mKRISHI® Fisheries - A Blue Ocean Innovation

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Why Blue Ocean is becoming Red?

India is blessed with a vast coastline of around 8110 km. Every day around one million fishermen from 3,202 fishing villages venture into the sea to catch fishes. The allied sector of fish processing and marketing build their hope on this catch. While everyone is hoping for a good catch, climate change impacts and over-fishing has led to declining catch.

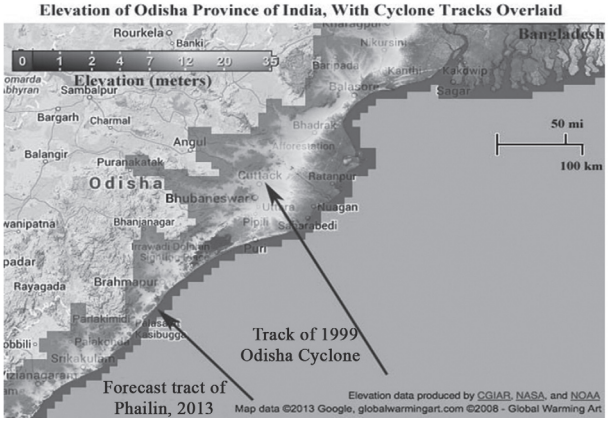
Fish catch is uncertain and each trip is expensive, especially the costs for diesel. It was estimated that for each tonne of fish catch, approximately 1.06 t of CO_2 gas is emitted. (Vivekanandan, *et al.*, 2013 *Current Science*, 105 (3):361-366) This is mainly because engines are not very optimized and consume 12-15 litre of fuel in an hour and may cover only 10-12 km (while not dragging the net). Hence, there is a need to optimize each fish trip.

Fishing in the seas is one of the riskiest profession as unpredictable sea conditions due to high wind speed and wave height, makes navigation very difficult, especially boats laden with fish catch. In an actual fishing scenario at sea, with more than 2 meter height waves (or swell) and wind speed more than 20 km per hour, a fishing boat can be tossed around like a toy. During 1891 to 2000, 308 cyclones have hit the Indian coast endangering the lives of 370 million within the 100 km belt off the coast. An Early Warning System (EWS) helps prevent such dangerous situations.

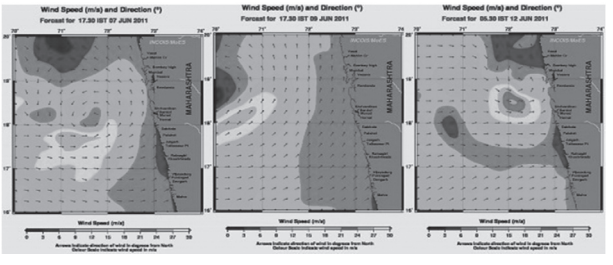
Technology as a Tool

Indian National Centre for Ocean Information Services (INCOIS) generates Potential Fishing Zone

Fishermen preparing for a fishing trip



Cyclone vulnerable East coast



OSF information (Wind Speed/Direction) provided by INCOIS

(PFZ) and Ocean State Forecast (OSF) Advisories for Indian coastal region. It processes the Chlorophyll and TSM images received from Oceansat-2 and Sea Surface Temperature (SST) images from NOAA-18/19 and MetOp-A/B satellites. These images are further processed for geometric correction, filtering and are geo-coded. Availability of the PFZ information addresses livelihood needs of the fishermen while wind speed, wind-direction and wave height information addresses their safety concerns.

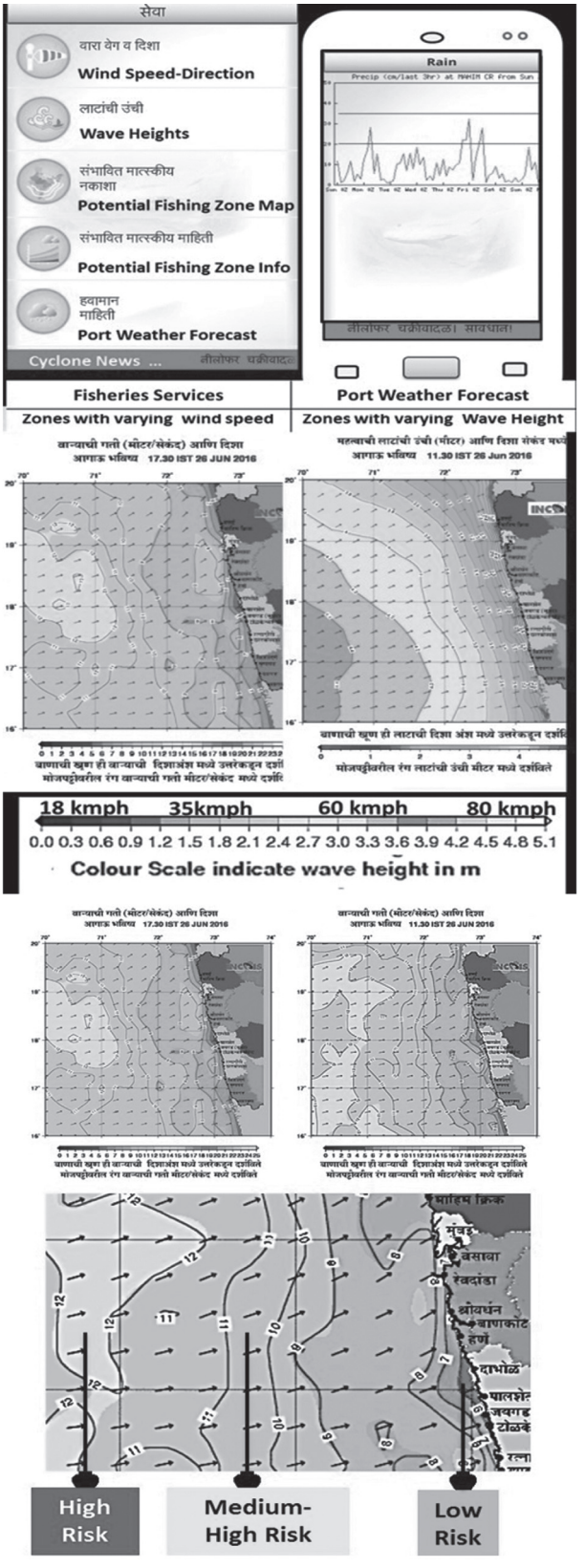
mKRISHI® Fisheries for fishermen

Mumbai Research Centre of ICAR-CMFRI and TCS Innovation Lab – Mumbai compiled the results of various surveys and fishermen feedback sessions, and created a simple to use mobile application in local language which can work on almost all the existing GPRS enabled mobile devices. Concepts such as Human Computer Interaction (HCI) helped to simplify the services and make it work during no/low mobile network (offline).

Collaborators included public and private partners like ICAR-CMFRI, INCOIS, Tata Consultancy Series (TCS), Tata Teleservices and various NGOs. mKRISHI® Fisheries with application of existing technologies thus became successful involving Design thinking, Simplification, Human Computer Interaction Service Design, GPS, Data Connection and Content personalization. For the mobile signal extension in deep sea, it required antenna design, tower configuration and device side amplification.

Following services were offered to the fishermen going out to sea.

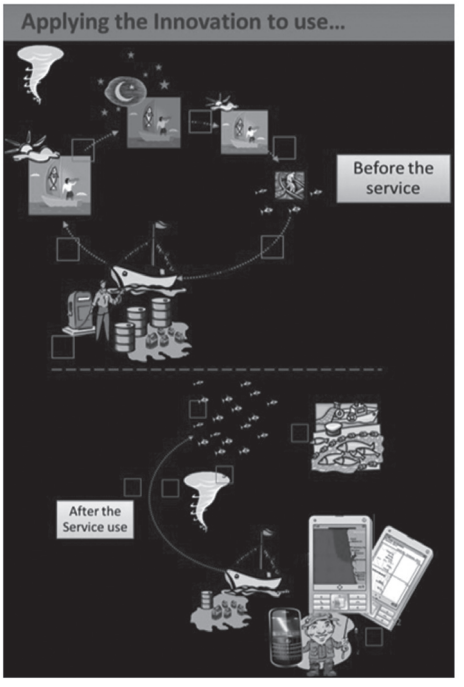
- Potential Fishing Zone
- Wind Speed and Direction
- Wave Height
- Weather Forecast
- Cyclone and *Tsunami* related warning
- Other news



mKRISHI® Fisheries Service incorporating HCI

Fishermen can now have information on their own mobiles and access whatever information is required for planning their fishing trips or navigation. Some used the information very early in the morning to see if PFZ was within the vicinity of their port (say 30-50 km) or far off. They check the wind speed or wave height forecast for next 3-5 days and when they find the sea conditions favourable, they would venture into the sea or else postpone the fishing trip. This selective fishing brought a disciplined approach, which not only led to less expenditure but also less diesel consumption and carbon emissions. While at the sea, the wind direction helps in planning to avoid 'drag' of the fishing vessel and hence further saving in diesel costs.The Information available thus made decision making simpler. Simplified information display method was also developed. Instead of putting the numerical value of the wind speed on the map, a "color code" for each wind speed range was coded and accordingly the respective regions on the maps were drawn in different colours. For a calm sea (wind speed less than 10-12 km per hour) shades of blue were used. For rough sea (wind speed 20 km per hour) light green was used. Anything in the shades of yellow, orange, red or white was considered very rough sea. White was the maximum with the wind speed ranging beyond 100 kmph, generally indicating cyclones. This information was available four times a day, for the next 5 days.

By avoiding unnecessary trips, savings in diesel, ice and labour costs accrued to the fishermen. They also planned their sailing time to get assistance of wind speed, direction, further reducing the diesel consumption. Information collected from Raigad district (Maharashtra) indicated a 30-40% increase in catch and 30% reduction in diesel consumption. Wind, Wave and cyclone information also helps them as an Early Warning System (EWS) to ensure safety of their lives and their investment in boat, fishing gears, etc.



Scenarios before and after use of mKRISHI® Fisheries Service

Mobile Signal Extension in Deep sea

A pilot study was conducted to expand the mobile signal in sea upto 30 km to help establish a "digital coastal highway", which would also pave the way for tracking, security cover and also aid marine businesses.

Revenue model

Initially a ₹ 30 per month per fisherman model was tried, but after realization of its positive societal impact it was decided it should be a free service. Thus it acquired a Google like Service model i.e. free for "common people" like fishermen, with no charge for life saving Early Warning System service (Wind/Wave/Cyclone information) etc. and charges for other stakeholders like business enterprises using this service. Other value added services like Catch Traceability which will be charged and operate through a share of subsidy or sale transaction from the buyers is under consideration. Mobile signal extension will be a pay

per use model where government must invest partly to subsidise initial cost. Later, telecom operators will continue as routine business. The beneficiaries would be the coastal fishermen, state governments, Ice industry, fish processing units, exporters and cage culture enterprises within 12 nautical miles.

This technology has the potential to directly impact 900,000 fishermen and another 3 million in allied sectors. Based on the survey conducted in Raigad by Mumbai Research Center of ICAR-CMFRI during 2013-14, it was observed that at 15% adoption level, fishermen can save upto 9,00,000 of litres (@30% less consumption). This translates to savings of ₹ 468 lakhs. (@₹ 52/litre), Diesel subsidy saving of ₹ 107.64 lakhs and lesser Green House Gas (GHG) emission of approximately 2412 tonnes. During December 2016, Ministry of External Affairs (MEA), Govt. of India and National Institution for Transforming India (NITI Aayog) held a National level contest on Social Innovation in which mKRISHI® Fisheries was selected as one of the Top 20 innovations. Winners were asked to exhibit their innovations at the *Pravasi Bhartiya Divas* held during 7 – 9th January 2017 at Bengaluru and the team setup a model which illustrated the Potential Fishing Zone (PFZ) and its impact in diesel reduction, an Early Warning System (EWS) created by the Wind Speed and Direction Forecast, Mobile Signal Extension to alert and monitor the crossing of the International border and promotion of cage culture based sustainable fisheries. mKRISHI® Fisheries app which presents advisories in local language, with easy to use icons on Java and Android mobile phones can be download from http://www.tcsmkrishi.com/app/mfish/ and is now available on google play store also. Upscaling of the service is also being planned.

PFZ validation cruise

Mobile signal extension testing

Catch by fishermen from a PFZ at Raigad