further avenue for the Centre's promotion especially in the Indian Ocean regional and

UNESCO IOC institutional spheres, and further at the higher global UN level in the context of the SDG14 imperative.

- Also importantly, by virtue of the wide geographical reach of the Centre in terms of awareness to the international community, through the constituency of trainees engaged and to be engaged in the courses of the Centre (nearly 6000 trainees from over 45 countries, so far - see Function a, above).
- Through links via the membership constituency of the Governing Board of the Centre – itself international in composition, involving UNESCO IOC and other regional stakeholders.

Function h

Organise assistance to IOC/UNESCO in mobilising human, financial and material resources to respond to the needs of the coastal countries of the region in dealing with emergency situations triggered by marine natural hazards.

The Centre played a vital societal role in achieving the aspirations of this function.

Through the relevant design and delivery of specific courses and encouragement and facilitation of engagement of regional stakeholders to participate in such courses, the Centre has made and is projected to make further valuable and significant contributions in this area of its mission. The Centre's creation and well framed governance and operational structure has led to significant resources (human, financial and material) being made available to support activities relevant to the function, both from India and from international alliances (addressed qualitatively elsewhere in this report).

In context, hazards related courses included:

- *Coastal vulnerability and advances in operational oceanography science* (hazards to humans and infrastructure relating to extreme sea level (eg relevant to acute and long-term changes), extreme waves, currents, erosion etc; relevant to protection and management of human life and public and private infrastructure in the face of threatening processes);
- *An observing system simulation experiment for Indian Ocean surface pCO2 measurements* (eg relevant to climate change and acidification and threats to primary producers, and in turn to food security, including calcareous species in coastal habitats, such as corals and pelagic organisms);
- *Indian Tsunami Early Warning System (ITEWS) training to naval officers* and, in context, the Centre's thematic links to the IOTIC and broader tsunami programme, including IOTWMS which itself has a node at INCOIS Hyderabad, co-located collegiately with the Centre;
- *Biological observations in the Indian Ocean (from microbes to megafauna)* (eg relevant to trophic structure analyses, algal bloom related threats in coastal environs etc);

- *Modelling for ocean forecasting and process studies* (eg relevant to engineering applications in siting and designing coastal outfalls, characterising land-based pollutants entering the coast, spills monitoring/prediction/risk assessment etc);
- *Fundamentals of ocean climate modelling at regional and global scales* (eg relevant for vulnerability assessments of important coastal/shelf habits with respect to climate change threats, such as warming, acidification, changes in ocean hydrodynamics and nutrient dynamics, species refugeeism due to changing background conditions etc).

UNESCO 40 C/79 Parameter 2

The relevance of the contribution of the centre's programmes and activities to the achievement of UNESCO's prevailing Approved Programme and Budget (C/5) at the time in which it was designated, including global strategies and action plans as well as sectoral programme priorities (IOC-UNESCO programmes and activities), as defined in the agreement.

UNESCO C/5 specifies several guiding principles in the form of objectives, lines of action and priorities, to which the Centre committed to align in the framing of its portfolio of courses and in the way it conducted its operations.

This review finds that the Centre's contribution to UNESCO C/5 at both the global level and specific to the sectoral programme priorities of IOC-UNESCO has been germane and at a high level, with reference to the designated guiding foci outlined in C/5. This is evident both through the selection of the topics designated for the many courses that were initiated during the 2018-23 period, as well as the reach geographically (eg Ref: C/5 Global Priority Africa) and in terms of actively promoting gender balance in its participant constituency (eg Ref: C/5 Global Priority Gender Equality). The metrics referred to for Function a, above, speak to this outcome.

With respect to the C/5 high level aim of 'supporting Member States in the implementation of the 2030 Agenda and other ocean related policies' the Centre's effort and resulting focus on the UN Decade (as discussed above), which then links to SDG14 as one important element of Agenda 2030, refers positively here.

More specifically to IOC's Functions, which reflect IOC's own priority responses to UNESCO C/5, the Centre has aligned very well with those through the themes in its portfolio of course topics.

A comparison between the full range of courses (**Annex 2**) shows clearly how the Centre is addressing IOC Function A (Ocean Research), B (Observing systems and data management, (C) Early warning systems, and (D) Assessment and information for policy (as also relevant to decision making), albeit perhaps to the lesser extent compared to A, B and C.

Furthermore, in C/5, capacity development, as a designated priority that cuts across all the elements in IOC Functions A, B, C, D above, is both implicitly and explicitly fundamental to the

Centre's mission and related course portfolio. For example, the very nature of training early career and emerging ocean scientists, practitioners, and decision makers in the range of subjects represented in the Centre's courses defines *capacity development* precisely.

UNESCO's Category 2 Centres are championed by UNESCO as one of its key modalities of Member State engagement in support of UNESCO's societal aspirations. There has clearly been (and is projected to be) an invaluable contribution by the ITCOocean C2C to UNESCO's aspiration in this context.

UNESCO 40 C/79 Parameter 3

The relevance of the contribution of the activities of the centre to global development agendas.

The Centre has constituted itself to be highly relevant to global development agendas, with particular reference to UN Agenda 2030 (UN General Assembly reference A/RES/70/1 21 October 2015), and its SDG14 'Life Below Water'. In this context, the reporting above on the Centre's activities in response to Parameter 2 refers. The Centre's actions and plans support the actions and priorities for IOC in UNESCO C/5, which in turn address the 2030 Agenda's SDG14.

SDG14 lists ten target areas for Member States to focus on and listing them herewith highlights that the Centre's portfolio of course themes address those that one could expect a C2C ocean training centre to sensibly cover within its mandate. The Centre provides its constituents with training in the underpinning science and related applications relevant to almost all the SDG14 'targets'. Those targets are:

*1 Reduce marine pollution**
2 Protect and restore ecosystems
3 Reduce ocean acidification
4 Sustainable fishing
5 Conserve coastal and marine areas
6 End subsidies contributing to overfishing
7 Increase the economic benefits from the sustainable use of marine resources
8 Increase scientific knowledge, research and technology for ocean health
9 Support small scale fisheries
10 Implement and enforce international sea law.
**SDG14 further emphasis 'plastic pollution' as a key issue to be addressed.*

The Centre addresses 1, 2, 3, 4, 5, 7, 8, 9 through a set of highly relevant and focussed courses. It's courses either focus directly on these areas or provide the essential underpinning scientific understanding and training on applying the science with respect to supporting these targets for SDG14.

This review notes that if in a position to add to its thematic areas for new courses, the Centre, in addition to being guided by these 10 target areas, could place even greater emphasis on plastic pollution as an adjunct theme to 1, above.

It is notable that the Centre recently introduced the 'Visting Professorship' programme, which could be used to bring further expertise in any of the above areas into the Centre's portfolio, complementary to the significant expertise already to hand at a national level.

Furthermore, it is also notable that the Centre has already introduced a focus on the UN Decade, as one important programmatic avenue to guide any enhancement of the Centre's attention on Agenda 2030 in the context discussed herewith.

UNESCO 40 C/79 Parameter 4

The quality of coordination and interaction with UNESCO, both at Headquarters and in the field, as well as National Commissions, other thematically related category 1 and 2 institutes or centres with regard to planning and implementation of programmes.

The Centre coordinates and interacts with UNESCO effectively and at appropriate levels. At the highest level, the Governing Board has UNESCO DG representation through the UNESCO IOC Executive Secretary (who also has the position of ADG UNESCO). UNESCO IOC is also represented on the Board by its Regional Liaison Officer. Board meetings have been held as required, with UNESCO IOC Members in attendance. At the national (Indian) level, the Board is represented by the Secretary to the Ministry of Earth Sciences (MoES), representing the Governmental host and national sponsor of the Centre (that is affected via the institutional host agency of the Centre – INCOIS Hyderabad). The INCOIS Director is also a Board Member and participates as required in all Board meetings, along with the Secretary MoES.

Centre leadership personnel (eg INCOIS Director) are closely involved with IOCINDIO (IOC Regional Committee for the central Indian Ocean). IOCINDIO is soon to be transformed to the IOC Sub-Commission for the central Indian Ocean, continuing and further strengthening the C2C's close interactions with countries of the Indian Ocean through the IOCINDIO UNESCO-IOC Member State constituency.

In the field, the Centre interacted with UNESCO IOC Perth Programme Office 2018-21* in respect to IOC and with several relevant scientific and capacity building related initiatives jointly managed (in a secretariat sense) with INCOIS: namely the IOGOOS, IIOE-2, IORP, SIBER and IRF network of alliances (discussed above).

**The UNESCO IOC Perth Programme Office operated up to 31 Sep 2021.*

The only other thematically related C2C in the region is that in Iran (RCOWA). Representation facilitating C2C-to-C2C coordination and interaction is via the Iranian Member on the Board and ongoing and further enhanced collegiate collaboration between these two C2C's is encouraged.

The Director of INCOIS (the Centre's host institution) is a regular Member of the Indian delegation to UNESCO IOC Assembly (biennial) and Executive Council (EC) (annual) Sessions, as is the Secretary MoES, enabling further opportunistic close and regular interaction between high level C2C leaders and UNESCO IOC representatives.

Secretary MoES is the C2C's Governing Board Chair. MoES also provides two other Members to the Board, being respectively the Joint Secretary MoES, and the Additional Secretary & Financial Advisor MoES. Furthermore, in this same context, INCOIS Director Dr Srinivasa Kumar is a Vice-Chair of the IOC and, by association, an Officer of the IOC and hence interacts with IOC formally inter-sessionally to the IOC's formal Assembly and EC meetings.

UNESCO 40 C/79 Parameter 5

The partnerships developed and maintained with government agencies, public or private and donors.

The Centre has established a substantive list of partnerships across government, and public and private donors, including with (for full names, see 4a, above):

- INCOIS/MoES
- RCOWA
- OTGA (IODE & UNESCO links)
- POGO
- IOTIC
- ESCAP
- ISBA
- CSSTEAP
- SNOM
- IOCINDIO
- IORA
- WAGOOS
- IOC Perth Programme Office (to Sep 2021)
- IOGOOS and its related alliances of IIOE-2, IORP, SIBER and IRF)

UNESCO 40 C/79 Parameter 6

The nature and efficiency of the centre' governance, including organizational arrangements, management, human resources and accountability mechanisms.

The Centre's Governance is effected through the Governing Board, which met regularly as required, and operated efficiently and with the support it required by INCOIS as the ITCOocean host. The Board minutes for 2020, 2021 and 2022 respectively, were provided to the reviewer, and were consulted for reference here.

The Board focussed on ensuring that the Centre adhered to its obligations as per the Agreement and in facilitating maximal relevancy of the Centre for its constituency. The composition of the Board is as specified in the Centre Agreement, having representation from the Indian Government (at the level of Secretary - Ministry of Earth Sciences), from UNESCO Member States (through heads of high-level institutions in ocean sciences relevant to the Centre's mandate) and from UNESCO at the DG level (through the IOC Executive Secretary/ADG).

The Board is well supported administratively by INCOIS through the Director and senior staff. It has met three times, and the agendas, reporting and strategic and tactical levels of the discussions underpin the Centre's strong performance and focus on its mission as per the Agreement.

The Board meetings involved both discussions on performance and forward-looking deliberations, and a live list of action items were examined and addressed at each.

The Board was also provided clear and accurate information by INCOIS on the Centre's formally audited finances and on its activities thereof in terms of courses that were run and proposed, with associated participation metrics.

Of note is that the Centre's administrative underpinning (through INCOIS) enabled the Board to maintain an efficient and regular Governance function even during the challenging COVID-19 era, and this is a testament to the sophistication and operability of the Centre's excellent modern virtual meeting facilities, being the same as used for the courses. Those facilities are further overviewed below (see also **Annexs 4 & 5**).

The Centre's organisational arrangements are excellent, having strong material support at a high government level (Indian Government, via the Ministry of Earth Sciences, as channelled through the Centre host, INCOIS in Hyderabad). The INCOIS Director oversees with autonomy the designation of required staffing resources to support the Centre, at senior to administrative levels (up to 45 staff) (See also **Annex 4**). This includes operational support in terms of finances, logistics and in providing staff experts in the course subject areas to act as trainers across the portfolio of courses.

The scientists at INCOIS that contribute training across the courses come with a high-level multi-disciplinary set of specialities, deriving from their own academic training at Masters to PhD levels and underscored by many years of experience. This suit of expertise includes:

> *Oceanography, Atmospheric sciences, Ocean/Atmospheric modelling (including General circulation, coupled ocean/atmospheric, ensembled, assimilation etc), Ocean State Forecasting, Ocean observations + instrumentation, Data Managements + Data visualization + open source s/w, Fisheries, Coastal Vulnerability, Multi Hazards Vulnerability Mapping, Geospatial applications, Coastal Zone Management, Sea Level data & applications, Tidal data analysis, Tsunami Early warning + awareness + preparedness, Ocean Biogeochemistry, Water quality + Harmful Algal Blooms + acidification etc, Remote Sensing + GIS using open source s/w, Operational Oceanography + oceanographic services, Ocean Optics, primary productivity, computational sciences + AI/ML techniques & applications for oceanographic data, MOOC platforms handling, Mathematics + Statistics.*

This is of great benefit to the trainees in that they not only receive high level training in their own courses but are also exposed to a vast array of opportunities to interact with experts in collegiate formats by virtue of the close and daily presence of the scientists on site during their courses. This capacity to develop mentorships, and establish professional links in complementary fields to those of the courses that they engage in is a notable feature.

To support direct on-site learning as part of the courses, INCOIS provides the Centre with direct access to all its biogeochemical and physical oceanographic laboratories, Indian Tsunami Warning System and other ocean hazards facilities, classroom facilities, IT infrastructure and internet access, and virtual conference meeting facilities (see also Annex 5).

On-site there is capacity to cater for large classroom numbers that may need to be run in conference type modes – INCOIS provides ITCOocean with conference rooms (2x) seating up to 400 people per room, with audio-visual facilities and with breakout areas for meals, tea breaks etc. This facility also allows for any trainees on site to opportunistically attend major conferences that may occur during their course periods, as observers, enabling them to engage collegiately with international participants and develop relationships for their future interests and endeavours. This has occurred to date and there will be opportunities forthcoming, for example when the IIOSC next gathers at INCOIS, likely within the next year or two.

ITCOocean also provides for digital lectures, integration across remotely situated classrooms and facilities enabling remote attendance. This enabled the Centre to cater for participants that would otherwise have no other means of attending lectures. This will continue to be an important virtue of the Centre.

Overall, the modalities of training made possible by the Centre include (see also **Annex 5**): theoretical lecture type classes; instrument demonstrations and training in their use (hands on sessions); software training; one to one (trainer-trainee) individual focus learning; group project and discussion sessions; wet/dry physical and biogeochemical laboratory sessions; and technical demonstrations.

There have been no course fees sought of applicants, further facilitating participation from lesser developed countries and SIDS. As a further notable feature of the Centre, this review notes that ITCOocean has on-site purpose built guest-house accommodation for participants and lecturers, offering single and double/suite rooms, at very low cost per night by international standards, with associated facilities for extended stays, including internal cafeteria and housekeeping facilities. The accommodation is within a few minutes walk to the learning and laboratory areas of the main ITCOocean building within the INCOIS site. The INCOIS site within which ITCOocean is hosted is within accessible distances (by walk or car) to outside conventional hotels (<1km) and shopping/food areas.

The accommodation, being within the gated security of the general INCOIS property, has 24/7 reception / security oversight.

UNESCO 40 C/79 Parameter 7

The financial resources available for ensuring sustainable institutional capacity and viability.

The Agreement specifies the Indian Government's committed obligation regarding financial resources for the Centre. **Annex 6** copies the Agreement within which Article 9 refers, specifying the Government's obligation. Essentially the Government must provide '*…all the resources, with financial or in kind, needed for the administration and proper functioning of the Centre'*. This has been achieved and exceeded.

Financial information in this context was provided (**see Annex 7**). The data are as reported to the Governing Board, showing that the ITCOocean C2C received resourcing from the Indian Government amounting to approx. (exact figures at INCOIS):

2017 - 18 (as a start-up figure pre-Agreement date of June 2018:)	$2.370M USD
2018 - 19	$1.931M USD
2019 - 20	$1.176M USD
2020 - 21	$0.600M USD
2021 - 22	$1.020M USD
2022 - 23	$0.811M USD
2023 - 24	$0.949M USD
2024 - 25 (projected)	$0.781M USD
2025 - 26 (projected)	$0.719M USD

ITCOocean has more than met its budgetary resourcing requirements, being greater than $600,000 USD per year. In fact, compared to its minimum requirement of 6 x $600K USD for the period, the financial input of ~$8.3M USD represents over twice the minimum that was required.

UNESCO 40 C/79 Parameter 8

The extent to which the centre enjoys within its territory the autonomy necessary for the execution of its activities and legal capacity to contract, centre legal proceedings, and to acquire and dispose of movable and immovable property.

The Centre enjoys full autonomy to execute its function, as granted to it by virtue of the Centre's Agreement co-signed at the Indian Government level and as intrinsically embedded in the autonomy and legal framework underpinning the Centre's host agency INCOIS of the Ministry of Earth Sciences of the Government of India.

It is therefore sanctioned formally by the Indian Government to have all that it requires at operational and institutional levels to undertake its mission as 'agreed' with UNESCO.

Underpinning establishment documents signed by the Government of India commit the Government to providing the required financial inputs annually. The host agency for the Centre (INCOIS) is a fully operational, legally framed, and legally protected entity within the

Ministry of Earth Sciences of the Government of India. This therefore ensures that auditing is undertaken, with that auditing also including the financial matters relating to ITCOocean.

The Governing Board includes, as a standing requirement, membership from representatives of the Government of India (through the Ministry of Earth Sciences and INCOIS) and this provides continual formal oversight that the Centre functions as per the Agreement.

This review concludes that the status and underpinning Governance framework should provide UNESCO with the confidence needed to ensure that the *"…centre enjoys within its territory the autonomy necessary for the execution of its activities and legal capacity to contract, centre legal proceedings, and to acquire and dispose of movable and immovable property…".*

5 Recommendations

The strong recommendation based on this review is that the ITCOocean C2C has performed unequivocally well and to above its required level in all respects, and therefore warrants renewal.

This is based on: the Centre's performance as assessed against the specifications for C2C reviews detailed in UNESCO document 40 C/79 12 November 2019 titled *Strategy for Category 2 Institutes and Centres Under the Auspices of UNESCO (2019)*, which lists eight ***parameters*** specifying what is expected in a review of a Category 2 Centre at the UNESCO level; and as then assessed specifically against the ITCOocean Centre Agreement between it and UNESCO which specifies at the more operational 'Centre' level eight ***functions*** which the Centre refers to as a guide to set and implement its activities.

The Centre has performed to a high quality and level in respect to each of the UNESCO 40 C/79 (2019) ***parameters***, through achieving what it committed to do and more in each case, through the eight ITCOocean ***functions*** specified in the Centre Agreement.

The qualitative and quantitative benefits to its constituent society when compared to the resources assigned to the Centre would clearly be substantial, and so it would be an interesting and instructive exercise for this to be examined formally through a cost: benefit analysis.

ANNEXES

Annex 1. ITCOocean C2C functions/objectives as set out in the Centre Agreement between UNESCO and the Government of the Republic of India

The functions/objectives of the Centre shall be to:

- Provide advanced training in operational oceanography for young scientists, technical persons and decision makers/officials from Indian Ocean Rim countries, South Asia, Africa, SIDS on a regular basis;

- Define regional and global problems and priorities, the solution of which requires regional and international cooperation and assist in the identification of training, education and mutual assistance needs,

- Provide training on generation of data using in situ and satellite platforms, transmission of data to operational centres, usage of data in models, and generation of forecasts and dissemination of the same to end users;

- Substantially contribute to the activities of numerous users and UNESCO/IOC programmes related to climate change, disasters mitigation, data and information exchange and others;

- Promote excellence in integrated multidisciplinary oceanography to improve understanding and management of natural resources;

- Help scientists to be in a state of preparedness for nowcasting and forecasting the behaviour of the ocean and address the role of ocean science and technology in delivering information critical to safety, commerce and environmental protection;

- Promote activities of the Centre, of UNESCO and IOC role in marine and coastal matters, raise public awareness concerning the need for sustainable management of the sea and coastal areas, introduce the benefits of national and regional cooperation approach;

- Organize assistance to IOC/UNESCO in mobilizing human, financial and material resources to respond to the needs of the coastal countries of the region in dealing with emergency situations triggered by marine natural hazards;

Annex 2 ITCOocean C2C courses conducted during 2018-2023 and associated participation metrics

Course Type	2018	2019	2020	2021	2022	2023
INTERNATIONAL	OTGA / INCOIS Training Course on : Discovery and Use of Operational Ocean Data Products and Service" 20 Participants- 10 Female & 10 Male	IOCINDIO workshop on "7th Session of the IOC Regional Committee for the Central Indian Ocean (IOCINDIO-VII) and IOCINDIO Scientific, Technical and Institutional Innovations Workshop for National and Regional Framework on Coastal Vulnerability Assessment and Monitoring for Sea-Level Rise and Storm Surges in the Indian Ocean Region" 32 Participants- 8 Female & 24 Male	"Discovery and Use of Operational Ocean Data Products and Services" 102 Participants- 34 Female & 68 Male	Fundamental Statistics for Oceanographers 87 Participants- 34 Female & 53 Male	Training in operational Oceanography for ISBA trainees 12 Participants- 01 Female & 11 Male	Visualization of Marine Met data (using FERRET) 193 Participants- 61 Female & 137 Male
INTERNATIONAL	Training on Tsunami Emergency Maps, Plans and Procedures (TEMPP-2) & Tsunami Warning	OTGA / INCOIS Training Course on :Discovery and Use of Operational Ocean Data Products and Services"	"Understanding Sea Level: data analysis and applications"	Visualization of Marine Met data (using FERRET) 97 Participants- 24 Female & 73 Male	POGO - ITCOocean Training Program on "Ocean Observations to	Oceanographic Remote Sensing: Bridging the Gap between Fundamentals

	Centre Operations and Standard Operating Procedures (SOPs)" 66 Participants - 12 Female & 54 Male	26 Participants- 8 Female & 18 Male	249 Participants- 81 Female & 168 Male		Societal Applications" 26 Participants- 11 Female & 15 Male	and Applications 246 Participants- 108 Female & 138 Male
INTERNATIONAL	OTGA / INCOIS Training Course on: Data Visualization of Marine Met data (using FERRET)" 22 Participants- 7 Female & 15 Male	OTGA / INCOIS Training Course on: Coastal Vulnerability Mapping and analysis using QGIS" 33 Participants- 10 Female & 23 Male	"Fishery Oceanography for Future Professionals" 1380 Participants- 629 Female & 751 Male	Fishery Oceanography for Future Professionals (Level : Basic, Batch-2) 142 Participants- 59 Female & 83 Male	OTGA-INCOIS Training Course: Ocean Colour Remote Sensing, Data Processing & Analysis 14 Participants- 6 Female & 8 Male	Operational Services Training to CSSTEAP members 14 Participants- 04 Female & 10 Male
INTERNATIONAL	OTGA / INCOIS Training Course on: Geospatial Techniques for Coastal Mapping and Monitoring (Using QGIS)" 22 Participants- 7 Female & 15 Male	OTGA / INCOIS Training Course on: Ocean Colour Remote Sensing - Data, Processing and Analysis" 38 Participants- 15 Female & 23 Male	New Rhythms in Indian Ocean 100 Participants- 35 Female & 65 Male	Principles of Ocean remote sensing & its applications 334 Participants- 142 Female & 192 Male		Machine Learning based Species Distribution Modelling 34 Participants- 14 Female & 20 Male

INTERNATIONAL	Training course on “International Seabed Authority Trainers” 6 Participants- 2 Female & 4 Male			Fundamental of Ocean Data Management 102 Participants- 43 Female & 59 Male		OTGA-INCOIS Course: Coastal Vulnerability Mapping and Analysis using QGIS 24 Participants- 10 Female & 14 Male
INTERNATIONAL				Fundamentals of Ocean Modelling 326 Participants- 172 Female & 154 Male		OTGA-INCOIS Training Course: "Ocean Colour Remote Sensing - Data, Processing and Analysis" 21 Participants- 12 Female & 9 Male
INTERNATIONAL				OTGA-INCOIS Training Course: Discovery and Use of Operational Ocean Data Products and Services.		Training course for Oman operators in early warning systems of Tsunami 5 Participants- 0 Female & 5 Male

				56 Participants-18 Female & 38 Male		
INTERNATIONAL				Biological Observations in the Indian Ocean (From Microbes to Megafauna) 70 Participants-25 Female & 45 Male		
INTERNATIONAL				Modelling for Ocean Forecasting and Process Studies 70 Participants-21 Female & 49 Male		
INTERNATIONAL				IOCINDIO workshop on Methodologies and Approaches of coastal vulnerability and		

				Advances in Operational Oceanography Science and Technology in the Indian Ocean. 39 Participants- 2 Female & 37 Male		
INTERNATIONAL				Indian Tsunami Early Warning System (ITEWS) Training to Naval Officers 12 Participants- 0 Female & 12 Male		
National	"Remote Sensing of Marine Phytoplankton - optics, pigment and taxonomy" 20 Participants- 9 Female & 11 Male	INCOIS Operational Services Training to "Indian Navy Officers (SNOM - Advanced Oceanography Course)" 5 Participants- 1 Female & 04 Male	"Virtual training to Indian Coast Guard officers on Oil spill advisory system" to Indian Coast Guards 178 Participants- 3 Female & 175 Male	Operational Services Training to Naval Hydrography Officers 5 Participants- 0 Female & 5 Male	Training to Coastal Community Radio Operators 49 Participants- 19 Female & 30 Male	Short Course on Data Science and AI 50 Participants- 13 Female & 37 Male

National	Training Course on “Operational Ocean Services, Data and Data Products” 18 Participants- 2 Female & 16 Male	“Marine Phytoplankton - optics, pigment and taxonomy” 18 Participants- 7 Female & 11 Male		Training Course for the Students on Ocean Observation System and Ocean Data Utilization 68 Participants- 29 Female & 39 Male	Sea Glider instrumentation, testing, data acquisition, processing and analysis. 17 Participants- 05 Female & 12 Male	Training Programme on Ocean Observation System and Models towards OSF, Coastal Dynamics and PFZ 43 Participants- 02 Female & 41 Male
National	“Fish-catch Time-Series Forecasting with R” 28 Participants- 9 Female & 19 Male	“Induction Training Program for New Entrants of INCOIS” 18 Participants- 6 Female & 12 Male			Operational Oceanography, Marine Meteorology & Operational Ocean Forecasting, Warning and Advisory Services for offshore E&P industries (DG HC) 10 Participants- 01 Female & 09 Male	Training Course on Ocean Observation System, operational Services and Ocean Data Utilization 17 Participants- 06 Female & 11 Male
National	INCOIS Service Utilization Training for	“Marine Meteorology and Operational Ocean State Forecasting”			Operational Services Training to National Institute of	Fundamentals of Remote Sensing & GIS and

	Indian Air Force Trainee Officers 8 Participants- 4 Female & 4 Male	10 Participants- 0 Female & 10 Male			Hydrography Officers (NIH - Advance Hydrography (83:111) Course) 04 Participants- 0 Female & 04 Male	Oceanographic Applications 50 Participants- 26 Female & 24 Male
National		"INCOIS Operational Services Training to Naval Hydrography Officers: Advance Hydrography (83:108) Course" 02 Participants- 0 Female & 02 Male			Advanced Operational Oceanography Course 04 Participants- 01 Female & 03 Male	Operational Oceanography, Marine Meteorology & Operational Ocean Forecasting, Warning and Advisory Services for offshore E&P industries (DG HC) 04 Participants- 01 Female & 03 Male
National		"INCOIS Operational Services Training to Eastern Naval Command Officers, Visakhapatnam"			Fundamentals of Remote Sensing and its Oceanographic Applications 206 Participants- 94	Operational Services Training to National Institute of Hydrography Officers (NIH - Advance

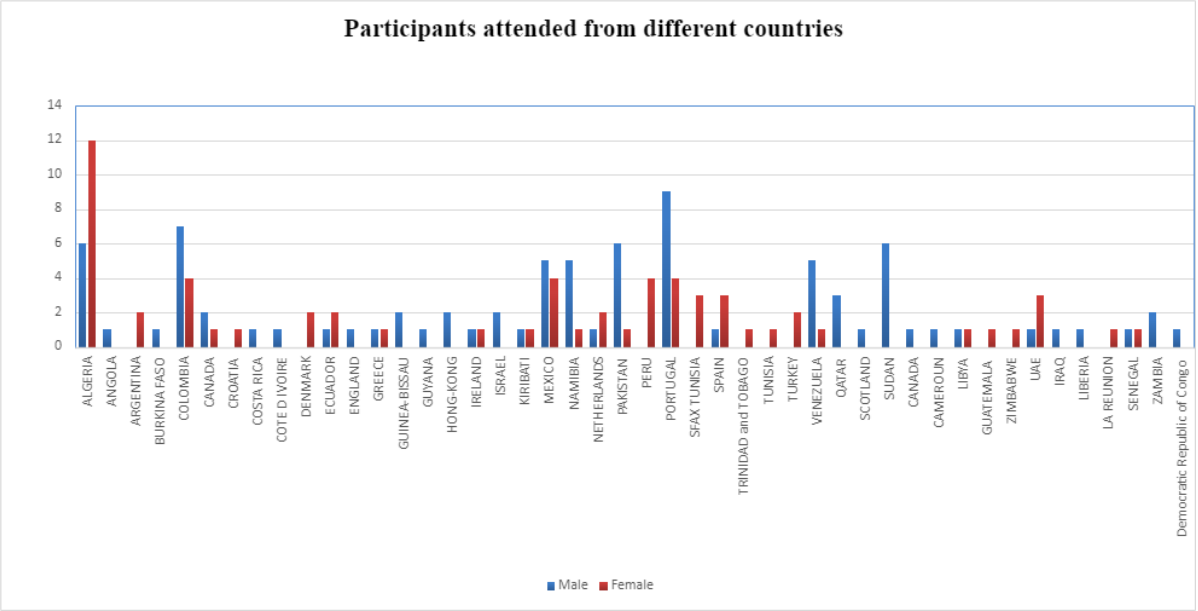
		05 Participants- 0 Female & 05 Male			Female & 112 Male	Hydrography Course) 04 Participants- 0 Female & 04 Male
National		"Tides and its applications in Oceanography" 11 Participants- 04 Female & 07 Male				Earth Observation Satellites (EOS-04 & EOS-06) Data for Ocean Applications 60 Participants- 21 Female & 39 Male
National		Training Course on "Trainers on Ocean Observation System and Ocean Data Utilization" 37 Participants- 06 Female & 31 Male				Training on Tsunami, storm surge, ocean state and vulnerability mapping to NPCIL Officers 12 Participants- 03 Female & 09 Male
National		"Remote Sensing and GIS applications using QGIS" 31 Participants- 11 Female & 20 Male				Sea Glider instrumentation, testing, data processing and analysis

						45 Participants- 05 Female & 40 Male
National						Short-term course spanning 4-6 months for Official from SNOM, Indian Navy 03 Participants- 01 Female & 02 Male
National						AI for Digital Transformation and Data Driven Decision Making 26 Participants- 05 Female & 21 Male
Seminar					Seminar on "The Oceanography of Tropical Cyclones" 50 Participants- 18 Female & 32 Male	Seminar on " An Indian Ocean family of ocean observation related alliances as an exemplar of what can be achieved collaboratively

						under a common spirit" 70 Participants- 32 Female & 38 Male
Seminar					Seminar on "Measuring the Oceans" by Eric D Asrao 50 Participants- 18 Female & 32 Male	
Webinar				Webinar on "Indian Argo program - Past, Present and Future" 86 Participants- 25 Female & 61 Male	Webinar on "Climate Change in the Indian Ocean region" 195 Participants- 79 Female & 116 Male	
Webinar				Webinar on " Numerical modelling of the coastal		

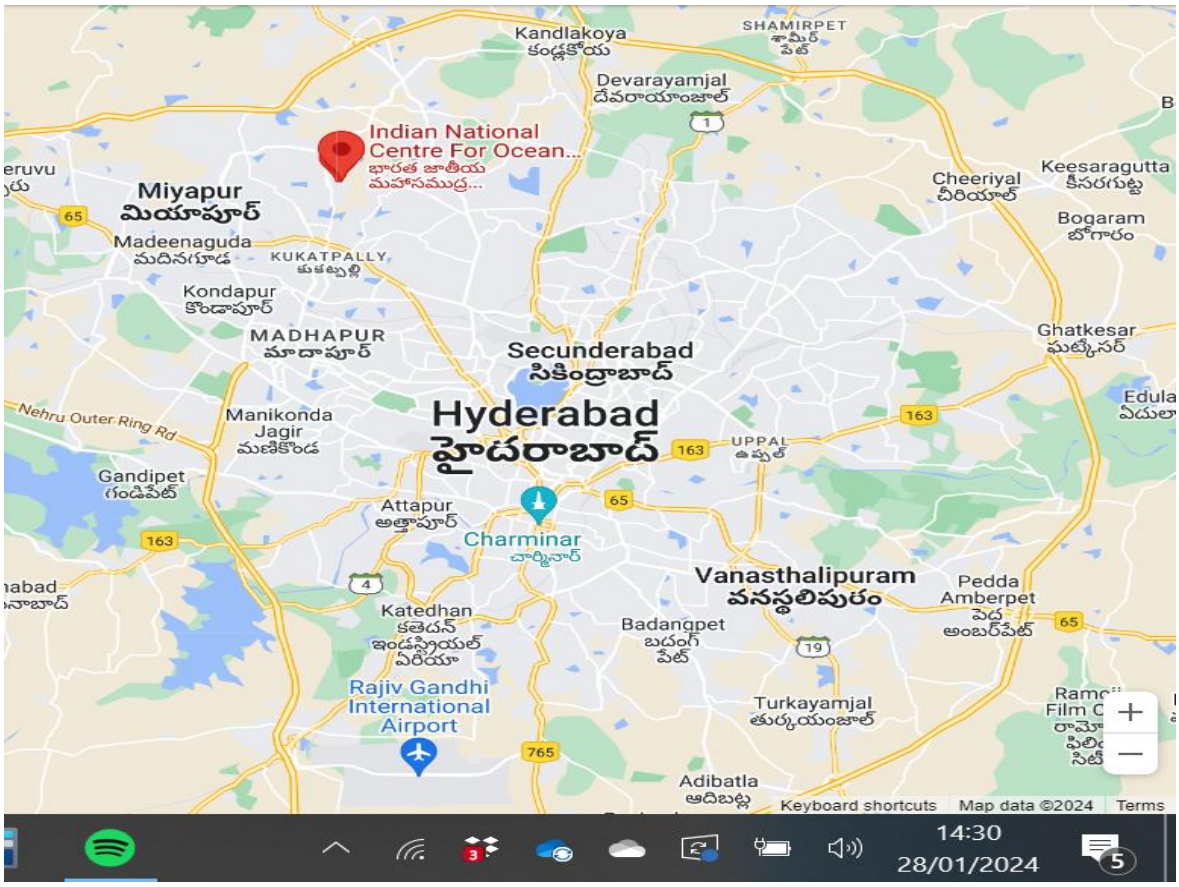
				circulation around India" 120 Participants- 45 Female & 75 Male		
Webinar				Webinar on " An Observing System Simulation Experiment for Indian Ocean surface pCO2 measurements" 101 Participants- 35 Female & 66 Male		
Total	~~218~~ 210 Participants, ~~68~~ 62- Female &~~150~~ 148 Male **International Participants- ~~86~~ 136** **National Participants-~~132~~ 74**	266 Participants- ~~68~~ 76 Female & ~~150~~ 190 Male **International Participants- ~~49~~ 129** **National Participants- ~~217~~ 137**	2009 Participants- 782 Female & 1227 Male **International Participants- ~~599~~ 1831** **National Participants- ~~1410~~ 178**	1713 Participants- 674 Female & 1039 Male **International Participants- 692** **National Participants- 1021**	637 Participants- 253 Female & 384 Male **International Participants- 131** **National Participants- 506**	~~921~~ 926 Participants- 325 Female & 601 Male **International Participants- 188** **National Participants- 738**

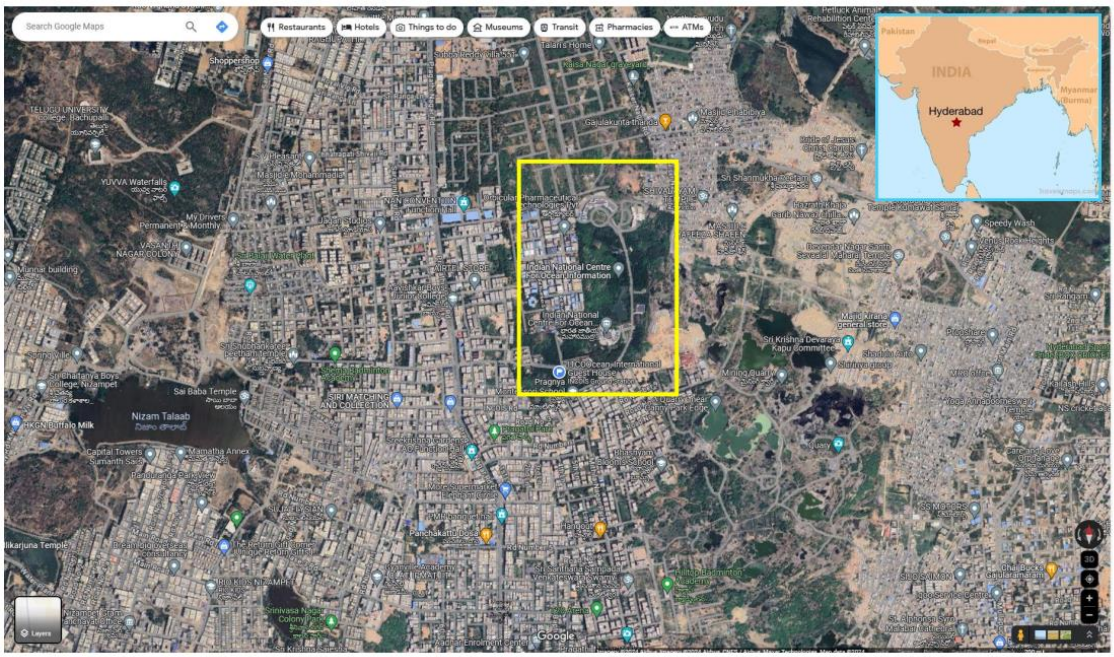
Annex 3 Countries from which trainees at the C2C derived



Annex 4 Pictorial overview of facilities, and national and international human resources supporting ITCOocean

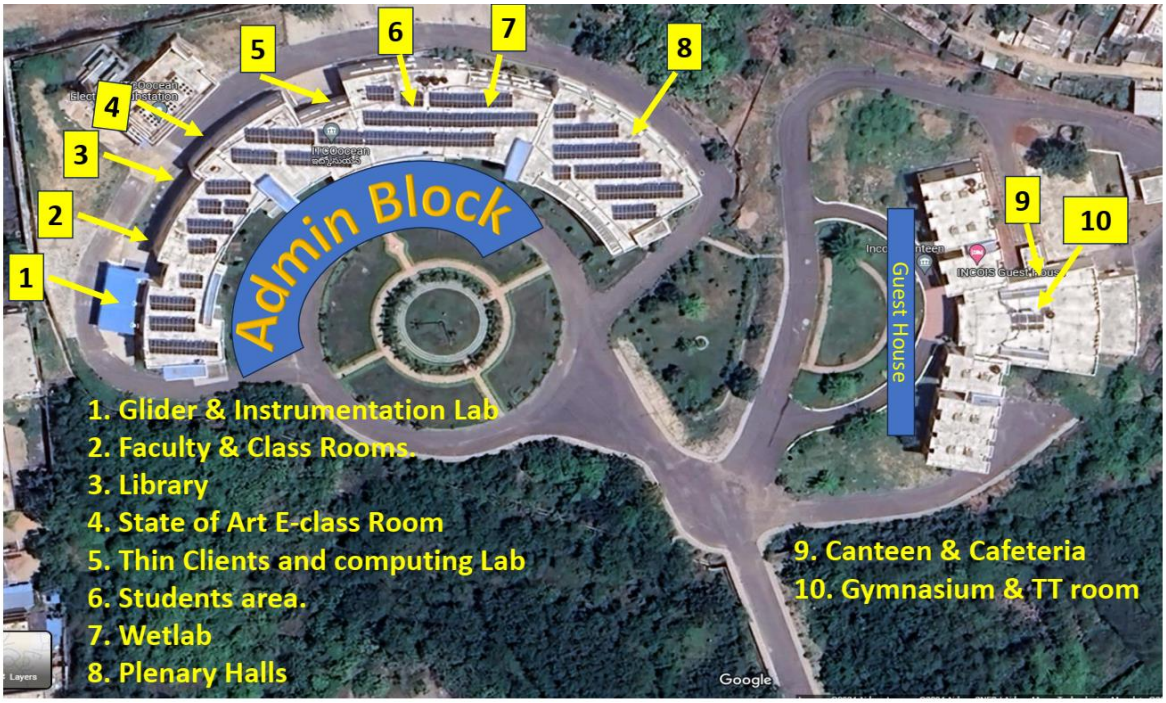
4.1 Hyderabad maps showing INCOIS location.





4.2 Aerial view of INCOIS site, showing accommodation guest-house building, ITCOocean and other key infrastructure buildings on-site.

INCOIS host site and buildings of ITCOocean, containing ~10 BGC, computing and ocean observing laboratories and workshops used for ITCOocean (wet and dry, including tank facilities for in-water infrastructure – as used for development, testing, calibrations etc))



ITCOocean guest house accommodation adjacent to ITCOocean Admin Block

ITCOocean Admin Block - front entrance view

4.3 Series of photos of exemplifying laboratories, classrooms and e-learning centre in ITCO Admin Block used for ITCOocean courses

e-classroom, catering for up to ~70 seated with virtual facilities enabling world-wide hook-ups.

Boardroom catering for e-meetings

4.4 Photos exemplifying courses in action on land and at sea (students, trainers etc)

POGO TRAINING

CLASSROOM SESSIONS AT ITCOO

FIELD TRIP VISAKHAPATNAM

ITYCOocean classroom pics on site (top 1-3) including BGC wet lab in action (middle left), plus in-the-field on-board training pic (middle centre and right), and during reviewer's site visit meeting participants at POGO-ITCOocean course 29 Jan - 4 Feb 2024 Operational Oceanography for Coastal Applications (bottom two photos).

Dining area pics, taken during POGO-ITCOocean course 29 Jan - 4 Feb 2024 Operational Oceanography for Coastal Applications.

4.5 Picture mosaic of senior ITCOocean personnel, from Director to administrative staff.

These staff provided by INCOIS to ITCOocean as trainers, across senior executive, scientist and support scientists levels, delivering and/or helping to set up an administer courses.

Dr. T Srinivasa Kumar
Director, INCOIS.

S. Nagewara Rao
Sr. Accounts Officer

Devendra Kumar
Purchase Officer

V. Subrahmanyam
Admin Officer

4.6 Picture mosaic of international experts who proved their services as trainers for ITCOocean since 2018 (top panel: 3 x on-site trainers) (bottom panels: 8 x on-site trainers who supported courses virtually, during the COVID-19 era).

Dr. Elizabeth Holmes, NOAA Fisheries

Prof. Lakshmi Varahan, Univ. of Oklahoma

Dr. Greg Cowie, Co-Chair SIBER

They have contributed to two full fledged training courses of ITCOOcean.

Dr. Jenny Huggett, DFFE.

Prof. Antony Richardson, CSIRO

Dr. Emma Rocke, Univ. Capetown

Dr. Eric Raes, MF.

Dr Sazlina Salleh (USM)

Dr Cara Wilson (NOAA)

Dr. Anisah Lee Abdullah (USM)

Dr Charles von der Meden (UKZN)

Contributed few hours to courses conducted online during COVID-19 under IOGOOS collaboration

Annex 5 Technical overview of the infrastructure used for ITCOocean at INCOIS (including laboratories, observing equipment, IT facilities, accommodation, classrooms, conference centres)

Dedicated physical and ICT infrastructure of training facilities in the hosting institution. **Campus Area Extent:** 10 Acres. **Administrative Block**: Dean room, Register Room, 10 faculty rooms, administrative support services rooms, reprographic facility, two vast side rooms for High Tea and lunch during the training. Multipurpose Hall, Exhibition Centre. **Class Rooms**: 3 types of class rooms with 60, 40 and 20 seater capacity. Learning environment is designed with state-of-the-art Electronic Class room facilities that allow a mix of in-class and highly interactive remote learning. **Computer Lab**: 40 thin client, with 25 TB centralized storage, campus wide wifi facility. **Guest House**: 24 student hostel rooms and 11 suit room, common dining, pantry and cooking area. **Play area**: Two indoor play areas for playing badminton and Table Tennis.
Details of the appropriate services that will be available in the hosting institution to support course participants. The following are services available at our institute to support the participants:

1. State of the art E-class rooms with capacity of 40 and 72 seating capacity for participants to undergo training.

- The e-class room provides high quality Local training, immersive Tele-presence, Distance learning and Distance Teaching experience.
- Up to 9 similar class rooms can be connected simultaneously in High Definition mode.
- Up to 50 class room users or Desktop / Smart phones / IPAD users can be joined to the ongoing training sessions of class room through Real Presence Desktop (RPD) software (available in Windows & Mac) and Real Presence **Mobile (RPM) App (available in Android & IOS)**

2. In house international guest house with 24 student rooms and 11 suit rooms, along with catering facility.

3. Computer lab facility with 40 thin client systems for hands on training.

4. Recording facility, HD Projectors, Photography.

5. Internet (LAN based and WiFi based), telephone and Fax facility.

6.Reporgraphic facility.

7. Vehicle on payment basis for travel between Airport/Railway stations to ITCOOcean campus.

8. Administrative and financial support services.

9. 24/7 power with emergency backup.

10. Centralized air conditioning for the entire campus.

Annex 6 Agreement 15 June 2018 between UNESCO and the Government of the Republic of India to establish ITCOocean as a UNESCO Category 2 Centre

AGREEMENT

between

THE UNITED NATIONS EDUCATIONAL SCIENTIFIC AND CULTURAL ORGANIZATION

and

THE GOVERNMENT OF THE REPUBLIC OF INDIA

concerning

THE ESTABLISHMENT OF THE INDIAN NATIONAL CENTRE FOR OCEAN INFORMATION SERVICES (INCOIS) OF THE MINISTRY OF EARTH SCIENCES AS AN INTERNATIONAL TRAINING CENTRE FOR OPERATIONAL OCEANOGRAPHY UNDER THE AUSPICES OF UNESCO (CATEGORY 2)

AGREEMENT BETWEEN UNESCO AND THE GOVERNMENT OF INDIA REGARDING THE ESTABLISHMENT OF THE INTERNATIONAL TRAINING CENTRE OOPERATIONAL OCEANOGRAPHY UNDER THE AUSPICES OF UNESCO (CATEGORY 2)

The Government of India,

and

The United Nations Educational, Scientific and Cultural Organization,

Having regard to the resolution whereby the UNESCO General Conference seeks to favour international cooperation in respect of promoting marine research, ocean protection and sustainable development,

Considering that the Director-General has been authorized by the General Conference, at its 39th session, to conclude with the Government of India an agreement in conformity with the draft that was submitted to the General Conference,

Desirous of defining the terms and conditions governing the framework for cooperation with UNESCO that shall be granted to the said Centre in this Agreement,

HAVE AGREED AS FOLLOWS:

Article 1 – Definitions

1. In this Agreement, "UNESCO" refers to the United Nations Educational, Scientific and Cultural Organization.

2. "INCOIS" refers to the Indian National Centre for Ocean Information Services acting on behalf of the Ministry of Earth Sciences (MoES), Government of India.

Article 2 – Establishment

The Government shall agree to take, in the course of the years 2017-2018, any measures that may be required for the setting up at INCOIS of a Category 2 International Training Centre for Operational Oceanography under the auspices of UNESCO, as provided for under this Agreement, hereinafter referred to as "the Centre".

Article 3 – Purpose of the Agreement

The purpose of this Agreement is to define the terms and conditions governing collaboration between UNESCO and the Government concerned and also the rights and obligations stemming therefrom for the parties.

Article 4 – Legal status

4.1 The Centre shall be independent of UNESCO.

4.2 The Government shall ensure that the Centre enjoys within its territory the functional autonomy necessary for the execution of its activities and the legal capacity:

to contract;

to institute legal proceedings;

to acquire and dispose of movable and immovable property.

Article 5 – Constitutive Act

The constitutive act of the Centre must include provisions describing precisely:

(a) the legal status granted to the Institute/Centre, within the national legal system, the legal capacity necessary to exercise its functions and to receive funds, obtain payments for services rendered, and acquire all means necessary for its functioning;

(b) a governing structure for the Centre allowing UNESCO representation within its governing body.

Article 6 – Functions/objectives

The functions/objectives of the Centre shall be to:

- Provide advanced training in operational oceanography for young scientists, technical persons and decision makers/officials from Indian Ocean Rim countries, South Asia, Africa, SIDS on a regular basis;

- Define regional and global problems and priorities, the solution of which requires regional and international cooperation and assist in the identification of training, education and mutual assistance needs,

- Provide training on generation of data using in situ and satellite platforms, transmission of data to operational centres, usage of data in models, and generation of forecasts and dissemination of the same to end users;

- Substantially contribute to the activities of numerous users and UNESCO/IOC programmes related to climate change, disasters mitigation, data and information exchange and others;

- Promote excellence in integrated multidisciplinary oceanography to improve understanding and management of natural resources;

- Help scientists to be in a state of preparedness for nowcasting and forecasting the behaviour of the ocean and address the role of ocean science and technology in delivering information critical to safety, commerce and environmental protection;

- Promote activities of the Centre, of UNESCO and IOC role in marine and coastal matters, raise public awareness concerning the need for sustainable management of the sea and coastal areas, introduce the benefits of national and regional cooperation approach;

- Organize assistance to IOC/UNESCO in mobilizing human, financial and material resources to respond to the needs of the coastal countries of the region in dealing with emergency situations triggered by marine natural hazards;

- Make recommendations to the governing bodies of the region on policy matters related to the mandate of the Centre and formulate proposals for the protection and sustainable development of the Indian Ocean and its coasts.

Article 7 – Governing Board

1. The Centre shall be guided and overseen by a Governing Board renewed every 3 years and include:

   (a) a representative of the Government concerned or his/her appointed representative;

   (b) representatives of Member States, which have sent to the Centre notification for membership, in accordance with the stipulations of Article 10, paragraph 2 below and have expressed interest in being represented on the Board;

   (c) a representative of the Director-General of UNESCO.

2. The Governing Board shall:

   (a) approve the long-term and medium-term programmes of the Centre;

   (b) approve the annual work plan of the Centre, including the staffing table;

   (c) examine the annual reports submitted by the Director of the Centre, including a biennial self-assessment reports of the Centre's contribution to UNESCO/IOC's programme objectives;

   (d) examine the periodic independent audit reports of the financial statements of the Centre and monitor the provision of such accounting records necessary for the preparation of financial statements;

   (e) adopt the rules and regulations and determine the financial, administrative and personnel management procedures for the Centre in accordance with the laws of the country;

   (f) decide on the participation of regional intergovernmental organizations and international organizations in the work of the Centre

3. The Governing Board shall meet in ordinary session at regular intervals, at least once every calendar year; it shall meet in extraordinary session if convened by its Chairperson, either on his/her own initiative or at the request of the Director-General of UNESCO or at the request of a simple majority of its members.

4. The Governing Board shall adopt its own rules of procedure. For its first meeting the procedure shall be established by the Government and UNESCO.

Article 8 – UNESCO's contribution

1. UNESCO may provide assistance, as needed, in the form of technical assistance for the programme activities of the Centre, in accordance with the strategic goals and objectives of UNESCO by:

   (a) providing the assistance of its experts in the specialized fields of the Centre;

(b) engaging in temporary staff exchanges when appropriate, whereby the staff concerned will remain on the payroll of the dispatching organizations; (and/or)

(c) seconding members of its staff temporarily, as may be decided by the Director-General on an exceptional basis if justified by the implementation of a joint activity/project within a strategic programme priority area.

2. In all the cases listed above, such assistance shall not be undertaken except within the provisions of UNESCO's programme and budget, and UNESCO will provide Member States with accounts relating to the use of its staff and associated costs.

Article 9 – Contribution by the Government

1. The Government shall provide all the resources, either financial or in kind, needed for the administration and proper functioning of the Centre.

2. The Government undertakes to:

(a) make available to the Centre necessary facilities and staff needed for the successful operations;

(b) entirely assume [the maintenance of the Centre premises, salary of the staff, operating expenses, and the like;

(c) contribute to the Centre a total amount of USD 600,000 per year for at least a period of 6 years;

(d) make available to the Centre the administrative staff necessary for the performance of its functions, which shall comprise of at most 6 staff members of INCOIS including the Director of INCOIS.

Article 10 – Participation

1. The Centre shall encourage the participation of Member States and Associate Members of UNESCO which, by their common interest in the objectives of the Centre, desire to cooperate with the Centre.

2. Member States and Associate Members of UNESCO wishing to participate in the Centre's activities, as provided for under this Agreement, shall send to the Centre notification to this effect. The Director shall inform the parties to the agreement and other Member States of the receipt of such notifications.

Article 11 – Responsibility

As the Centre is legally separate from UNESCO, the latter shall not be legally responsible for the acts or omissions of the Centre, and shall also not be subject to any legal process, and shall bear no liabilities of any kind, be they financial or otherwise, with the exception of the provisions expressly laid down in this Agreement.

Article 12 – Evaluation

1. UNESCO may, at any time, carry out an evaluation of the activities of the Centre in order to ascertain:

(a) whether the Centre makes a significant contribution to the UNESCO's strategic programme objectives and expected results aligned with the four-year programmatic period of C/5 document (Programme and Budget), including the global priorities of the Organization, and related sectoral or programme priorities and themes;

(b) whether the activities effectively pursued by the Centre are in conformity with those set out in this Agreement.

2. UNESCO shall, for the purpose of the review of this Agreement, conduct an evaluation of the contribution of the category 2 Centre to UNESCO strategic programme objectives, to be funded by the host country or Centre.

3. UNESCO undertakes to submit to the Government, at the earliest opportunity, a report on any evaluation conducted.

4. Following the results of an evaluation, each of the contracting parties shall have the option of requesting a revision of its contents or of denouncing the Agreement, as envisaged in Articles 16 and 17 below.

Article 13 – Use of UNESCO name and logo

1. The Centre may mention its affiliation with UNESCO. It may therefore use after its title the mention "under the auspices of UNESCO".

2. The Centre is authorized to use the UNESCO logo or a version thereof on its letter headed paper and documents including electronic documents and web pages in accordance with the conditions established by the governing bodies of UNESCO.

Article 14 – Entry into force

This Agreement shall enter into force, following its signature by the contracting parties, when they have informed each other in writing that all the formalities required to that effect by the domestic law of India and by UNESCO's internal regulations have been completed. The date of receipt of the last notification shall be deemed to be the date of entry into force of this Agreement.

Article 15 – Duration

This Agreement is concluded for a period of six years as from its entry into force. - The Agreement shall be renewed upon common agreement between Parties once the Executive Board made its comments based on the results of the renewal assessment provided by the Director-General.

Article 16 – Denunciation

1. Each of the contracting parties shall be entitled to denounce this Agreement unilaterally.

2. The denunciation shall take effect within 30 days following receipt of the notification sent by one of the contracting parties to the other.

Article 17 – Revision

This Agreement may be revised by written consent between the Government and UNESCO.

Article 18 – Settlement of disputes

1. Any dispute between UNESCO and the Government concerning the interpretation or application of this Agreement, if not settled by negotiation or any other appropriate method agreed to by the parties, shall be submitted for final decision to an arbitration tribunal composed of 3 members one of whom shall be appointed by INCOIS, another by the Director-General of UNESCO, and a third, who shall preside over the tribunal, shall be chosen by the first two. If the two arbitrators cannot agree on the choice of a third, the appointment shall be made by the President of the International Court of Justice.

2. The Tribunal's decision shall be final.

IN WITNESS WHEREOF, the undersigned have signed this Agreement,

DONE in 2 original copies in English language.

For the United Nations Educational, Scientific and Cultural Organization

Audrey Azoulay
Director-General

For the Government of the Republic of India

H.E. Dr M. Rajeevan
Secretary
Ministry of Earth Sciences

भारत सरकार
GOVERNMENT OF INDIA
पृथ्वी विज्ञान मंत्रालय
MINISTRY OF EARTH SCIENCES
पृथ्वी भवन, लोदी रोड, नई दिल्ली -110003
Prithvi Bhavan, Lodhi Road, New Delhi-110003

FAX : 91-11-24629779
PHONE :

संख्या
No. MoES/16/10/12-INCOIS(ITCOocean)

नई दिल्ली -110003
New Delhi-110003 17.12.2020

Sub: Notification for the entry into force of the ITCOOcean – Reg.
Ref: Your email dated December 14, 2020.

Dear Dr. Justin,

This has reference to your email regarding the agreement between Govt. of India and UNESCO for the establishment of International Training Centre for Operational Oceanography (ITCOocean) at INCOIS, Hyderabad as Category II centre.

It may be recalled that Secretary MoES as the authorized representative has signed the agreement with UNESCO to establish ITCOOcean at INCOIS as a Category 2 Centre of UNESCO. An Ink signed copy was forwarded to the Permanent Delegation of India, UNESCO, Paris on 15 June 2018 for handing over to the UNESCO secretariat, which would have been received by the Secretariat. The purpose of this letter is to confirm full compliance to Article 14 of the MoU between UNESCO and Govt. of India, and to treat 15 June 2018 as the date of entry into force of the agreement.

Kindly acknowledge the receipt of this letter.

With best regards,

Yours sincerely,

(Cdr. P.K. Srivastava)
Programme Director, MoES

Dr. Justin Ahanhanzo
IOC Regional Liaison Officer for Latin America and the Caribbean,
Asia and the Pacific and Africa
Intergovernmental Oceanographic Commission of UNESCO (IOC-UNESCO)
UNESCO Headquarters, 7 Place de Fontenoy
75352 Paris Cedex 07 SP
France

Cc: Permanent delegation of India to UNESCO, Paris

Annex 7 Budget data for ITCOocean from 2018.

From: Uday Bhaskar T V S <uday@incois.gov.in>
Sent: 31 January 2024 12:59
To: Nick D'Adamo <nick.dadamo@uwa.edu.au>
Cc: 'meenakumarib@gmail.com' <meenakumarib@gmail.com>
Subject: RE: Your input please - ITCOocean review data

Dear Nick and Meenakumari Mam,

Further to the inputs provided till now, the budget information following the financial year format as followed here is given below:

As budgetary data submitted formally through Board Meeting documents, the ITCOocean C2C received resourcing from the Indian Government amounting to approx. (exact figures at INCOIS):

2017 - 18 (as a start up figure pre-Agreement date of June 2018:)	$2.370M USD
2018 - 19	$1.931M USD
2019 - 20	$1.176M USD
2020 - 21	$0.600M USD
2021 - 22	$1.020M USD
2022 - 23	$0.811M USD
2023 - 24	$0.949M USD
2024 - 25 (projected) (if needed for the review)	$0.781M USD
2025 - 26	$0.719M USD

++

Do let me know if you need anything further from me.

Warm regards
uday