

INDIAN OCEAN GLOBAL OCEAN OBSERVING SYSTEM

Report from Secretariat

M. Nagaraja Kumar
Secretary, IOGOOS



GRA Forum
November 13, 2024

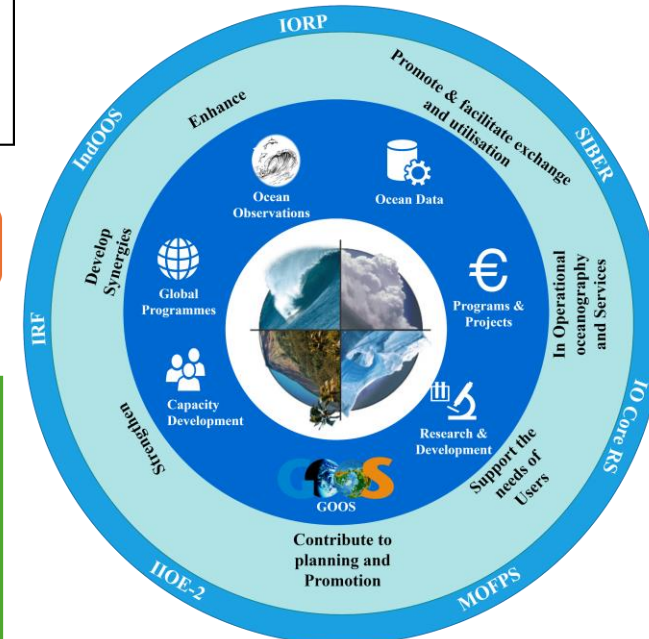
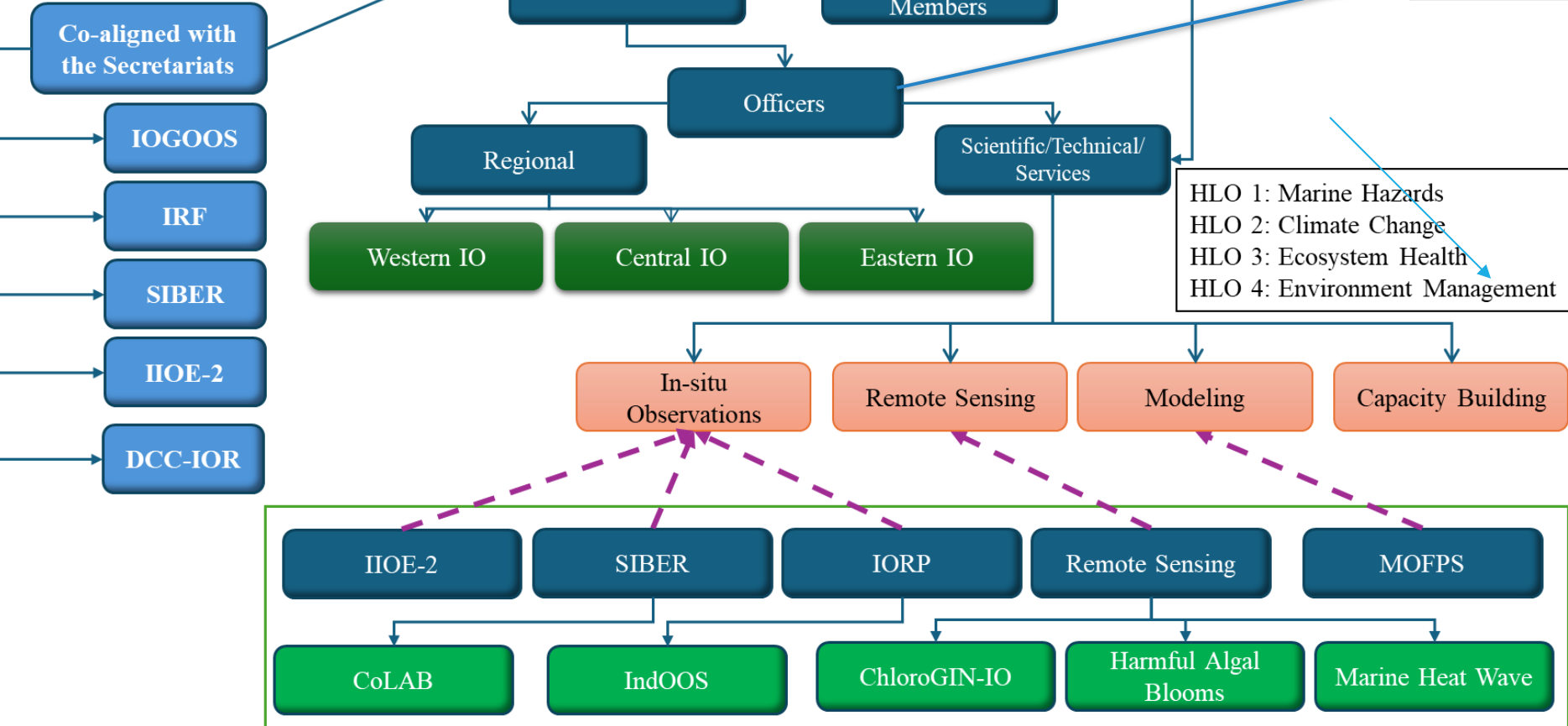
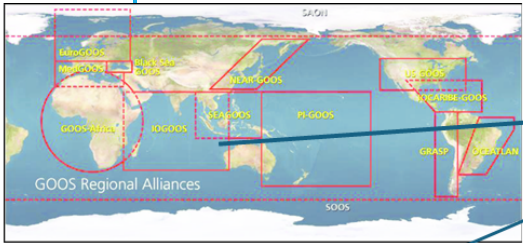


IOGOOS GOVERNANCE



IOGOOS GOVERNANCE

Region	Person	Designation
Central Indian Ocean	Vacant	Chair
Eastern Indian Ocean	Dr. Brett Molony	Officer
Western Indian Ocean	Dr. Faiza Al Yamani	Officer
IOGOOS Project Representative	Dr. Jenny Huggett	Officer
IOGOOS Project Representative	Dr. Juliet Hermes	Officer
IOGOOS Secretariat	Mr. M. Nagaraja Kumar	Secretary



IOGOOS GOVERNANCE

❑ IOGOOS Annual Meetings

- 19th meeting in Lombok, Indonesia – March 2024
- 18th meeting in Perth, Australia – February 2023

❑ Elections of IOGOOS Officers

- No Vacant positions up to October 2024. Nomination process for next tenure is being initiated

❑ Memberships

- Membership fee is voluntary
- Oceans Institute, University of Western Australia joined at IOGOOS 18
- Department for Continental Shelf, Maritime Zones Administration & Exploration of Prime Minister's Office of Mauritius showing interest

❑ Finance and Accounts Statement

- Completed Financial Auditing
- IOGOOS Budgetary allocations by IOC

❑ IOGOOS Pilot Projects

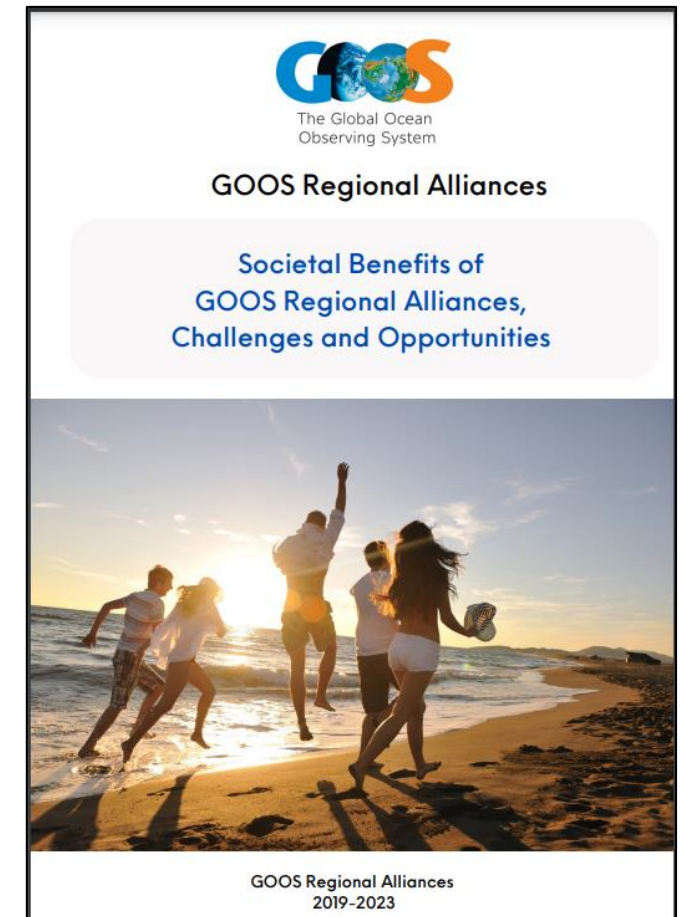
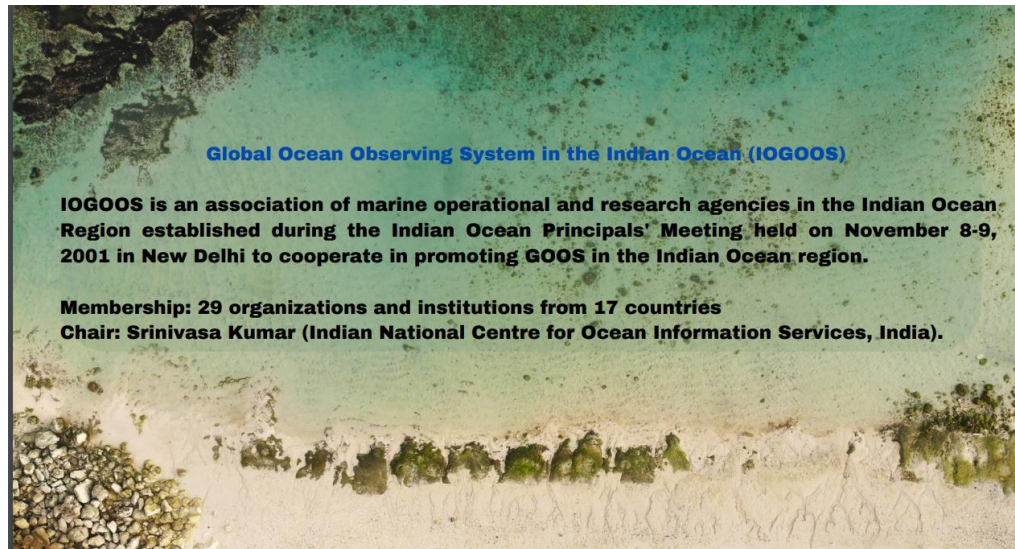
- Sustained and enhanced ocean observing platforms
- Modelling for Ocean Forecasting and Process Studies (MOFPS) – To design a Comprehensive survey to gather the requirements
- Remote Sensing products dissemination as part of Indian Ocean Core Remote Sensing Project

❑ IOGOOS Trainings / Meeting participation

❑ UN Ocean Decade Activities

SOCIETAL BENEFITS OF GOOS REGIONAL ALLIANCES, CHALLENGES AND OPPORTUNITIES

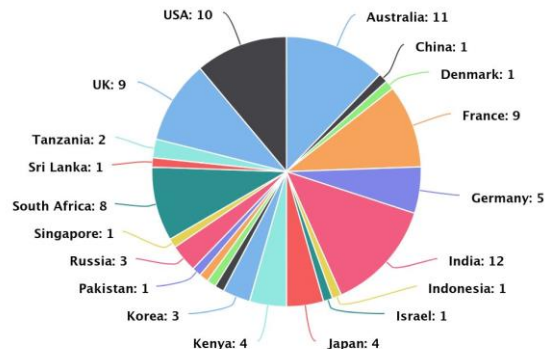
- ❑ IIOE-2 as one of the success story under Ocean Observing and Monitoring;
- ❑ IndOOS under Data Management and Services;
- ❑ SIBER under Analysis, Modeling and Forecasting Systems;
- ❑ ChloroGIN Data Products under Products and Applications
- ❑ IndOOS Resource Forum under Institutional and Governance



INTERNATIONAL INDIAN OCEAN EXPEDITION - 2

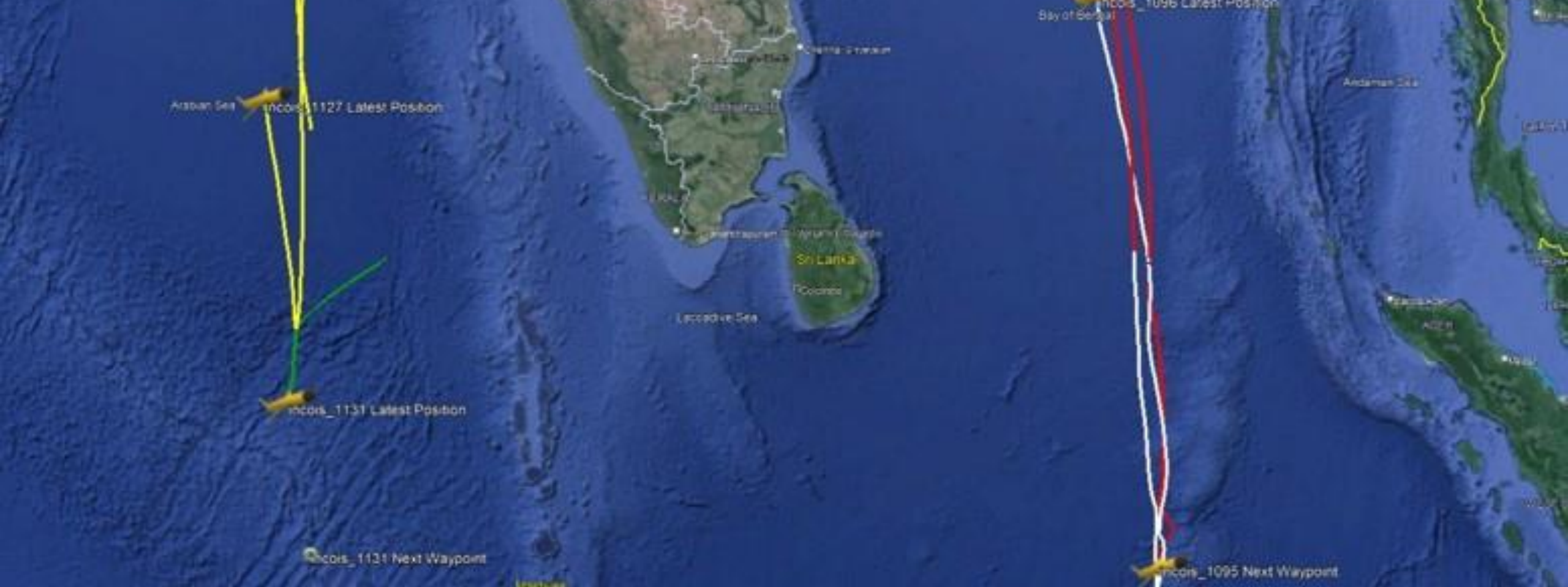
- ❑ An International Brainstorming session on “Future Roadmap for IIOE-2” held at INCOIS, Hyderabad
 - Extend the tenure of IIOE-2 aligned with the UN Decade of Ocean Science for Sustainable Development
 - Addendum to IIOE-2 science plan and revised implementation strategy for extension of IIOE-2 tenure till 2030
- ❑ 57 endorsed projects involving 21 Countries with India (13 projects), Australia (11 projects), the USA (10 projects), UK (9 projects), France (10) and South Africa (6 projects) leading the way — 07 Projects in 2023-24

Participant Nationalities Wise No. of Endorsed Projects Submitted as on 2024



Participants from broad spectrum of scientific bodies involved in the Indian Ocean research including IGOOS, IIOE-2, IORP, IRF, SIBER, IOCINDIO, SCOR, IOC and ECSN

November 28-30, 2023
Hosted by INCOIS, India

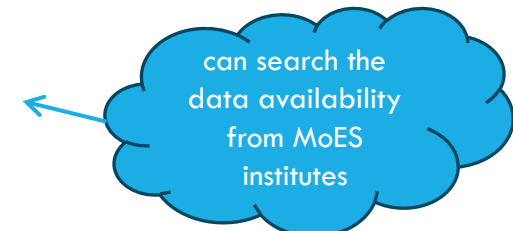


INDOOS UPDATES



OCEAN OBSERVATIONS IN INDIAN OCEAN

- ❑ EKAMSAT (India-US Collaboration)
 - ❑ Facilitated the participation of representatives from Bangladesh, Mauritius and Sri Lanka
- ❑ MoES-NOAA OMNI-RAMA Joint Data Portal (<https://incois.gov.in/portal/datainfo/buoys.jsp>)
- ❑ EARTH SYSTEM SCIENCE DATA PORTAL (<https://incois.gov.in/essdp/>)
- ❑ In-situ Data (<https://incois.gov.in/portal/datainfo/insituhome.jsp>)
- ❑ Remote Sensing Data (https://incois.gov.in/portal/remotesensing/TERA_display.html)
- ❑ Indian Ocean Core Remote Sensing Project – ChloroGIN-IO Products and HAB Info Products (<https://incois.gov.in/portal/ChloroGIN>)
- ❑ LIVE ACCESS SERVER (<https://las.incois.gov.in/>)
- ❑ Integration of the data with ERDDAP

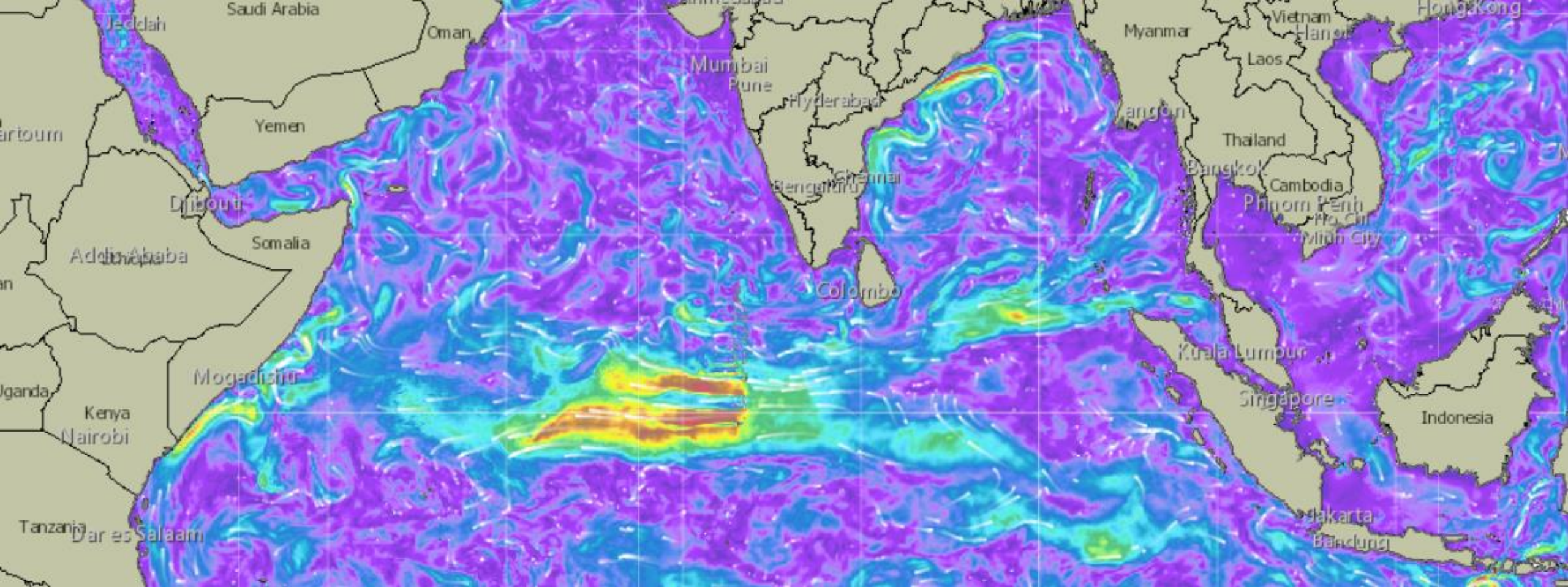


ERDDAP
Easier access to scientific data

ERDDAP > List of All Datasets

19 matching datasets, listed in alphabetical order.

Grid DAP Data	Sub-set	Table DAP Data	Make A Graph	W M S	Title	Sum-mary	Meta-data	Back-ground Info	RSS	E mail	Institution	Dataset ID
	set	data	graph		* The List of All Active Datasets in this ERDDAP *		M	background			INCOIS	allDatasets
data			graph	M	AMSR2 3day Global		M	background			INCOIS	AMSR2_3day_Global
data			graph	M	AMSRE Monthly Global Data		M	background			INCOIS	AMSRE_MONTHLY_GLOBAL
data			graph	M	Daily ASCAT global wind field		M	background			ifremer	ascat_daily_datasets
data			graph	M	Daily-OI-V2, final, Data (Ship, Buoy, AMSR-E, AVHRR, GSFC-ice)		M	background			INCOIS	NOAA_AVHRR_AMSR_datasets
data			graph	M	Data from a local source.		M	background			NOAA	NOAA_AVHRR_datasets
data			graph	M	INCOIS ARGO 10 Day data Kessler-McCreary Methodology		M	background			INCOIS	incois_argo_10day_McCreary
data			graph	M	INCOIS ARGO 10 day data Variational Analysis Methodology		M	background			INCOIS	incois_argo_10d_VAM
data			graph	M	INCOIS ARGO Monthly data Kessler-McCreary Methodology		M	background			INCOIS	incois_argo_mnt_McCreary
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data			graph	M	INCOIS argo SST data Weekly		M	background			INCOIS	incois_argo_sst_weekly
data			graph	M	INCOIS Oceansat 2 OCM Data		M	background			INCOIS	incois_oceansat2_datasets
data			graph	M	INCOIS Quikscat Daily Data		M	background			INCOIS	incois_quikscat_daily_datasets
data			graph	M	INCOIS Quikscat Monthly Data		M	background			INCOIS	incois_quikscat_mnt_datasets

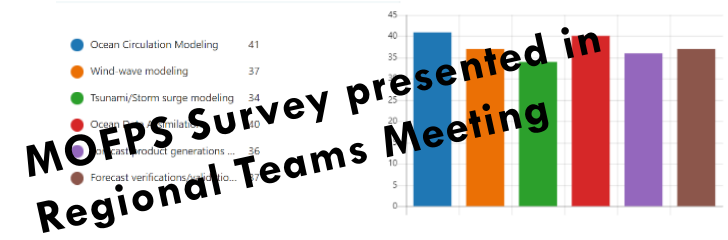


MODELLING FOR OCEAN FORECASTING AND PROCESS STUDIES (MOFAPS)



MODELLING FOR OCEAN FORECASTING AND PROCESS STUDIES (MOFPS)

- ❖ Increased interest in the region
- ❖ Aligning with the ‘UN Ocean Decade’ through OceanPredict Program
- ❖ The detailed survey form designed in June 2023
<https://forms.office.com/r/CZME07EK8P>
 - General Information (Name, Affiliation, Field of work, Products user or not, etc.) and more specific information on the products being used, modelling parameters and models used, modelling and observation capabilities of the institutes, requirements of the member institutes, etc.
- ❖ Collaboration with OceanPredict DCC
 - Members are part of Regional Team for Indian Ocean
 - Co-hosted virtual meeting of the 1st Regional Teams meeting with ocean modelling products stakeholders (Representatives from Member Institutes/Countries have participated and obtained Users Feedback (Scientific Users, NGOs, Fishermen community, etc.))



WEB PORTAL FOR OCEAN PREDICTION



Regional Specialized Meteorological Centre (RSMC)
for Numerical Ocean Wave Prediction
and Global Numerical Ocean Prediction
Indian National Centre for Ocean Information Services (INCOIS)



Home Publications Waves Ocean Prediction

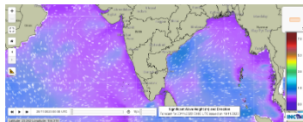
The Indian Ocean is a vast stretch of seawater and a source of sustenance and livelihood for millions of people in the countries that border it. The marine resources of the Indian Ocean and the concept of the blue economy play a significant role in supporting the socioeconomic development and well-being of the populations living in this region.

Indian National Centre for Ocean Information Services (INCOIS) is an autonomous organization under the Ministry of Earth Sciences, Government of India. It was established in 1999 and has provided various ocean-related services since then. INCOIS started its wave forecast services from (25-05-2006) and augmented it with essential ocean variables from ocean general circulation models from (03-03-2015). INCOIS generates early warning advisories based on the state of the seas surrounding the Indian subcontinent and serves several island countries. These services are critical for the operational activities of offshore sea goers and onshore activities such as coastal tourism, ports and harbors etc.

INCOIS operationally runs a suite of wave and ocean general circulation models at different resolutions to provide early warning services to maritime stakeholders. Users of forecasts are equipped to take informed decisions based on the sea state conditions, avoiding loss of life and property. Thus, INCOIS services extensively contribute to the development of the blue economy in the region through its forecasts and advisory services. Forecasts of essential ocean variables at different time scales are thus crucial for a broad spectrum of users ranging from fishermen to offshore industries. Recognizing the role played by INCOIS in issuing forecasts for the region, the WMO Executive Council at its seventy-sixth session (EC-76) adopted the designation of RSMC Indian National Centre for Ocean Information Services (INCOIS) (India) for numerical ocean wave prediction and global numerical ocean prediction.

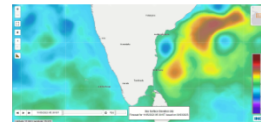
WMO recognition to INCOIS as one of the first Regional Specialized Meteorological Centre (RSMC) for Numerical Ocean Wave Prediction and Global Numerical Ocean Prediction

Waves



[View](#) [Data Download](#)

Ocean Prediction



[View](#) [Data Download](#)

Model Name	Domain	Resolution	Forcing	Mixing	DA
WAVEWATCH-III	Four nested grids covering Global Ocean	Global Ocean (1 x1 deg), Indian Ocean (0.5 x0.5 deg), Northern Indian Ocean (0.25 x0.25 deg) and coastal (10 Km x10 Km)	ECMWF forecast winds (0.25x0.25deg)	NA	Optimal Interpolation method: Assimilates Sig. Wave Height (SWH) from SARAL/AltiKa, Jason-3, Sentinel-3a and Sentinel-3b and all available in-situ SWH observations in the Indian Ocean

Model Name	Domain	Resolution	Forcing	Mixing	DA
HYbrid Coordinate Ocean Model (HYCOM) version-2.35	20E-120E & 43S-30N	6.9 km (1/16) degree nested to a 25 km (1/4) Global Hycom	Atmospheric forcing: GFS Rivers: NRL climatology	KPP mixing	Method: Tendral Statistical Inter Order Kalman Filter Variables: A Along Track altimeter data, Argc Temperature & Salinity

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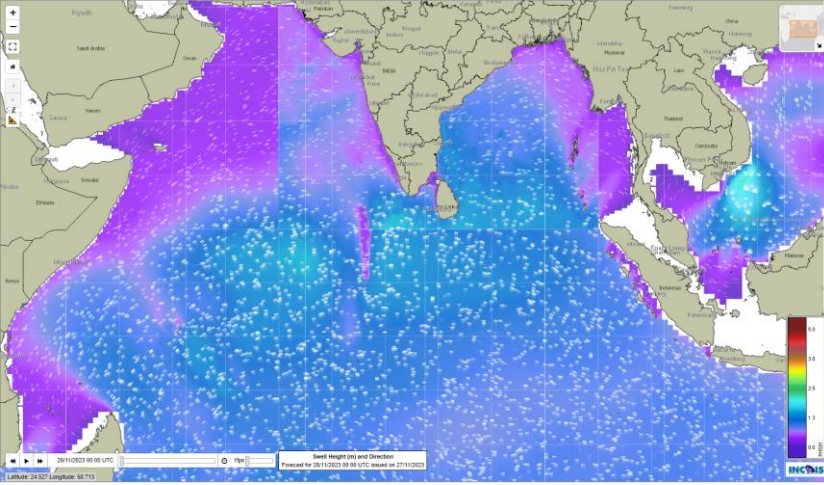
Dr M. Ravichandran, Secretary, MoES Inaugurated the RSMC service during OSICON23 conference on 23 August 2023.

<https://incois.gov.in/oceanservices/rsmc.jsp>

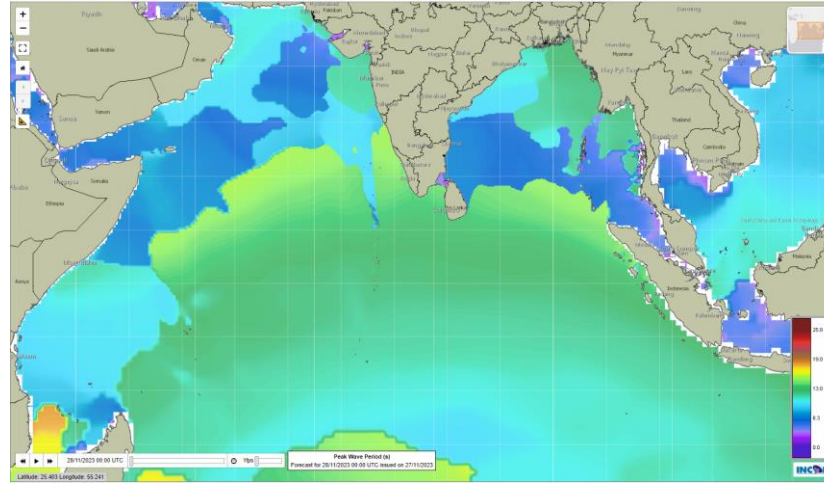


Numerical Ocean Wave Prediction Products

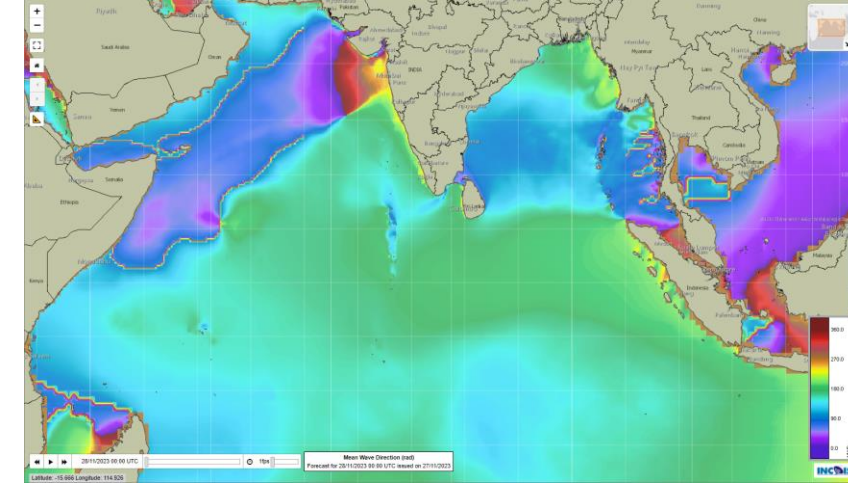
Swell Height and Direction



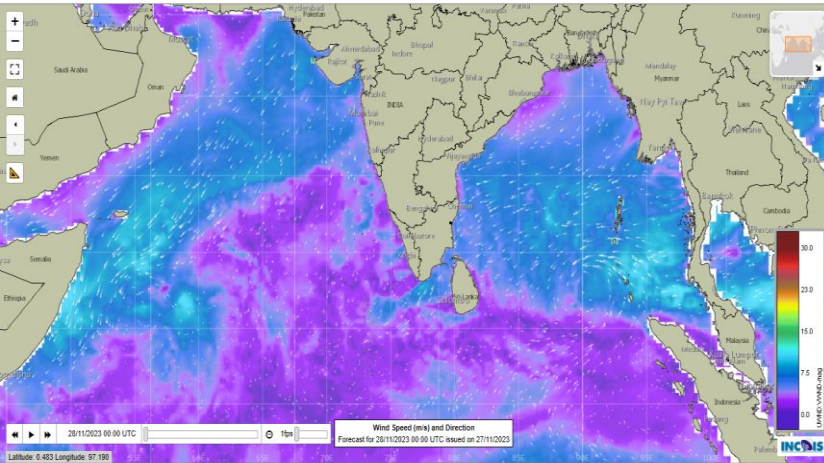
Peak Wave Period



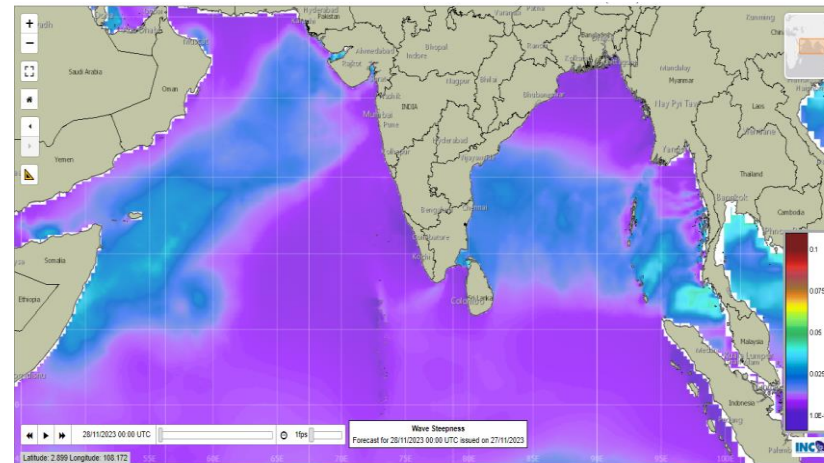
Mean Wave Direction



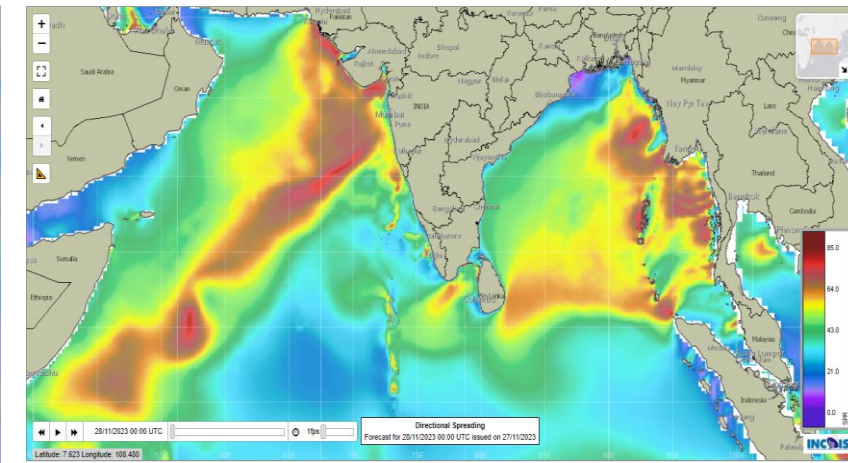
Wind Speed and Direction



Wave Steepness

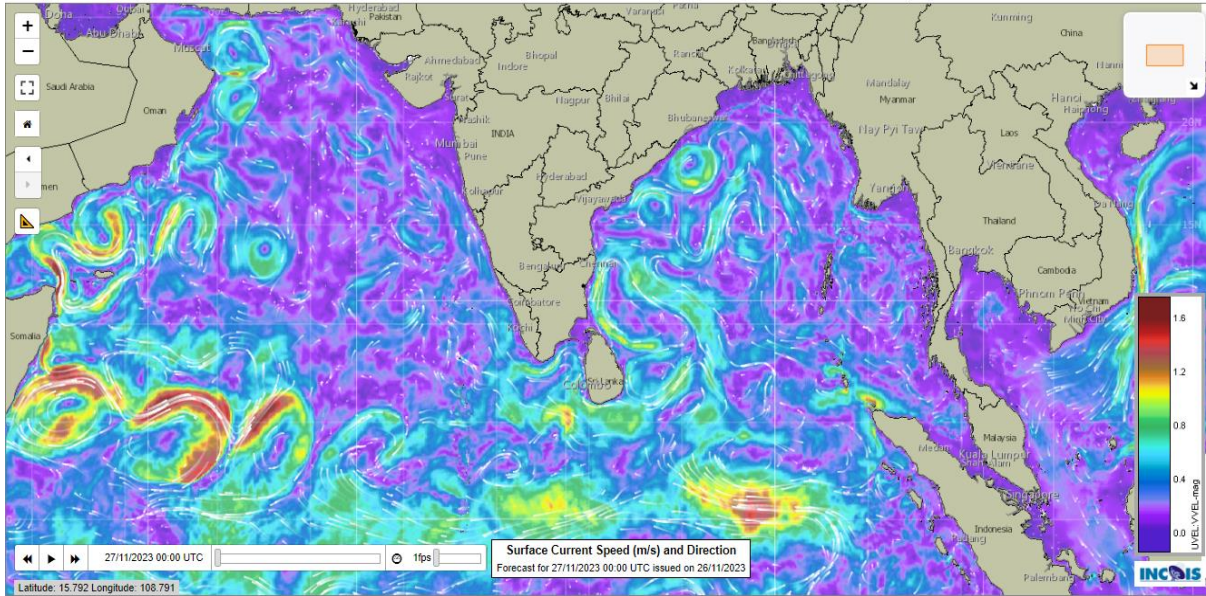


Directional Spreading

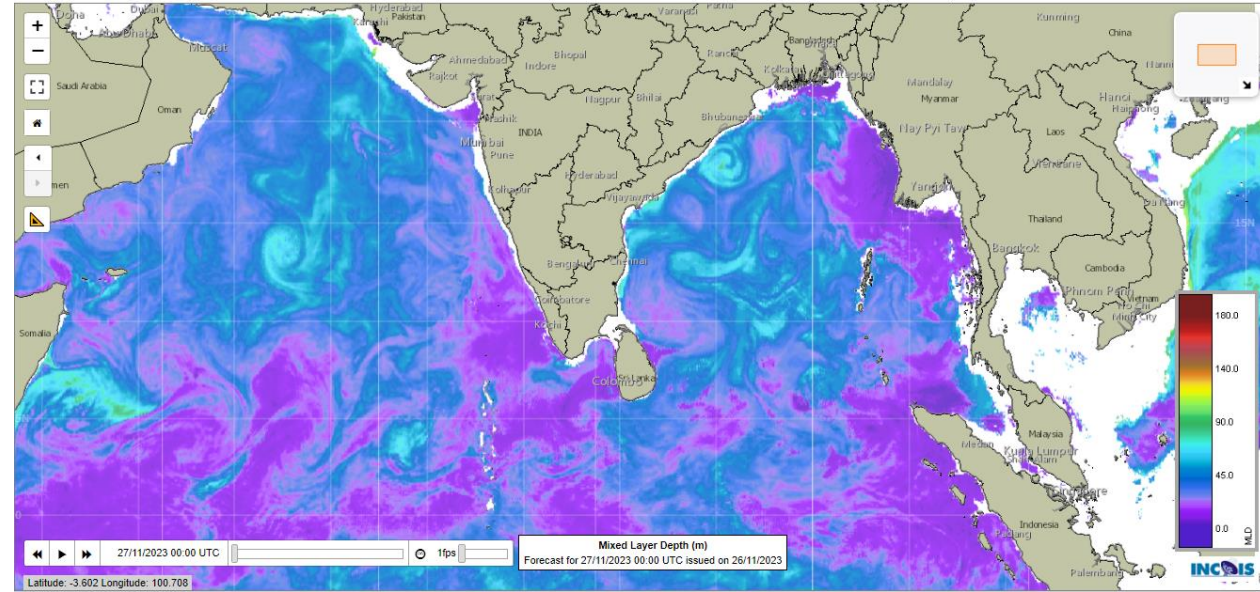


Global Numerical Ocean Predication Products

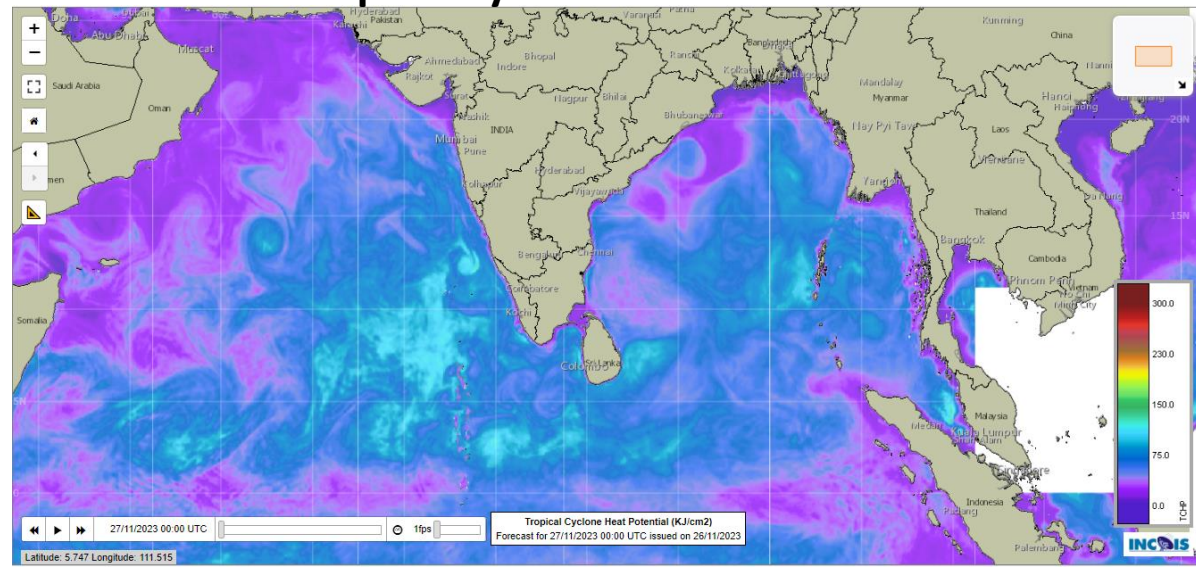
Surface Current Speed and Direction



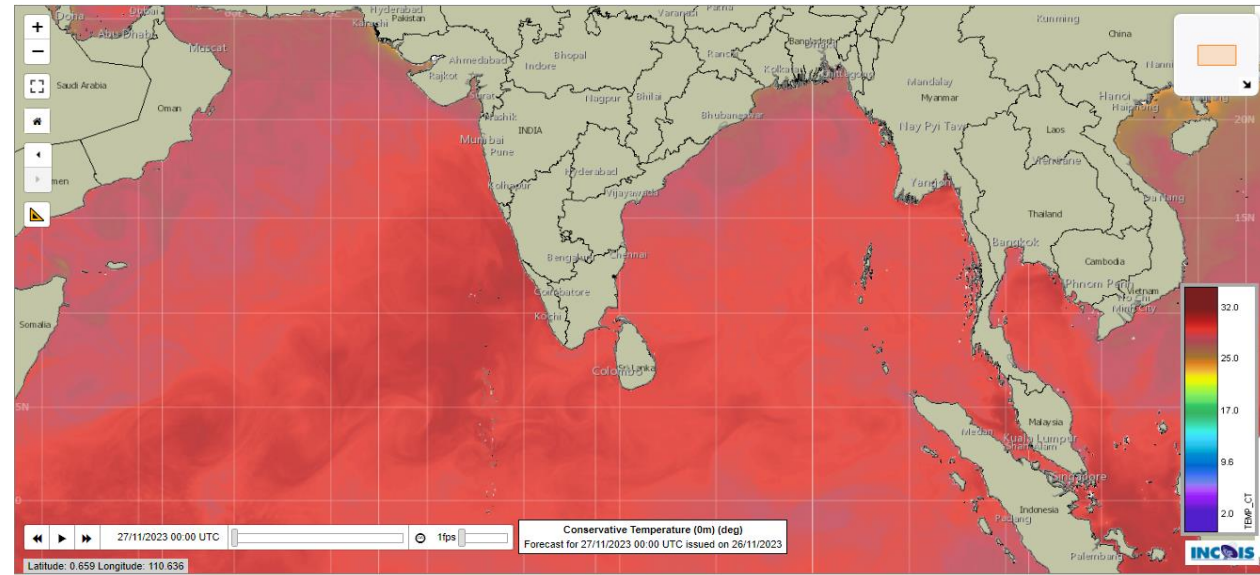
Mixed Layer Depth



Tropical Cyclone Heat Potential

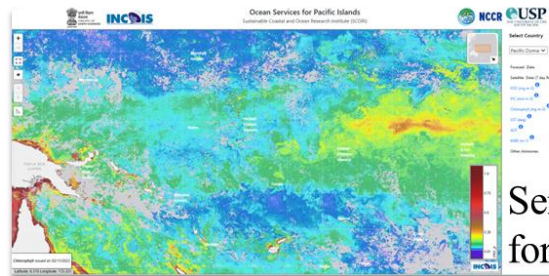
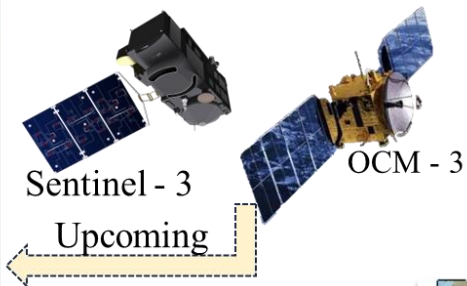


Conservative Temperature

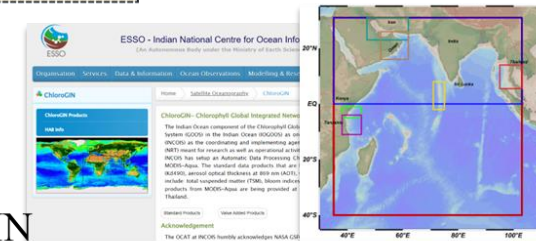


REMOTE SENSING PRODUCTS / SERVICES - UPDATES

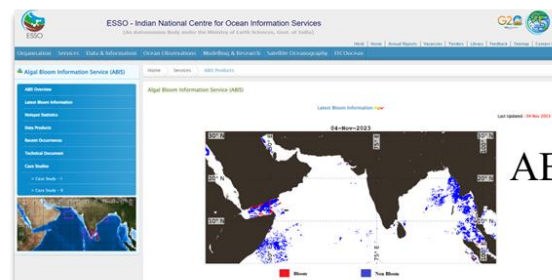
- ✓ INCOIS Services
- ✓ User Curated Data
- ✓ R&D Use



ChloroGIN



PFZ Advisory



Output

Level- 3/4

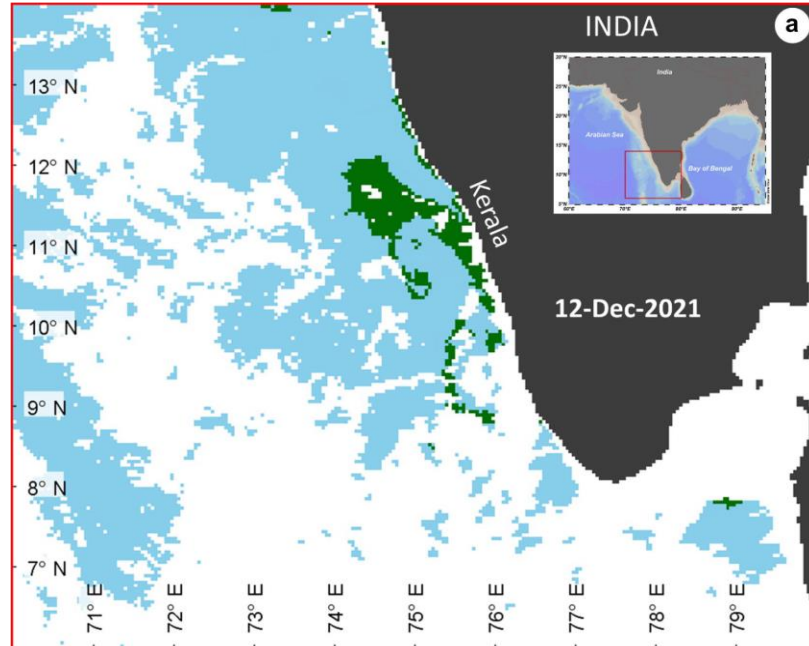
- ✓ Standard
- ✓ Value Added
- ✓ Anomaly
- ✓ Roll

Tuna Advisory



REMOTE SENSING PRODUCTS / SERVICES - UPDATES

- Continued to provide the RS Data products to Member institutes area of Interest
- Satellite remote sensing-based advisories on Harmful Algal Bloom
(<https://incois.gov.in/portal/hab.jsp>)

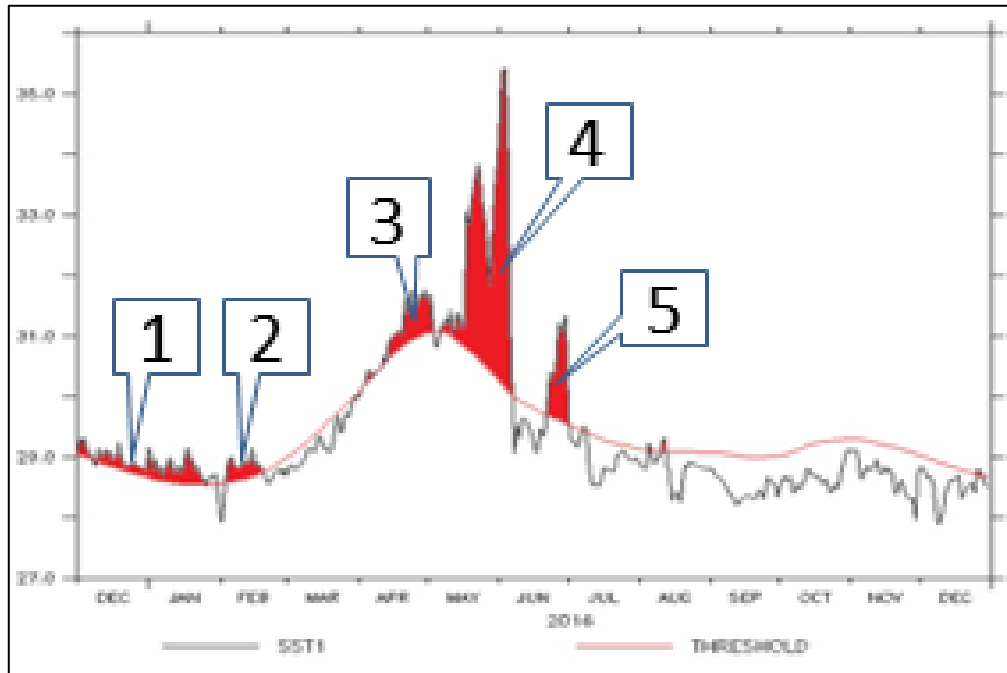


Map of the study area showing the presence of green *Noctiluca scintillans* (deep green). Field photographs showing green *Noctiluca scintillans* bloom (b), and fish kill events (c, d) in coastal waters of Kerala at Kodikkal on 16 December 2021. (e) Bioluminescent green tide photographed at Varkala, Kerala on 14 December 2021

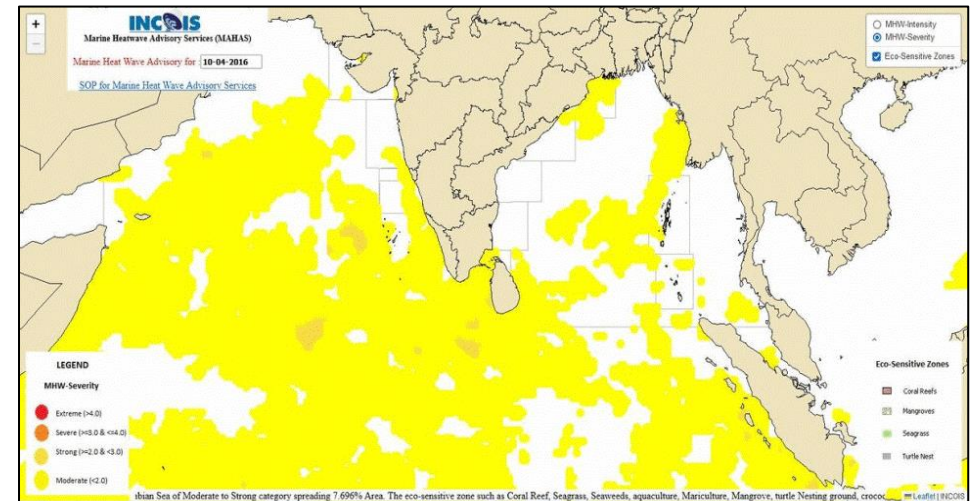
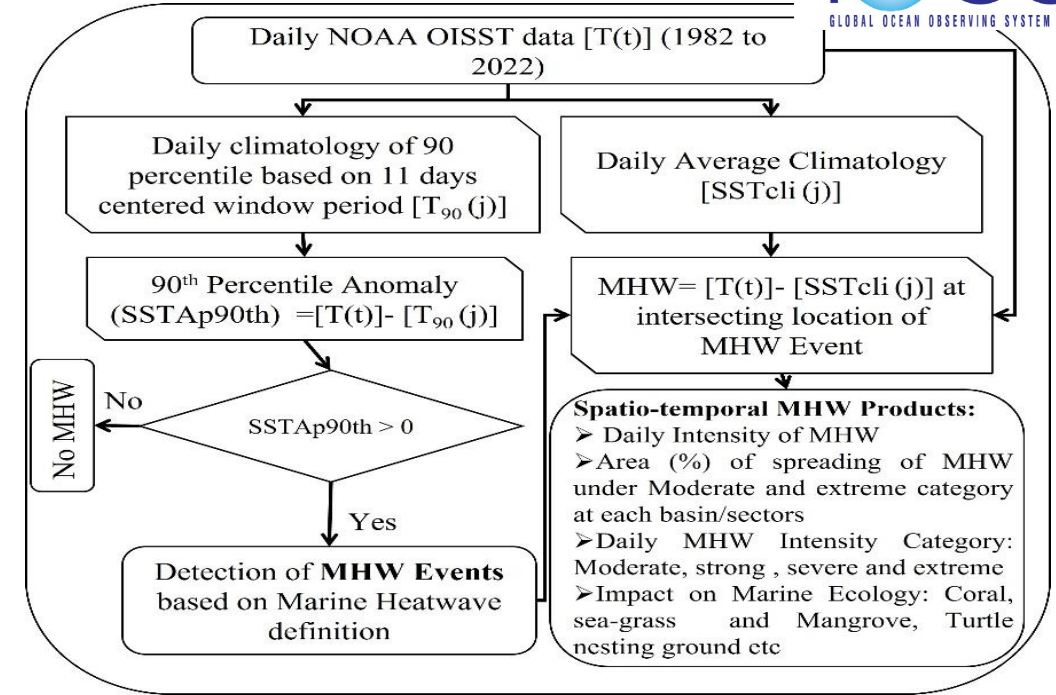
Short Communication on "Satellite-Based Detection of Noctiluca Bloom in the Coastal Waters of the South-eastern Arabian Sea: A Case Study Implicating Monitoring Needs" published in Natl. Academy of Science Letters (March-April 2023) 46(2):103-107.
<https://doi.org/10.1007/s40009-023-01205-2>

MARINE HEAT WAVE ADVISORY SERVICES

- Marine Heatwaves (MHWs) are prolonged extreme oceanic warm water events.
- **Mechanisms of Genesis of MHW:**
High pressure zone, reduce the cloud coverage, Solar insolation, suppress the LHF and SHF, increase the advection and reduce the convection, reduce the coastal upwelling, Rossby and Kelvin planetary wave, teleconnection of ENSO, IODM, MJO in different time scale



Identification of MHW window period based on Threshold limits



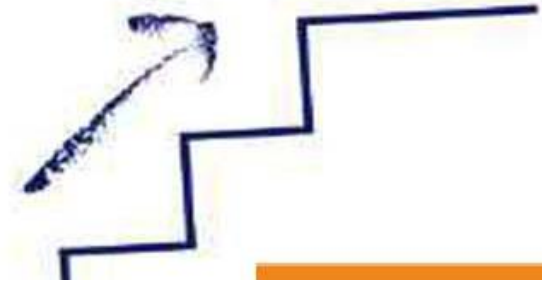
Mohanty et. al., 2021. Persistence of marine heat waves for coral bleaching and their spectral characteristics around Andaman coral reef . **Environmental monitoring and assessment**

COACHING TEACHING KNOWLEDGE

TRAINING



SKILLS



CAPACITY BUILDING



IOGOOS TRAININGS / MEETING PARTICIPATION

IOCCG - ITCOOcean Program : 2024 Summer Lecture Series Frontiers in Ocean Optics and Ocean Colour Science

- November 04 – 16, 2024
- Member countries: Bangladesh, France, India, Indonesia, South Africa, USA.
- Other countries: Brazil, Canada, Croatia, Italy, Lebanon, Lithuania, Peru, Russia, Spain, Uganda, Vietnam.
- Sponsors: POGO, ITCOOcean / INCOIS.
- 28 Participants from 16 countries.



IOGOOS TRAININGS / MEETING PARTICIPATION

❑ OTGA-INCOIS Training Course: "Ocean Color Remote Sensing - Data, Processing and Analysis"

- October 21 – 25, 2024
- Member countries: India, Mozambique, Sri Lanka and Tanzania .
- Sponsors: OTGA, ITCOOcean / INCOIS.
- 21 Participants from 4 countries.



IOGOOS TRAININGS / MEETING PARTICIPATION

❑ On job training to officials from Mauritius on PFZ Services

- July 29 – August 02, 2024
- Member countries: Mauritius
- Sponsors: ITCOOcean / INCOIS.
- 2 Participants from 1 country.



IOGOOS TRAININGS / MEETING PARTICIPATION

❑ Customization of Ocean State Forecast Products

- May 20 – 24, 2024
- Member countries : Bangladesh, Maldives Myanmar and Sri Lanka.
- Other Countries : Myanmar
- Sponsors: RIMES, ITCOOcean / INCOIS.
- 11 Participants from 4 countries.



IOGOOS TRAININGS / MEETING PARTICIPATION

□ Ocean Observations to Coastal Applications

- January 29 – February 07, 2024
- Member countries: Bangladesh, India, Indonesia, Madagascar, Maldives Sri Lanka and Tanzania .
- Sponsors: POGO, ITCOOcean / INCOIS.
- 28 Participants from 7 countries.



IOGOOS TRAININGS/ MEETING PARTICIPATION

□ Fishery Oceanography for the Ocean Decade (F.O.O.D.)

- January 18 – February 07, 2024.
- Member countries: Bangladesh, Indonesia, Kenya, Madagascar and Sri Lanka.
- Other Countries: Oman, Philippines.
- Sponsors: ITEC and ITCOOcean /INCOIS
- 11 Participants from 07 countries



IOGOOS TRAININGS/ MEETING PARTICIPATION

- ❑ **Ocean Color Remote Sensing - Data, Processing and Analysis**
 - December 04-08, 2023.
 - Member countries: Bangladesh, Indonesia, Kenya and Sri Lanka.
 - Sponsors: OTGA and ITCOOcean / INCOIS .
 - 21 Participants from 4 countries.



IOGOOS TRAININGS / MEETING PARTICIPATION

- ❑ **Coastal Vulnerability Mapping and analysis using QGIS**
 - November 20-24, 2023.
 - Member countries: Bangladesh, India, Indonesia, Kenya and Sri Lanka.
 - Sponsors: OTGA and ITCOOcean
 - 24 Participants from 5 countries



IOGOOS TRAININGS/ MEETING PARTICIPATION

Machine Learning based Species Distribution Modelling

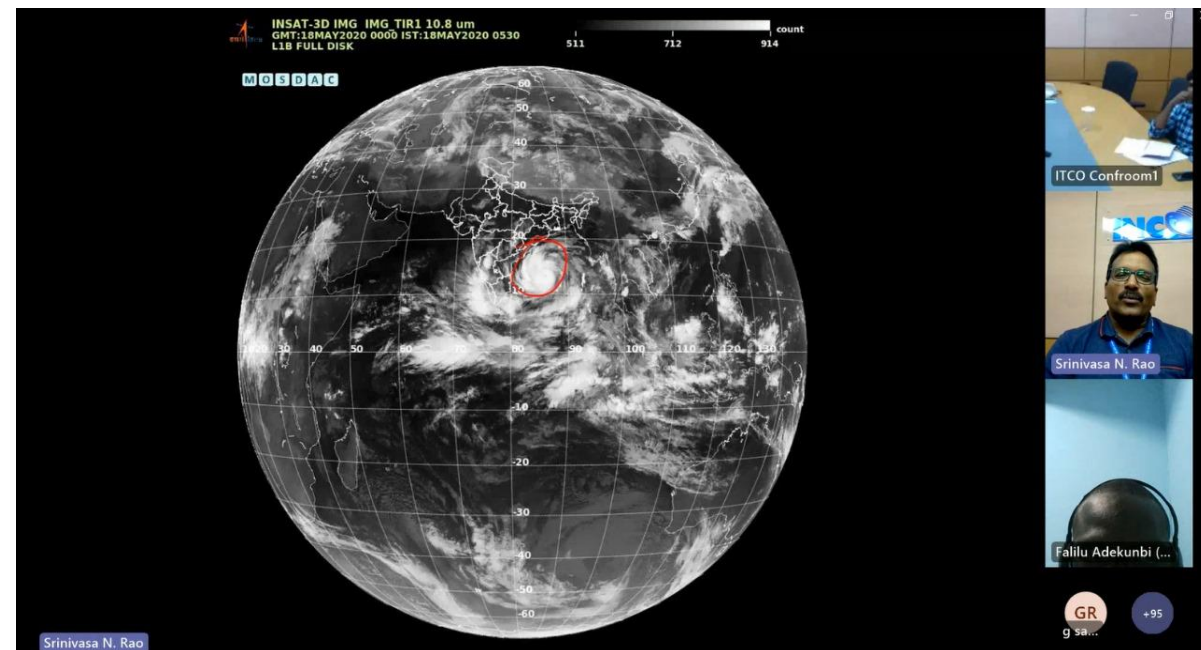
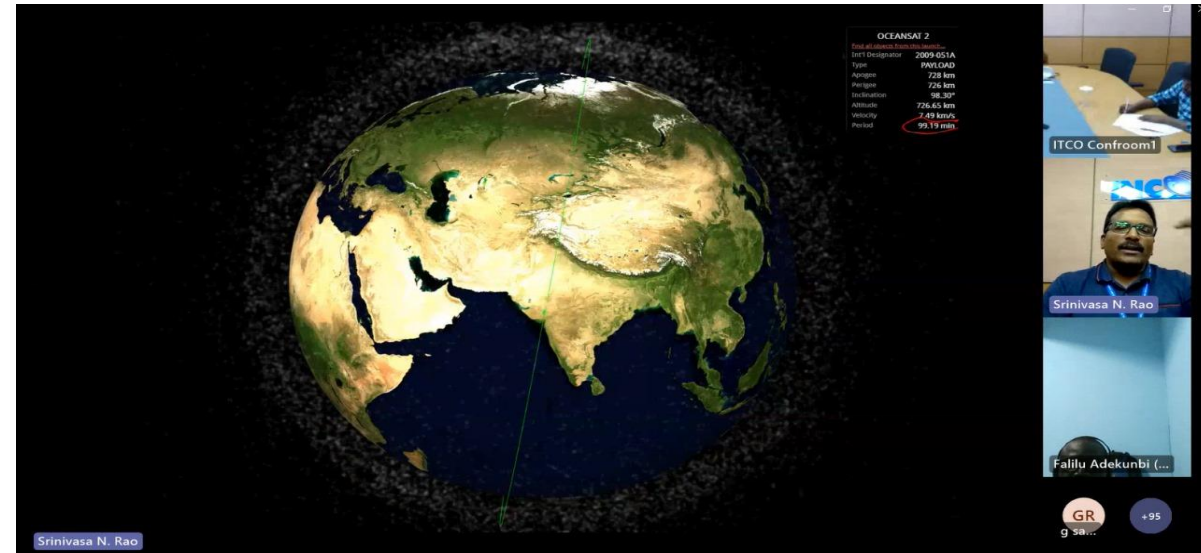
- September 11-22, 2023.
- Member countries:
Bangladesh, Indonesia, Kenya
and Sri Lanka
- Sponsors: ITCOOcean /
INCOIS.
- 21 Participants from 4
countries.



IOGOOS TRAININGS / MEETING PARTICIPATION

□ Oceanographic Remote Sensing: Bridging the Gap between Fundamentals and Applications

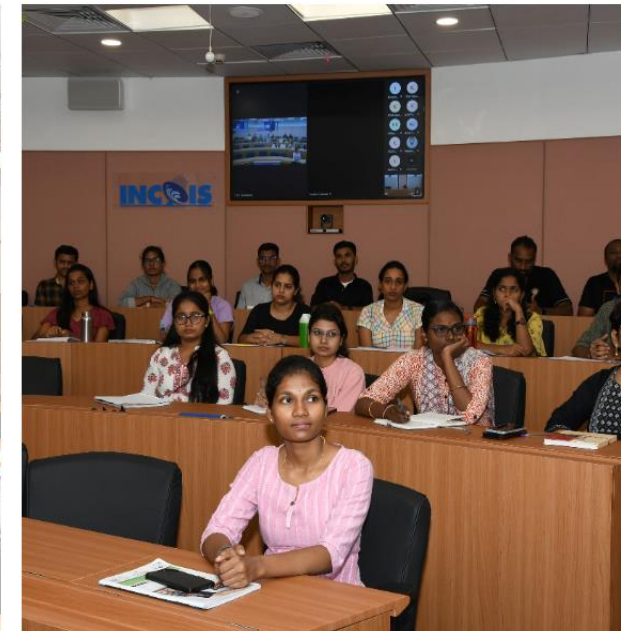
- 07-11 August, 2023(Virtual).
- Member countries: Bangladesh, India, Kenya, Malaysia, Mauritius, Mozambique, South Africa and Sri Lanka.
- Other Countries : Benin, Comoros, Ghana, Nigeria, Vietnam+ 7 countries.
- Sponsors: ITCOOcean / INCOIS.
- 246 Participants from 20 countries



IOGOOS TRAININGS / MEETING PARTICIPATION

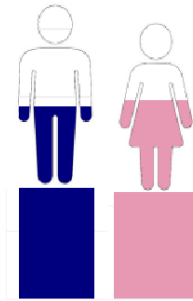
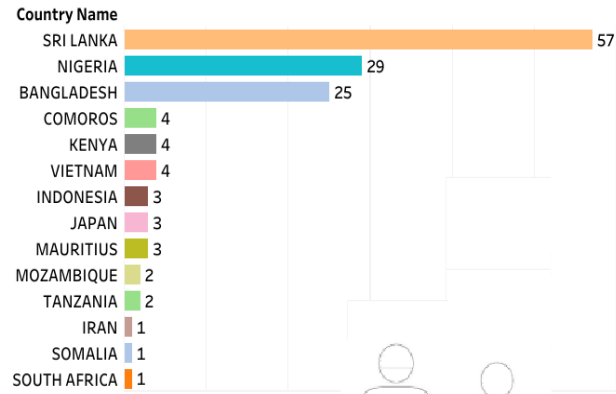
□ Visualization of Marine Met data (using FERRET)

- 24-28 July , 2023(Virtual).
- Member countries: Bangladesh, India, Kenya, Mozambique, Sri Lanka, Tanzania and USA.
- Other Countries : Ghana, Nigeria, UAE + 10 countries.
- Sponsors: ITCOOcean / INCOIS.
- 196 Participants from 20 countries

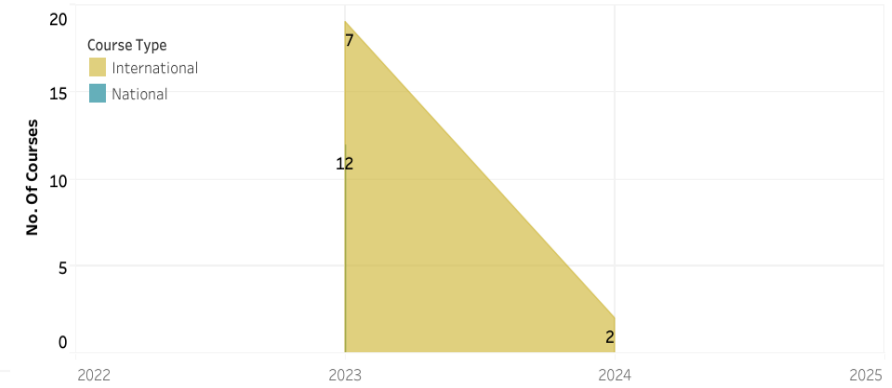
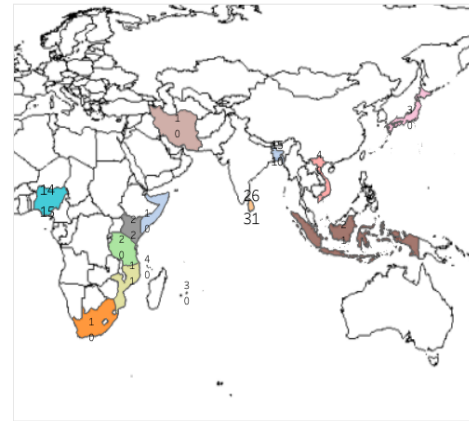


ANALYTICS

Member state Country	No. of participants
Bangladesh	44
India	639
Indonesia	3
Iran	1
Kenya	7
Madagascar	2
Maldives	4
Mauritius	4
Mozambique	3
South Africa	2
Srilanka	65
Tanzania	5
USA	3
Other countries	25



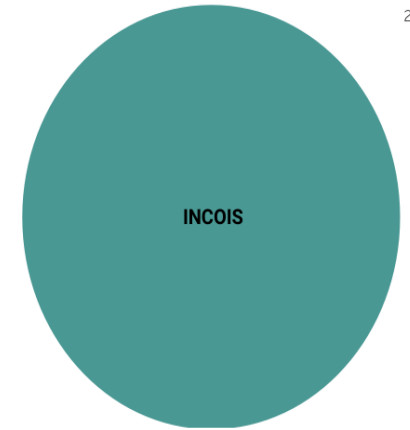
ITCOO Training User Demographic



Name of the Fund
INCOIS

Funding Agencies

Filter By Year
2023 to 2024



Course Tags





2021
2030 United Nations Decade
of Ocean Science
for Sustainable Development

UN OCEAN DECADE



IOGOOS IN UN OCEAN DECADE

- Collaborate with Decade Collaborative Centre for the Indian Ocean Region (DCC-IOR) – cohost the events and collaborative opportunities with Member institutes
- Collaborate with OceanPredict DCC to cater to the needs of MOFPS project
- Co-hosted the INDIAN OCEAN REGIONAL DECADE CONFERENCE 2024 - Bridging billions to Barcelona (An Official Prelude to the 2024 Ocean Decade Conference in Barcelona) during February 1-3, 2024
 - Indian Ocean Region Session during IOCON24
- IOGOOS Participation in GOOS Regional Forum side event at Barcelona Ocean Decade Conference in April 2024.



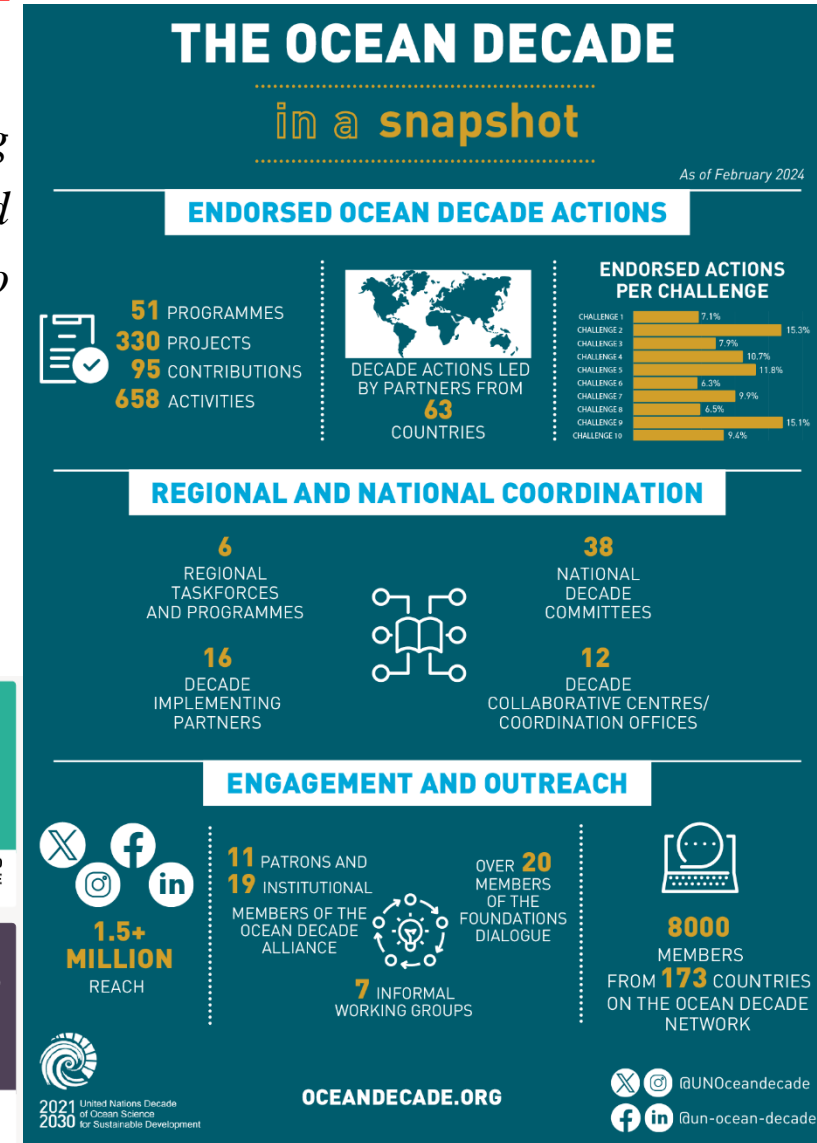
OCEAN LITERACY PROGRAMS

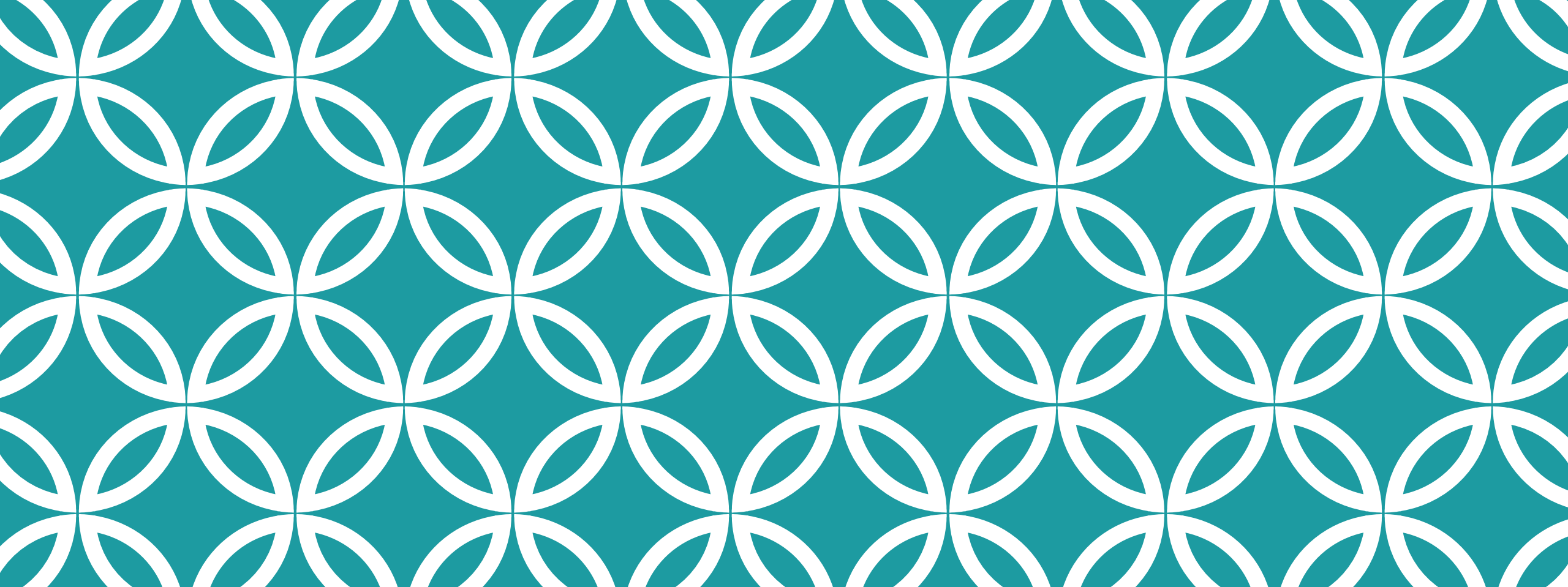
IOGOOS Secretariat in partnership with INCOIS and DCC-IOR conducted several Ocean awareness campaigns during last one year

- ❑ 05 Mega Awareness Campaigns in 05 coastal states with 2300 fishermen,
- ❑ User Interaction Workshops at 237 coastal villages (in partnership with partners) with more than 9000 fishermen in 10 coastal states
- ❑ Swachh Sagar Surakshit Sagar in 37 Beaches from 12 coastal districts in Andhra Pradesh with 6470 participants with more than 10 tonnes of garbage,
- ❑ UIW with 70 fishermen leaders from Andhra Pradesh
- ❑ Facilitated visits to 6561 students from 70 school / college visits,
- ❑ Lectures at 07 schools / colleges by INCOIS Scientists
- ❑ Visit of 91 students from 12 colleges/universities/institutes in Chennai to ORV Sagar Nidhi
- ❑ 245 students from 28 schools across 09 districts of Telangana participated in Drawing/Painting, Extempore and Science Exhibition/model making competitions on two occasions (on the eve of World Tsunami Awareness Day and INCOIS Foundation Day)
- ❑ 03 Open days on multiple occasions with participation of more than 1050 general public visitors (other than students from schools/colleges)

2024 OCEAN DECADE CONFERENCE

- Side-events for the IOR representation
- **DCC-IOR led on-site event** dedicated to the Indian Ocean region: **FL-IND – Chair, IOGOOS**
- **DCC-IOR partnered off-site event** led by IOCINDIO titled: *‘Enhancing coastal resilience in the Indian Ocean: Key contributions of ocean and climate sciences to institutional capacity development as a vital solution to coastal vulnerability and climate change’*.
- **Eleventh GOOS Regional Alliance Forum (GRF-XI)**





FUTURE PLANS



FUTURE PLANS

- ❑ **Empowering the Next Wave of Indian Ocean Prediction: IOPredict-2024**
 - December 9-13, 2024
 - Sponsorship from IOC-UNESCO Budget with more focus on participants from GOOS Africa regions
- ❑ **Integrated annual meetings of IOGOOS and its allied projects and programs (IIOE-2/ IRF/IORP/ SIBER, etc.)**
 - April / May 2025
 - Government of Mauritius has kindly agreed to host
- ❑ **International Indian Ocean Science Conference (IIOSC)-2025**
 - Last Quarter of 2025
- ❑ **Ocean Literacy Programs under UN Ocean Decade framework in partnership with DCC-IOR and INCOIS**



THANK YOU

<https://incois.gov.in/iogoos/home.jsp>

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