





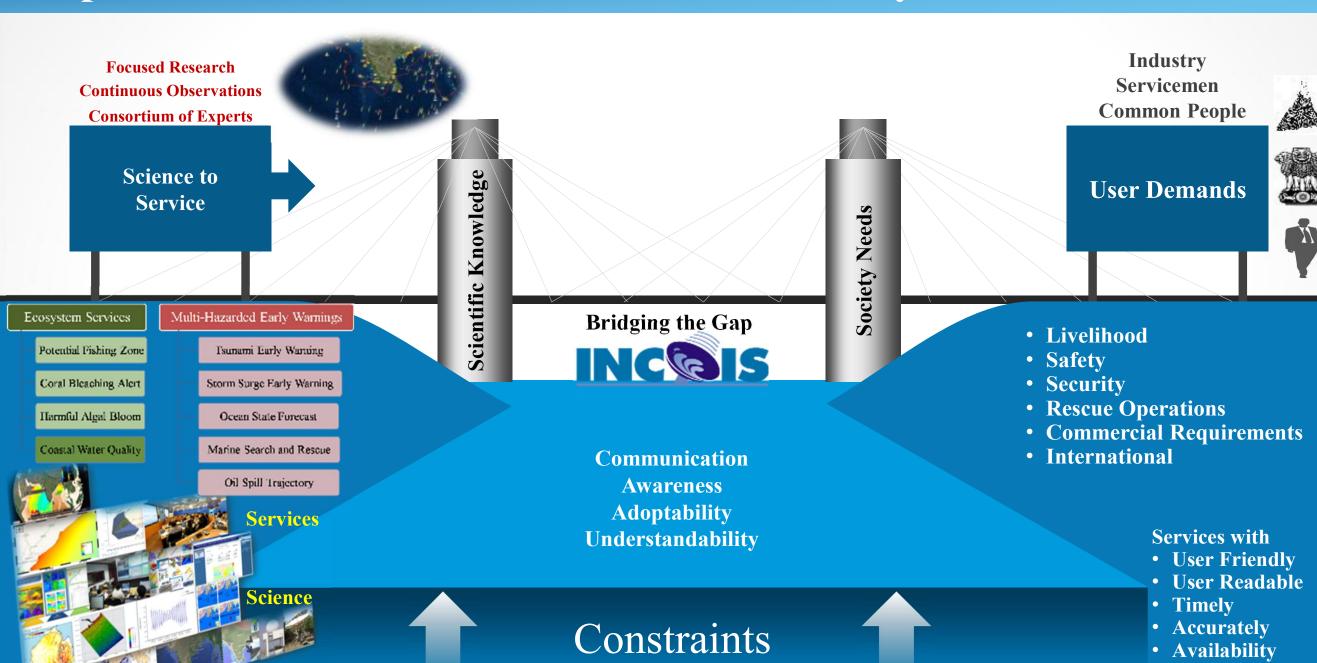
MARINE FISHERY ADVISORY SERVICES

Nimit Kumar Indian National Centre for Ocean Information Services (INCOIS-MoES)

Ocean Observation System and Ocean Data Utilization, 20 June 2024

Operational Ocean Services: Science to Society

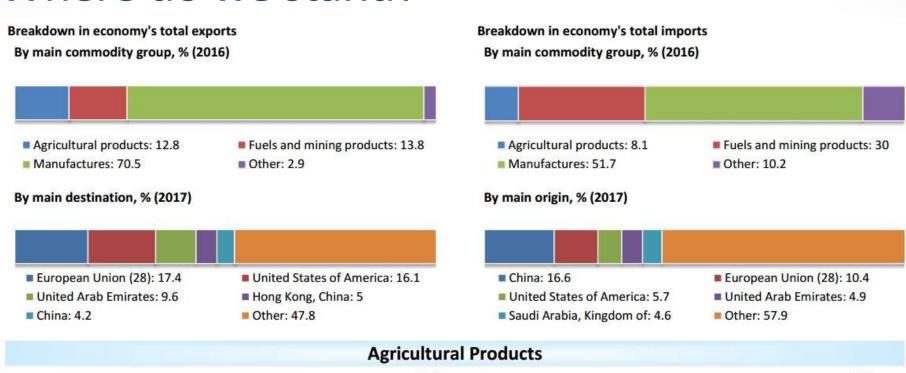
Observations



What is being traded?

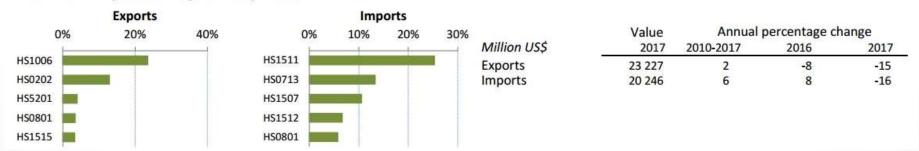


Where do we stand?

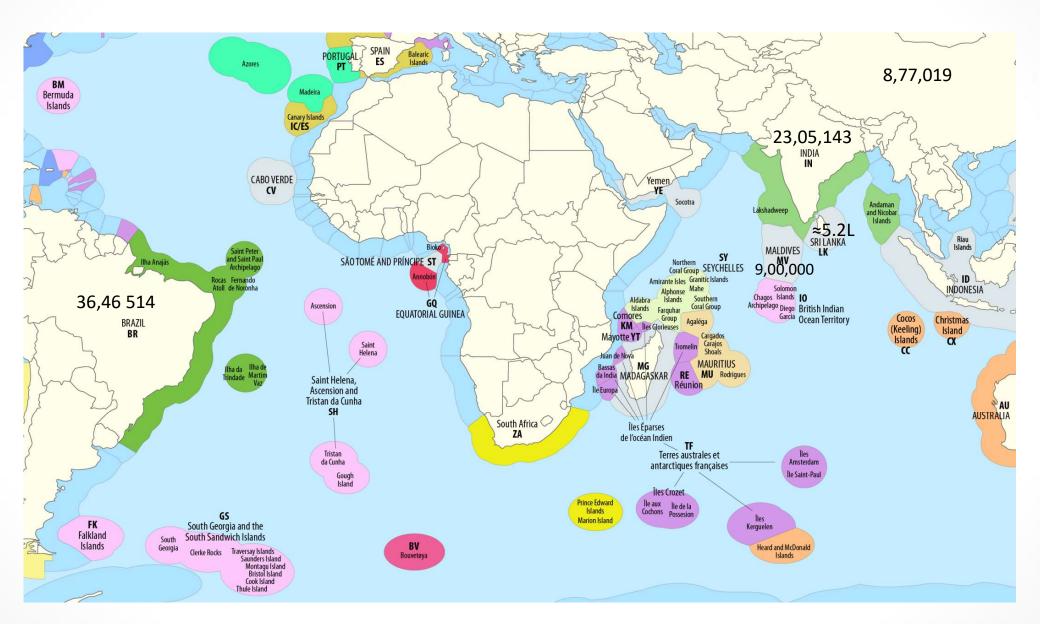


| Тор ехро | orted products (Million US\$) | Value 2017 | Top impo | orted products (Million US\$) | Value 2017 |
|----------|-------------------------------------|---------------|----------|------------------------------------|---------------|
| HS1006 | Rice | 5 461 | HS1511 | Palm oil and its fractions | 5 122 |
| HS0202 | Meat of bovine animals, frozen | 2 994 | HS0713 | Dried leguminous vegetables | 2 696 |
| HS5201 | Cotton, not carded or combed | 923 | HS1507 | Soya-bean oil and its fractions | 2 135 |
| HS0801 | Coconuts, Brazil nuts, cashew nuts | 800 | HS1512 | Sunflower-seed, or cotton oil | 1 344 |
| HS1515 | Other fixed vegetable fats and oils | 767 | HS0801 | Coconuts, Brazil nuts, cashew nuts | 1 156 |

Share in economy's trade in agricultural products

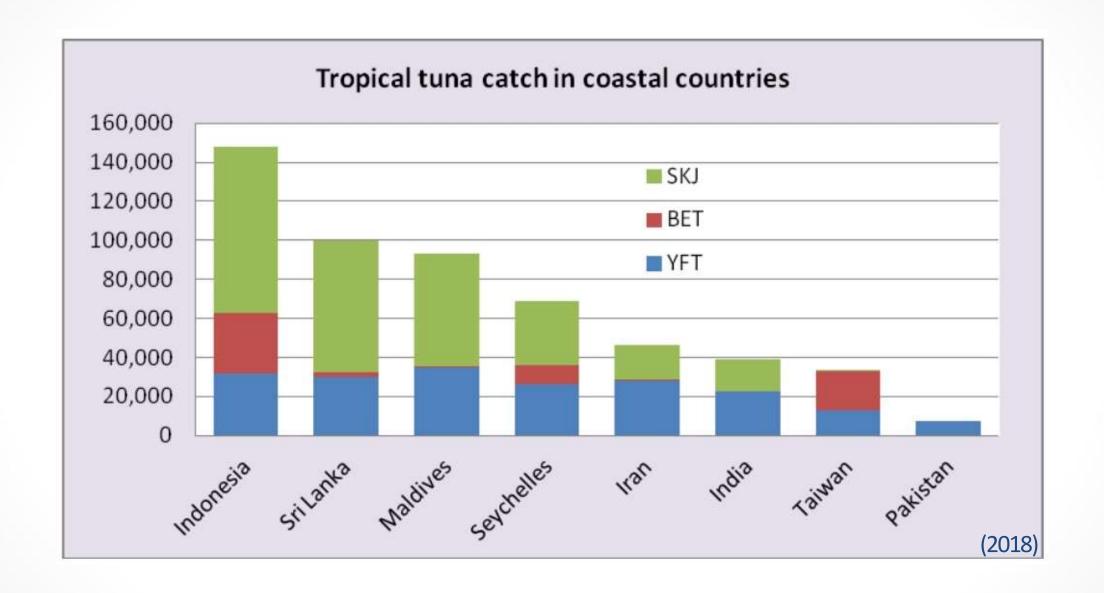


Where do we stand?



India ranks 18th in total EEZ and 14th in Shelf (4,02,996 km²) EEZ area

Where do we stand?





Fishing Heritage - Fishermen

Bird Congregation

Colour

Bubbles breaking on Surface

Muddy and oily water and calm Sea

Reflection in the Night

Kaladu (a kind of smell)

Fish

Availability

Type

Quantity



What is challenging?

- ☐ Locating and catching fish is challenging as fish stocks dwindle and move further offshore
- ☐ Increases the searching time for shoals, fuel cost and human effort in fishing operations
- Increase of atmospheric Carbon Dioxide with the burning of fossil fuels
- ☐ A reliable and timely forecast on the potential zones of fish aggregation, which help to reduce the time and effort spent in searching the fishing grounds



Potential of Remote Sensing

- RS for Marine applications started in 1960 with the first picture of the Earth by astronauts
- ☐ Marine Applications of Satellite Remote Sensing have been developed recently due to
 - ☐ Use of new sensors with improved spatial and radiometric resolution
 - ☐ Easier data access
 - ☐ Ability to process and disseminate vast amount of data with the present computational facilities
 - ☐ Increasing awareness of the advantages of RS



Food Chain

Potential Fishing Zone

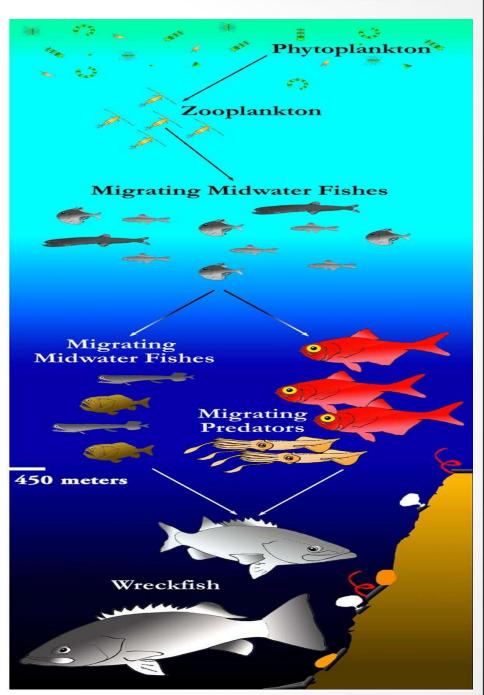
Primary producers



Primary consumers

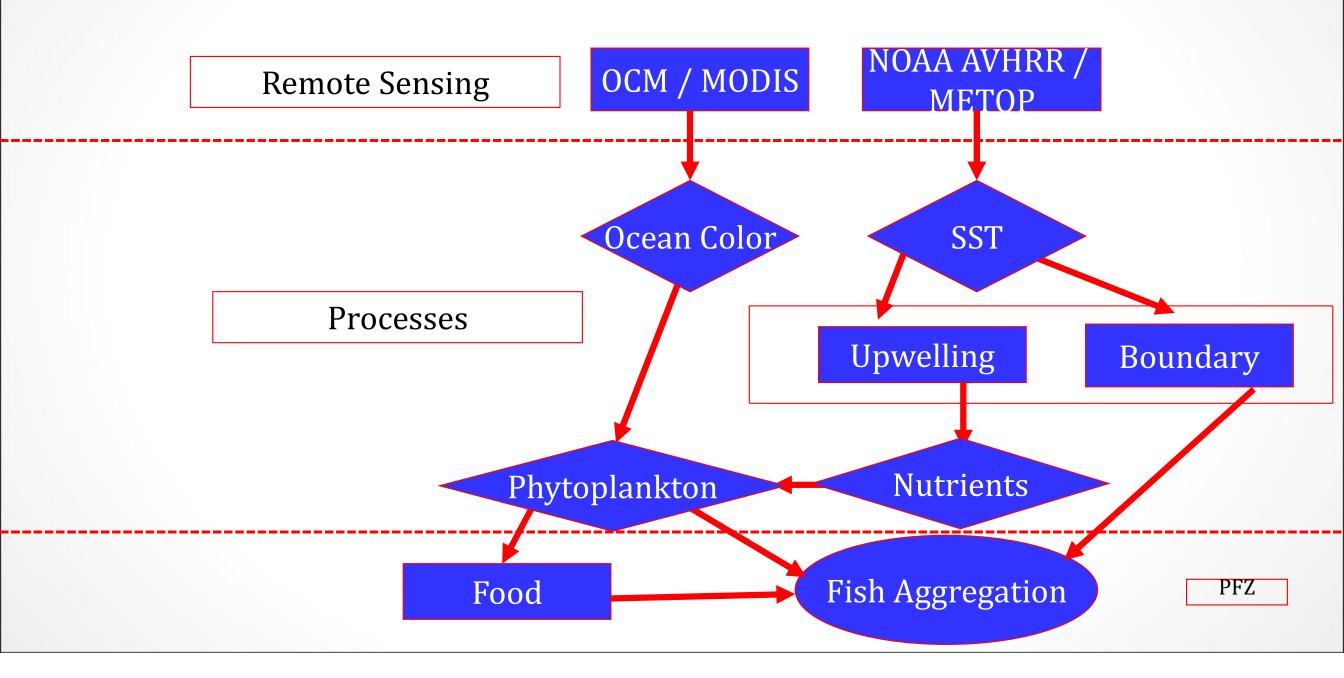
Secondary consumers

Phytoplankton is an index of Primary productivity



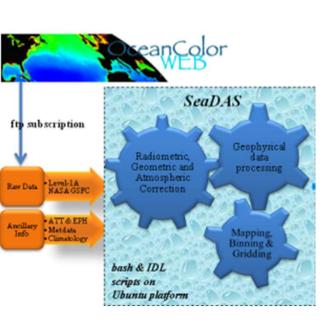


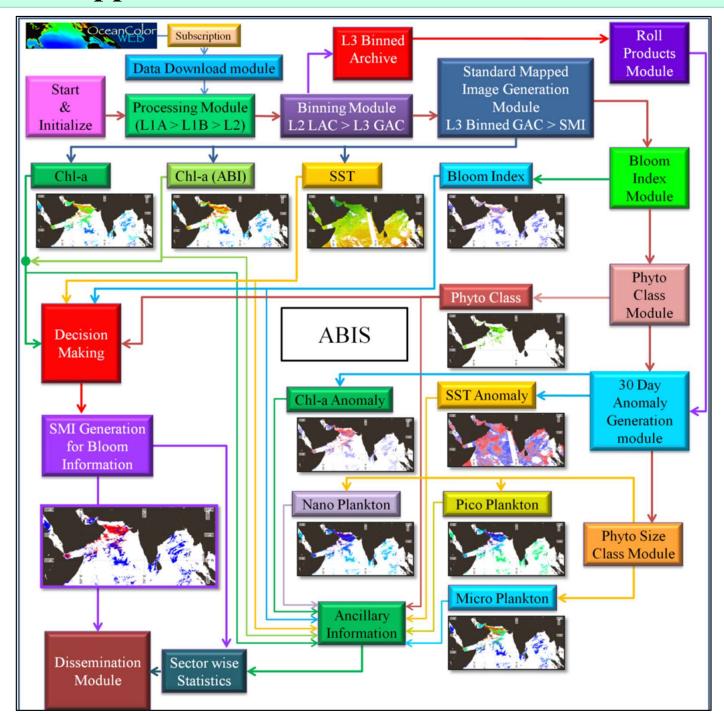
Fish Finding -The Remote Sensing Approach



Satellite Products for Operational Applications



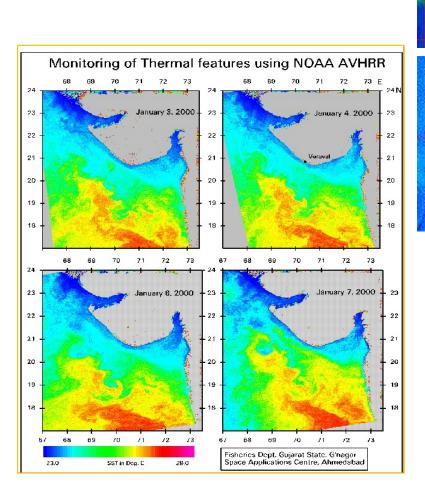


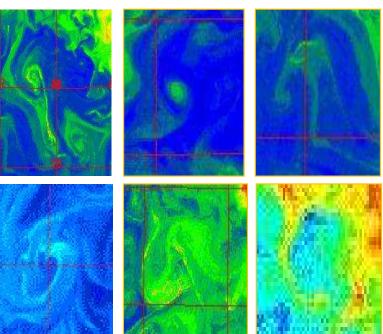




Identification Keys

- Oceanic Fronts
- Meandering Patterns
- Eddies
- Rings
- Mushroom shaped features
- Tongue shaped features
- Coastal Upwelling
- Shelf Break fronts
- Plume fronts
- Diverging fronts
- Converging fronts







MARINE FISHERY ADVISORY SERVICES

Inputs & Processing

INCOIS Ground Station

- Chlorophyll, TSM (Oceansat-2)
- •SST

(NOAA-18/19, MetOp-A/B)

INCOIS-ChloroGIN Chlorophyll, Kd490 [Daily & 3d roll] (MODIS-Aqua) JPL-PO.DAAC •SST (OSTIA GHRSST) modeling Remotely-Sensed Data -IVVVIII-Interpretation ENVI, ArcMap, **ERDAS** Imagine

Products

PFZ Text

- Landing Center (LC)
- Direction (with angle)
- Distance from LC
- Bathymetry
- Position (Lat/Long)

PFZ Maps

INCOIS-PFZ Lab

- Potential Fishing Zones
- Bathymetry
- Landing Centers
- Coastal Districts
- EEZ boundaries
- Fishing-Restriction Zones

INCOIS-OSF Lab

- Wind/Current Vectors
- •MLD, D20
- ·High Wind-wave

| | | Nileswa | uniya Kavvayi | ઉપગ્રફશી મળ | સુધના <u>ક</u> ્રન્ ાતી માફિત | सार 18 फरवरी 2014 लक ी भुष्ठज 18 ईजुआ री 2014 | મત્સ્ય મ કા ર ના સુધી મત્સ્ય ભંડ | ડપત્તથ્યતા રની ઉપલ | હ્ ધતા | |
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Information Dissemination

Direct

- ✓ Fax
- ✓ Phone.
- ✓ Email
- ✓ Web-GIS

Mass-comm.



- ✓ Web-text
- ✓ EDBs
- **✓**DEAL
- ✓ University projects
- ✓SMS/Mobile-Apps
- **✓** NGOs
- ✓IVRS/Helpline
- ✓ Community Radio
- ✓TV/Radio
- ✓ Newspapers





Marathi

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ICT to reach End Users - Dissemination Modes

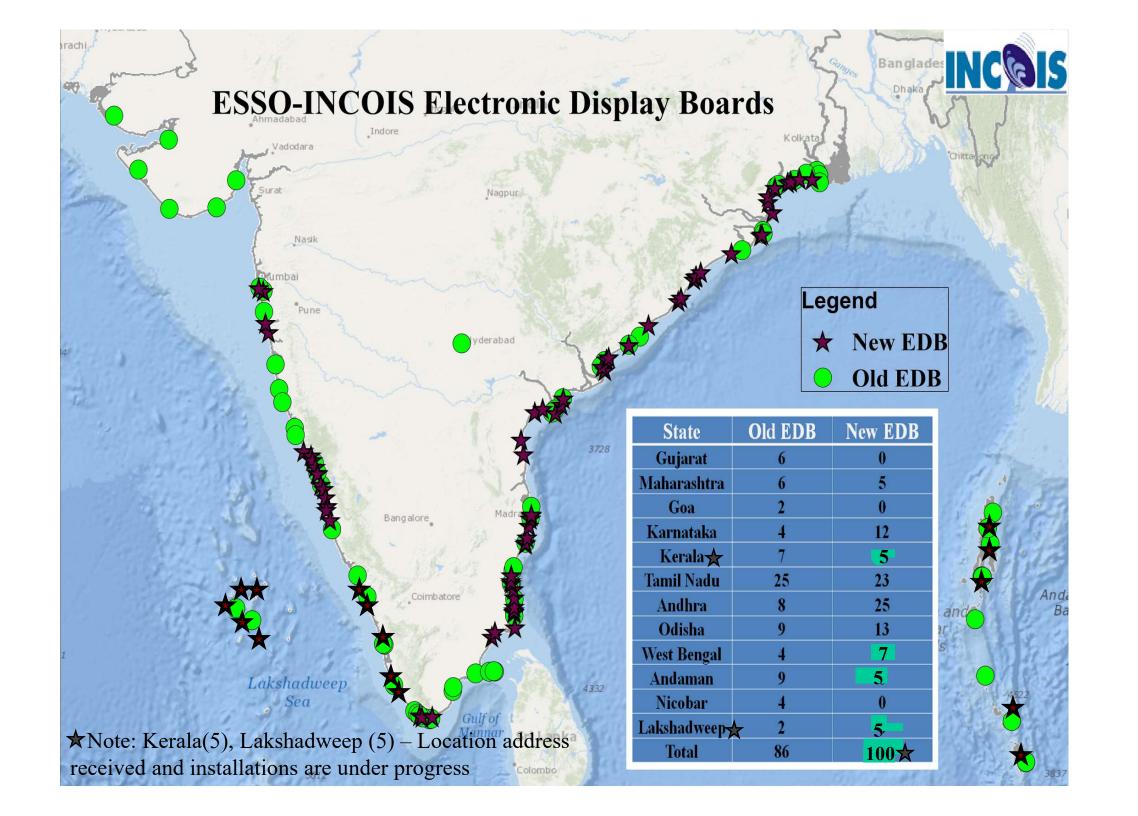




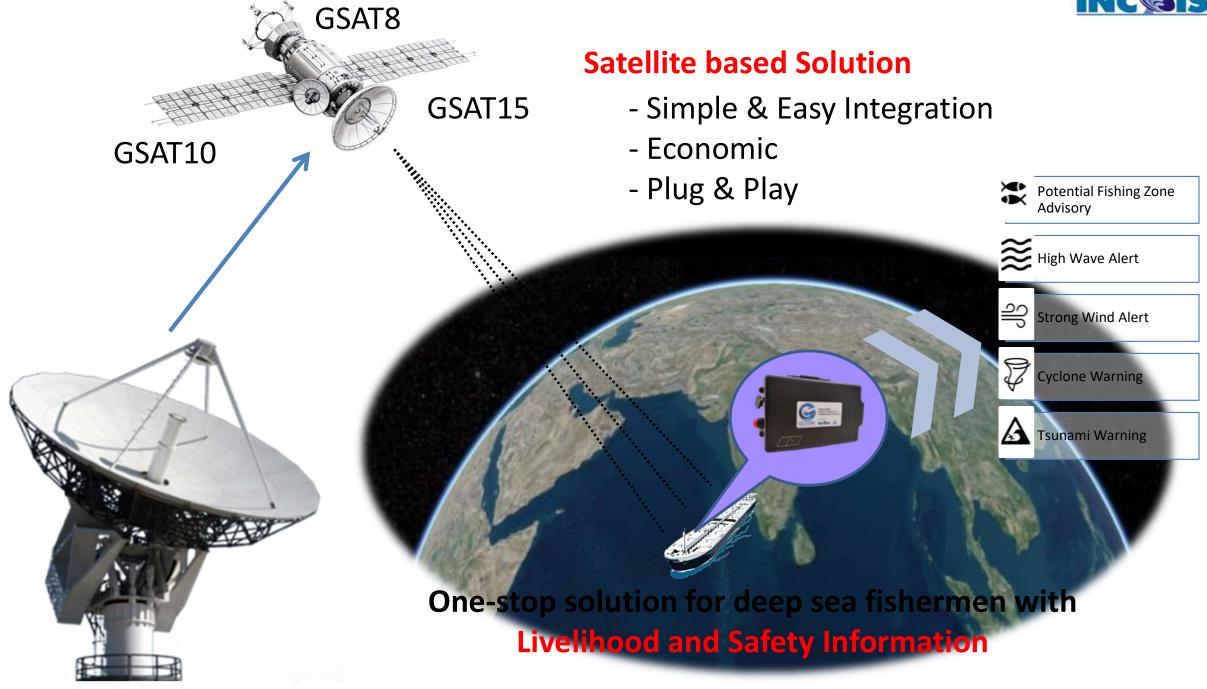
Serving 600,000+ of Registered Fishermen











'जेमिनी' वाचवणार मच्छीमारांचे प्राण

मुंबई : चायबस्यी माहिती, लाटांची अंची आणि हयामानाचा जंदात इत्यादीची माहिती देशारे ''मेथिमी' तंत्र हे क्लेकी बांधवांबाठी उपवृक्त आहे. या लंबाहानामुळे मध्यीमाताचे डोगारे आधिक नुकरतन आणि जीविकाहाची सांचन्यास मदत होगात आहे. जीपनी जंज हे पहाराष्ट्रातील ४. इजार बोटींबर बसबिएबात आले आहे. उर्वरित रू प्रभार नृष्णीनारांनी याचा याचा करावा प्रमूत राज्यभरात कार्यक्रम हाती चेण्यात येत आहेत.

केंग्रीय समुद्री मालयकी acceptant. nivern (सीएमएकजाजाय), जाकीय राष्ट्रीय महासागर सूचना संधा केंद्र (इक्टीइस) आणि औ.एम. फेरक कठिनेज आफ अराज्य (तका, राषण्ड) प्रांच्या संपृक्त विकासने 'सामग्री हपासल अंदाज' आणि 'गणन जेपिनी' या लंबलानावर वसीया वेचील शेरफरफआरअस्थरक कार्यालयात भाष्य करण्यात आले. या चेत्री इक्ष्मंद्रास्ये शास्त्रज्ञ हो निवित क्रमार यांनी 'जेतिनी' तंत्राचाचत enfinit Rock

जी. एम. वेटक कॉलेज ऑस



'अभिनी'ची माहिती वेताना डावीकपून डॉ. अनुलक्ष्मी खेल्लपन, डॉ. निष्ठित कुमार,

🚁 नेविनी हे को आरोब किएण कारीवार बांध्यपांताठी तथार करण्यात आले आहे. ्राप्ता वा कावा लंडकानाचा वाचर वस्त्र यह त्यातील वाच समस्या आहेत. वायर लगा दिने पाहिले. फेल्या पाच वर्षात ३२ तक्के च्यारिकारके भरबी समुद्र आणि उर्वाद विवास प्रजनसम्बद्धाः स्टब्ल्यम्

- कृष्णानंत होमानीकर, प्रव्यक्षमध्यानक, मुंबई प्रावेशिक हवामान ताम विचाप

मापनाचे प्राच्याचे विजय संदेदे, केंद्रीय अंचातून कोंग्री चांचवांच्या स्पार्ट मन्त्री भारपकी अनुसंधान मोक्स्ट्रान्य मन्द्रातीन हानधालीयो शंख्याच्या संपर्धतंत्रका हाँ, अवस्था धेस्तावन, मुंबई, बसई-पालबर आणि रावण्ड वेदील मध्योमत बांधव, मत्रकव्यवसाय विभाग, महाराष्ट्र बंदर विभाग, नेजी विभाग, अब बांगीच्या केवियकस्ये कुरोडी तराक्षक राज पांची पा पंजी उपस्थिती पीर्वायमा.

गगन बंदेसगहरकारे लेकिनी

माहिती सहज उपलब्ध होईल. जेविकी हे भोवाइसच्या बनु दूखड्डी वर्नेवर होक अवले, मोधाइलमध्ये जेमिनी र्जप बाउनातीब करून च्याचे, छोटेने धारणता पेण्यासाराखे इताचे आहे. सहा तास जार्जिंग फेल्याका ते लीव चक्रीवावळाची चेतावणी

तवामान आणि तमुदावे क्षेत्रीय बलेटिन, उम्लवस्थियांच प्रक्रीपारकामाठी ४-स्ट्रेप प्रेतमानी प्रणानी, पोर्ट केनावणी विश्वत. मचीमातना विलेल्क इलाऱ्यामध्ये काय असते आणि चळीवाठकावी वेतायणी क्यों विजी जाते, या पुदर्शाची पाहिती मध्यीमारांसाडी सामते सेवा व्य विश्ववाच्या सारतीकरणातुत मुंबई प्रावेशिक हथामान विश्ववाद्या संवातिका सुभागी पुते वांनी विज्ञी

संशोधन प्रणाली

मध्याच्या सामरी इवामानाचा विचार चरावचा झामा तर समूरात विविध प्रकारस्या जावती येत माहेत. त्यापुत्री प्रकाशार समुद्रात पार्तमारी करण्यासाठी गेन्यावर त्यांना योग्य ती सामरी हवान्यनाची पादिनी त्यांच्या मोबाइमार फिळाली तर त्यांचा और व त्यांची साधनभागतीती वाच् राकते. त्यामुळे मध्यीमारांना ४६४इम (हॅटराबाव) वांनी विकासित केलेज्या मांतीकन प्रमानीचा प्रथ्योप व्हाचा, हा

रेण्यात यंत्रार आहे, आहे निवित कामा कांगी साणिकारे.

минициприция вистеми आयक एम.डी. वादेगावकर मामाने alt, our fearest uses the finit मार्गभारी कल नये, प्रांत त्याच बादलाचा परिणाम इतर ठिकाणी बायर करावा मृत्यून राज्यनशत जाणवत नाही. लिये संजीमारांनी दिवसांपर्यंत चाल् १७कते. सब्दा मानेमारी काकला पाहिते. एण या घेण्यासध्ये उत्प्रक केने जाईल.

याच्यीमारांना टेनिटंगमाठी योषात येळी होते आमे वर्ग, पाठळ करेंही गेवी, अस्त्राने मध्यतिकार वांग्यव मार्थामती मार वासन बसारात. त्यापारे सव्योगारांना आस्तिक नकसान सहन करावे लागते. जिम्मि तंत्र हे महाराष्ट्रातील x हजार बोटीका बार्विण्यात आले आहे. उपेरित १० अजार भगारिकारांनी पाचा कार्यक्रम आयोजित क्रमन तंत्र

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सॅटेलाइटद्वारे मोबाइलवर समुद्रातील हालचालीची

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मच्छिमार बांधवांसाठी गगन जेमीनी तंत्र आशेचे किरण : उपसंचालक डॉ. कृष्णानंद होसाळीक

ळि/प्.गो.मळे ासेवा केंद्र (इन्कॉईस) ान मंत्रालय भारत सरकार ाद यांच्या संयुक्त विद्यमाने हवामान संभाव्य मासेमारी भाणि गगन जेमीनी या विषयावर कार्यशाळेचे तन मुंबई वसोवा येथे त आले होते.

कोळी बांधवांसाठी आशेचा किरण ती.एम.बेंदक विज्ञान ठरू शकतो. गेली पाच वर्षात ह्यालय तळा रायगड आणि अरबी समुद्रात आणि बंगालच्या बादळांची बादझालेली आहे. व्यक्त केले. अशा बेळी गगन जेमीनीच्या

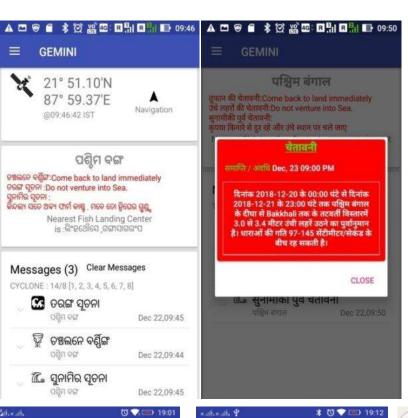
आज गगन जेमीनी या नवीन, तंत्रज्ञानाचा फायदा मच्छिमार बांधवांनी घ्यावा असे विचार ीय राष्ट्रीय महासागर उपसागरामध्ये ३२ टक्के चक्री प्राचार्य डॉ.विजय सरोदे यांनी

> इन्कॉईस हैदराबादचे शास्त्रज्ञ माध्यमात्न सागरामधील डॉ.निमीत कुमार यांनी बोलताना हवामानाचा अंदाज मिळ शकतो सांगितले की, मच्छिमार त्या अनुषंगाने मच्छिमारी करणे बाधवांसाठी गगन जेमीनी हे नवीन सुलभ होईल. जी. एम. बेटक तंत्रज्ञान विकसित करण्यात आले विज्ञान महाविद्यालयाचे प्राध्यापक आहे या तंत्रज्ञानातून कोळी डॉ.बी.जी.भवरे यांनी खप परिश्रम बांधवांच्या स्मार्ट मोनार्टकतर





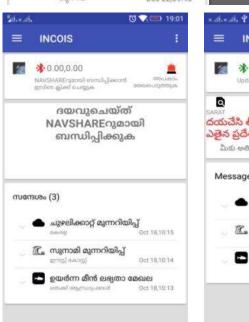




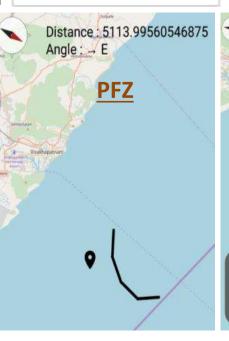


GEMINI Mobile App

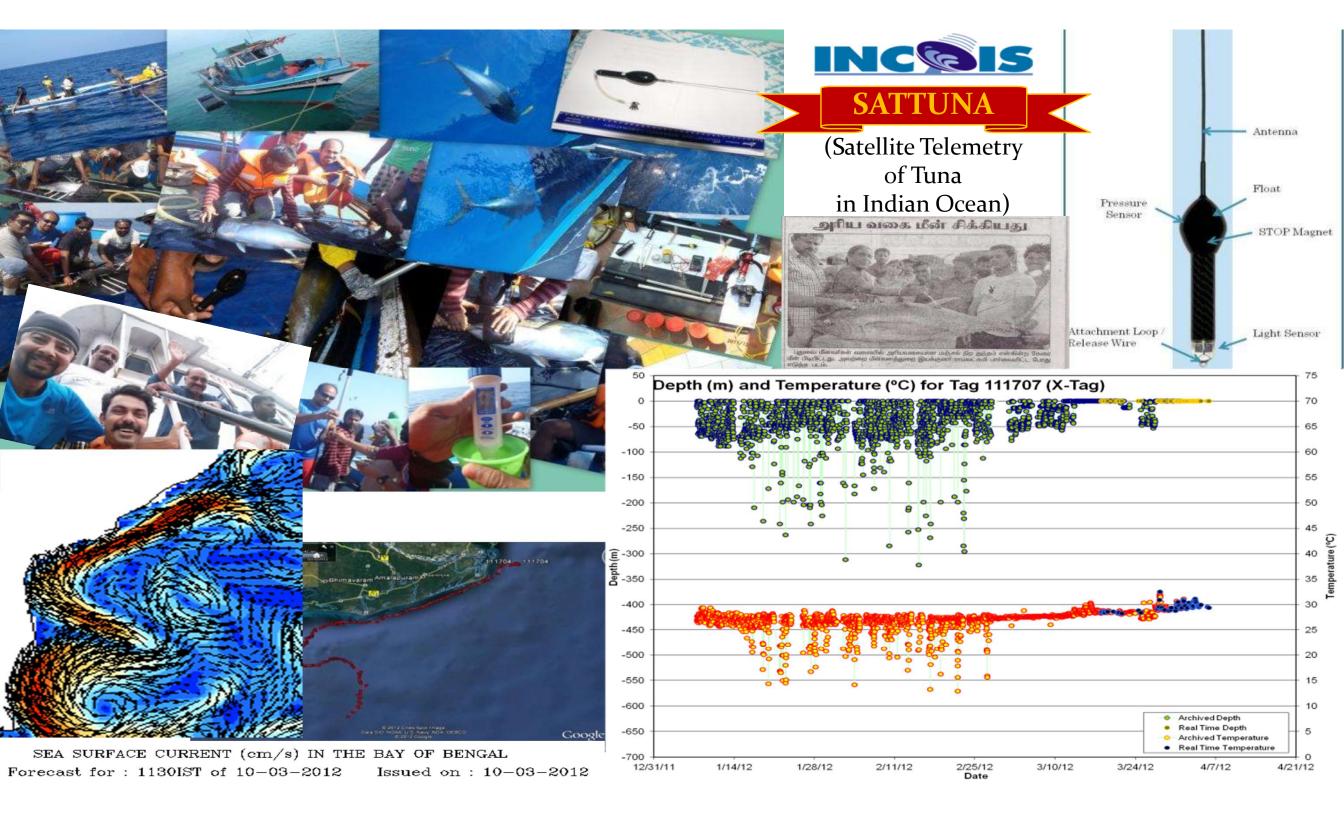




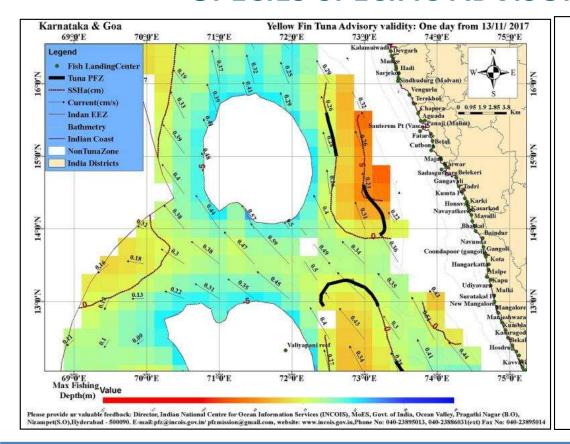








SPECIES SPECIFIC ADVISORIES FOR TUNA



Data updated on: 13-11-2017 17:07:20

Tuna Fishing Zone

KARNATAKA कर्नाटक KARNATAKA

SATELLITE DATA SHOWS LIKELY AVAILABILITY OF FISH STOCK TILL 14 NOV 2017 उपग्रह से प्राप्त सुचना अनुसार 14 नवम्बर 2017 तक मत्स्य अंडार की उपलब्धता SATELLITE DATA SHOWS LIKELY AVAILABILITY OF FISH STOCK TILL 14 NOV 2017

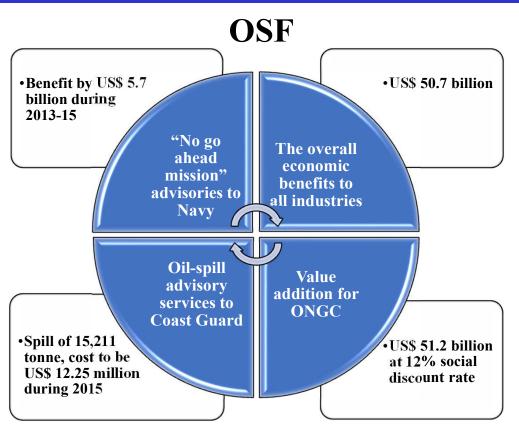
| From the coast of | Direction | Bearing (deg) | Distance (km) From-To From-To | Depth (mtr) From-To From-To | Latitude (dms) | Longitude (dms) |
|-------------------------------------------------------------------------------|-----------|------------------|-------------------------------------|-----------------------------------|-------------------|--------------------|
| Kapu कापु काद्र) | NW | 272 | 217-222 | 2228-2233 | 13 17 30 N | 72 42 29 E |
| Surata <mark>k</mark> al Pt सुरतकळपॉइंट केंप्र डर्स्स्ट क ळी०थ्र | NW | 277 | 193-198 | 1891-1896 | 13 11 53 N | 73 0 0 E |
| Mulki मुल्की ಮುಲ್ಲಿ | NW | 275 | 205-210 | 1860-1865 | 13 15 0 N | 72 52 49 E |
| Karki करकी डंडेन | w | 270 | 135-140 | 614-619 | 14 18 48 N | 73 9 48 E |
| Udiyavara उदियानारा ಕುದಿಯವರ | sw | 269 | 237-242 | 311-316 | 13 14 32 N | 72 30 27 E |
| New Mangalore न्यू मेंगजोर ನ್ಯೂ ಮಂಗಲೋರೆ | NW | 276 | 185-190 | 1903-1908 | 13 5 55 N | 73 5 55 E |
| Navayatkere नाव्यात केरी संबंधार्य है वे | sw | 269 | 130-135 | 323-328 | 14 10 31 N | 73 14 53 E |
| Bhatkal भटकळ चथुर्ज | NW | 272 | 134-139 | 309-314 | 14 0 45 N | 73 16 30 E |

Tuna Fishery Advisory Maps with information on

| Tuna Fishing Zones | Surface Currents | Bathymetry |
|-----------------------|------------------------|------------------------------|
| Indian EEZ | Indian Coastline | Coastal Districts |
| Restricted Zones | Major Fishing Villages | SSHa & Maximum Fishing Denth |

Economic & Environmental Benefits of Ocean Services





PFZ



National Agricultural Innovation Project (NAIP)

- •32 fishing boats in Raigad Dt., Maharashtra could save the diesel of 18492 gallons of diesel in a month
- •CO₂ cutting down by 330,000 lbs

Validation **Experiments**

- •Saving of diesel varied from 5.67 g to 341.7 g
- •Reduction of CO₂ emission from 3.45 t to 0.06t

National Council for Applied Economic Research

- •Savings in diesel consumption computed an annuity of US\$49.49 billion or
- •Present value of around US\$ 38.94 billions over the 25-year useful life

Central Marine Fisheries Research Institute (CMFRI)

- •At 15% adoption level, fishermen can save up to 237,754.8 of gallons of Diesel
- •Lesser Green House Gas (GHG) emission of approximately 2412 tonne

TEWS

The economic benefits of the Tsunami Early Warning Centre can be simply accessed by the list of under-sea earthquakes in the Indian Ocean Region for which a 'No Tsunami Threat' advisory issued by ITEWC, INCOIS avoids relocation and rehabilitation expenditure. Considering the expenditure incurred by Odisha government for evacuation and relocation of coastal population during Phailin, an expenditure of US\$ 4.75 billion would be required in the absence of "No Tsunami Threat" advisory."



Benefits

68.49 billion **Clear Demarcation of the**

Additional profit **Annual Economic** in hands of Benefit fishers US\$ 46.57 to

US\$ 4.1 billion annuity with investment of **US\$ 4.38** million

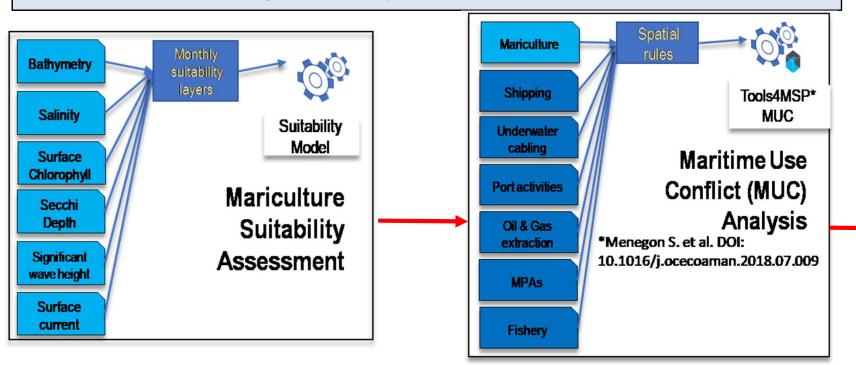
Reaching entire fishermen community

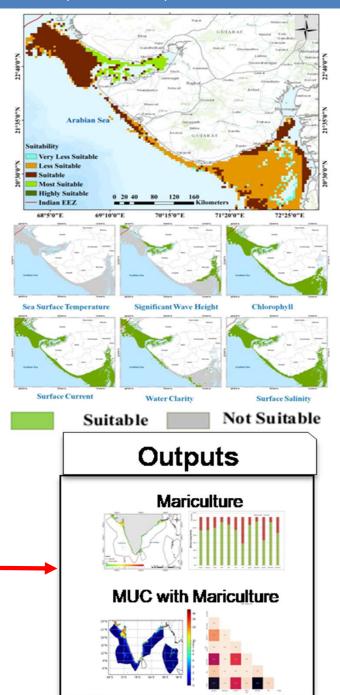
> Marine fisheries **GDP** increase from 3.9% -7.8 % per annum

Towards Mariculture Advisory Services (MAS)



- Suitability classes for Mariculture (Open Sea Cage Culture) were derived for each month and for across the Indian EEZ.
- The classes were determined considering bathymetry as base parameter (constraint) and while checking suitability of other oceanographic parameters (total 6).
- This provides combination of only two variables leading to least suitability. In ascending manner (two to six), maximum possible suitability of all the six parameters derives highest site suitability.
- Further, parameter-wise suitability is also included so that user can take decision if non-suitable parameter (e.g. SST here) is an important enough to influence site selection decision. Freedom for case-based choices.
- In order to aid Marine Spatial Planning (MSP), the maritime use conflict analysis is carried out, further refining the MSS maps.





Ground-level Impact

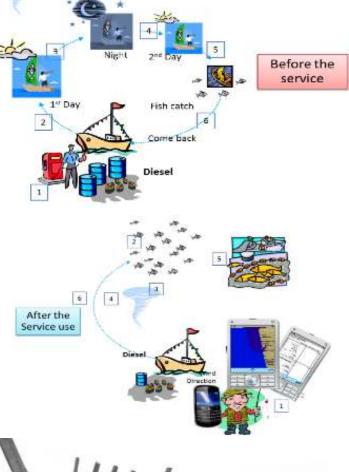


Preliminary study conducted in the Gilakaladinidi village in Krishna District, Andhra Pradesh on use of Potential Fishing Zone Advisories and Conversion from Bottom Trawling to Gillnetting

- Gilakaladindi Village has witnessed a rapid change in the fishing practices particularly since November 2011 after the initiation of MSSRF-INCOIS intervention
- Majority of the fishers, who hitherto have been practicing bottom trawling method of fishing, upgraded their fishing technique based on PFZ advisory and shifted to gillnetting so as to enable them to engage in pelagic fishing
- It is interesting to note that the conversion has happened in such a rapid manner that by July 2013, out of 65 boats owned by our 23 respondents 50 fishing vessels have already been converted (and are under use) and three boats have been newly constructed

* The woman respondent who was earlier a small fish trader has constructed a new boat with gillnetting during this year

| Year of Conversion | No of Respondents* |
|-----------------------|-----------------------|
| 2011 | 3 |
| 2012 | 18 |
| 2013 | 1 |
| Total | 22 |



Acknowledgements

INCOIS, UNDOS Colleagues Partner organizations, collaborators





Discussion...

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