

Report on the Conference on

**Climate Change, Coastal Ecology and
Fisheries Resources and Livelihood
in Maharashtra**

18 July 2015



Institute for Community Organisation Research (ICOR)

Goregaon East, Mumbai

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Climate Change, Coastal Ecology and Fisheries Resources and Livelihood in Maharashtra

Fisheries in Maharashtra has been facing a crisis in the past few years because of several reasons such as sea water pollution, overfishing, destructive fishing practices, declining fish stocks, coastal land use changes, etc. Climate change is now emerging as a new threat, and it will aggravate the problem. In this context, Institute for Community Organisation Research (ICOR) organised a one-day conference on “Climate change, coastal ecology and fisheries resources and livelihood in Maharashtra” in Mumbai on 18 July 2015. The conference had over 40 participants comprising marine and social scientists, government officials and representatives of fisheries communities from coastal districts of Maharashtra.

The topics discussed included: causes of climate change and its impacts; problems facing fisheries in Maharashtra; impact of climate change on coastal communities and fisheries resources; coastal degradation and its impact on marine ecology; implications of climate change for fisheries livelihood and technology use; and fishing communities’ perspectives and responses on these issues.

Dr. Somavanshi, former Director-General of Fisheries Survey of India, along with Mr. Rambhau Patil (co-chair for the afternoon session), President of the Maharashtra Macchimar Kriti Samiti, moderated the day’s proceedings. In his introductory remark. Dr. Somavanshi talked about how climate change and the changing and erratic rainfall patterns have far-reaching consequences for fishermen as well as farmers and how it will set in motion a vicious circle of paucity and poverty.

CLIMATE CHANGE – CAUSES AND GENERAL IMPACTS

Dr. Nandini Deshmukh started the proceedings with a talk on climate change, its causes and its wide-ranging impacts across several sectors. She emphasised the need for the spread of awareness about climate change and its consequences in order to initiate action to mitigate the same.

She explained the direct relationship between the rapid industrial development over the past one-and-a-half centuries and the rise in the emission of heat-trapping greenhouse gases, causing an increase in the earth’s temperature (which is known as the greenhouse effect). This is one of the major causes of global warming and a contributing factor to climate change. She enumerated the various causes for the increase in greenhouse gas emissions -- coal plants, industrial production, chemical effluents and fossil fuel combustion among others. She underlined the role of deforestation under the pretext of development as one of the major factors for the increase in global temperature. She also explained the broad range of effects of climate change, using examples from all over the globe.

There has been a substantial rise in the earth's temperature in this century, particularly in the last three decades. The seas and oceans have absorbed 90 per cent of this heat generated. The fluctuation in heat absorption causes mayhem in the marine ecology, which in turn affects the livelihood of fishing communities and those in the fishery business. Global warming is also one of the causes for the increase in the frequency and intensity of cyclones, typhoons and hurricanes. The rising temperature of the earth and oceans affects the water cycle, causing erratic and intense rainfall, cloudbursts and floods. Countries all over the world have faced such extreme events in recent years. The global rise in temperature also causes icebergs and icecaps to melt. This can have severe consequences in the form of rising sea levels, which can lead to submergence of low-lying coastal land. Increased temperatures can also cause extreme heat waves and droughts in certain regions.

The direct effects of these phenomena on human life were summed up under four categories -- food supply, water, health and infrastructure. Unseasonal or inconsistent rains can cause huge damage to crops and reduce food supply. Droughts and groundwater depletion will affect availability of water. The changing climatic conditions are conducive to the spread of various diseases thus endangering people's health. It affects not just the physiological but also psychological health. The occurrences of numerous calamities results in mass destruction of property and infrastructure amenities like roads, railways, bridges, ports, etc.

Much of this is the result of unrestrained human activities and ignorance of their serious environmental impacts. All this havoc may be termed as the cost of the kind of progress or development patterns that we have followed. It is imperative that the situation be assessed and understood in order to find a more permanent solution rather than employing short-term measures as this is a global problem and not a local one.

In the question-and-answer session following the talk. some participants raised the question that, if the problems are so serious, why environment is not considered seriously in government policies. Dr. Deshmukh replied that people have to be vigilant and act together through petitions or rallies to make the government pay attention to such issues and make it respond to public demands for the common good.

THE STATE OF MARINE FISHERIES IN MAHARASHTRA

Dr. Vinay Deshmukh, former Principal Scientist at the Central Marine Fisheries Research Institute (CMFRI), Mumbai, then presented an overview of the state of marine fisheries in Maharashtra and the various factors that impact marine coastal ecology and fisheries. He made several important points, drawing mostly from data scientifically collected over the years; he said statistics should not be used as a smokescreen to conceal the truth but as tools to establish facts and draw the right conclusions.

He began with some general data on the physical features of Maharashtra's coastline and fisheries infrastructure. Maharashtra has a fisher population of almost 3.5 lakh and over 17,000 fishing boats. Its annual average fish landing (for the period from 1996 to 2014) is

3.41 lakh tonnes, which was valued at Rs. 2,320 crore in 2012-13. However, fisheries contributes less than one per cent to the state's Gross Domestic Product (GDP), which is perhaps the reason why this sector is neglected.

The annual fish catch fluctuated owing to seasonal changes but, looking at a longer period, the average trend in fish catch suggested a rise in production until the year 2000 after which there was a steady fall (Fig. 1).

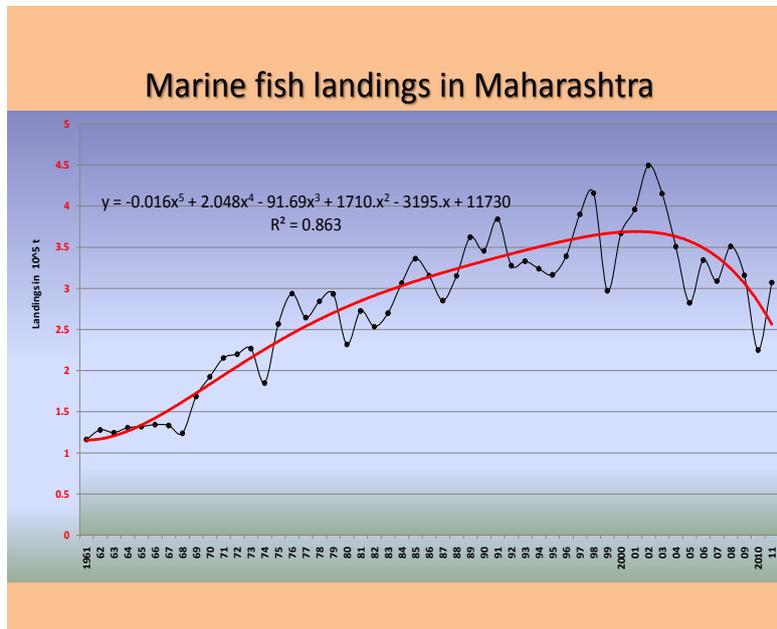


Figure 1 : The trend in marine fish landings in Maharashtra

The major reasons for this are: excessive fishing, pollution due to dumping of untreated sewage into the sea, climate change, habitat destruction due to reclamation of land, and wrong fishing techniques.

Though 34 fishing techniques are used in the state, the four most important ones are trawling (which alone accounts for 60 per cent of the fish production), dol netting, gill netting and purse seiners.

Data on commercially important fish suggest that prawns, ribbon fish and croakers (*gol* and *koth* in local terms) are caught in the highest quantities. A comparison of major resources between 2002-06 and 2007-11 shows that the production of these fish dropped in the later part of the decade. A study of 40 species of fish over the past 50 years showed that only 8 per cent of the fish stocks are now available in abundance; the rest are less abundant, declining or depleted. Also, the decadal compound growth rate of marine fish landings which increased at 3.2 per cent annually from 1961 to 1990 slowed down to 0.41 per cent during 1991-2000 and then declined further to a negative growth rate of -4.7 per cent during 2001-2010. He cited the examples of Bombay duck, pomphret and lobster to

illustrate the decline in fish stocks and said certain species like the sand lobster had disappeared. Analytical models like length-based stock assessment indicate that most species are over-exploited.

Destructive fishing techniques like trawling and purse seine are largely responsible for the loss of valuable marine flora and fauna and thus for the drop in fish production. Dr. Deshmukh and his team were part of a committee which was to propose a model, based on production statistics and various analytical models, for finding a solution to these issues.

He summarised the issues and problems of the fishing sector in Maharashtra as follows:

- Traditional fishers get low catch and low returns largely because of coastal pollution and over-crowding.
- Trawling revenue has declined because of resource depletion and high operational cost and also the glut in shrimp supplies in the international market.
- Dol net and gill net sectors are the economically most affected as their catch, catch rates and sizes of fish caught have drastically declined.
- Purse seine is meant for pelagic fish such as mackerel, seer fish and perch, and its success depends on the abundance of these fish.
- Dwindling catch and catch rates of traditional resources – Bombay duck, silver pomphret, seer fish, thread fins, and croakers.
- The catch comprises small-sized and less-valued fish.
- Longer search and fishing time and the shortening of the fishing season.

Climate change has now added to these problems. As far as marine fisheries is concerned, the most important environmental variable is temperature. Global warming has caused a rise in sea surface temperature. The average annual temperature along the Maharashtra coast had risen more than 1^o centigrade over the past few decades (Fig. 2). This data was supplemented by satellite thermal imageries from the past four decades.

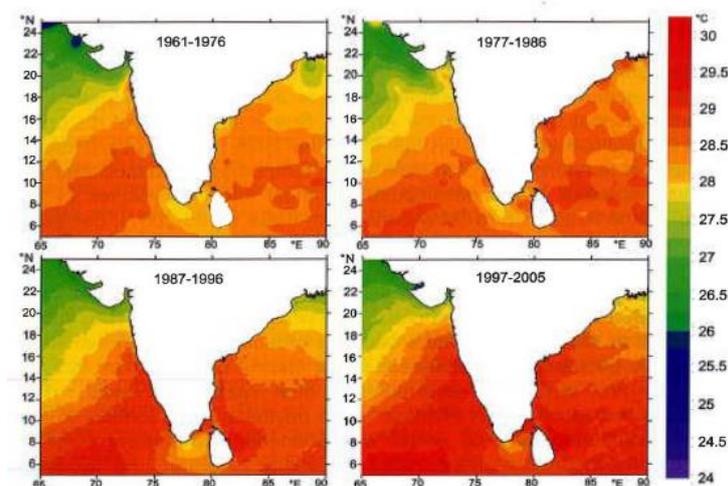


Figure 2 : Warming of the sea surface along the Indian coast

All these factors contribute to several physical and biological changes which impact coastal marine ecology and fisheries. The displacement or destruction phytoplankton habitat and coral bleaching have a profound effect on the marine ecosystem. These affect fish reproduction and food consumption. They influence the metabolic activity of fish and phenology (life cycle events) leading to their migration and extension of the depth where they occur.

Scientists suggest that the two possible reasons for reduction in fish size and the extension of their distributional boundaries and depth of occurrence are fishing pressure and temperature changes. It was therefore necessary to do further research to pinpoint the reasons and then work towards finding solutions.

He, however, suggested that because trawlers are destructive of coastal marine ecology, there was a need to regulate their numbers and also mesh sizes.

IMPACT OF CLIMATE CHANGE ON COASTAL COMMUNITIES AND FISHERIES

Dr. Veerendra Veer Singh, Principal Scientist, CMFRI, Mumbai, spoke about the changing coastal ecology, climate change and their impact on fisheries. He said the gravity of climate change and its serious consequences were realised about two decades ago. It led to the question, 'What to do next?'. The broad solution was to act together to face the challenge.

Fishermen needed to be aware of climate change and its consequences. Climate change affects their lives largely through phenomena such as sea surface temperature rise, sea level rise, erratic rainfall, natural calamities such as storms, tidal surges and cyclones, habitat destruction and change in the quality and quantity of seawater. He showed a chart (Fig. 3) which outlined the effects of greenhouse gases on marine environmental and biological parameters (which in turn affect fisheries) and their projected impact on marine fisheries.

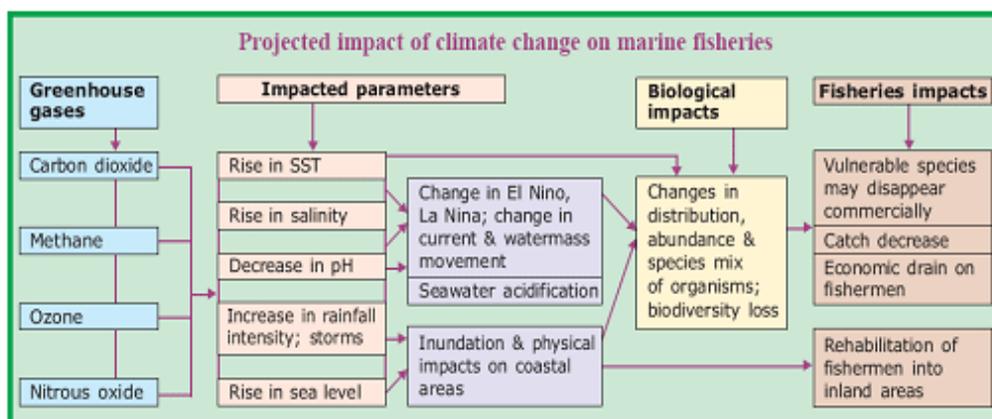


Figure 3: Projected impact of climate change on marine fisheries

The major effects were a shift in marine species distribution, change in their range boundaries and shrinkage of their habitat. Climate change also affected fisheries infrastructure such as coastal villages, ports, fish-landing centres and fish-drying platforms.

As mentioned earlier, the sea surface along the Indian coast has been warming over the past few decades. The impact of this is seen in the shift in the depth of distribution and extension of the range of some species. For example, some pelagic (living at or near the surface of the sea) species such as the Indian mackerel show a shift in the depth of their distribution and are now caught by sea-bottom trawlers. These findings indicate that adaptable species may be able to adjust to the immediate challenge of a rise in temperature for a shorter or longer duration. However, vulnerable groups such as corals are in peril. Extensive coral bleaching has been observed in several areas and it is directly related to the increase in sea surface temperature and acidification of seawater.

Other environmental changes also affect fish catch through various factors like changes in wind and wave patterns, currents and rainfall. This can be observed through the extension in distributional boundaries of small pelagic fish such as sardines and mackerel.

We need to understand fisher folk's perception about these changes. CMFRI has therefore formulated a survey to know their observations and perspectives, which can help in recognising their problems and working out solutions.

Dr. Singh presented the outcome of a preliminary vulnerability assessment using 30 indicators (under five categories – demographic, fishery, occupational, climate and infrastructure) done in 75 coastal fishing villages of Maharashtra. Of these, 20 villages, mainly in Thane and Raigad districts, were found to be vulnerable to climate change. An assessment of the coastal land area likely to be submerged in 75 fishing villages under different sea level rise scenarios (0-0.3 m, 0-0.6 m and 0-1 m) showed that fishing villages in Raigad and Thane are more vulnerable to loss of land and, consequently, displacement of coastal communities (see Table below).

Area likely to be submerged (km ²) in selected fishing villages of Maharashtra				
District	No. of Villages	0- 0.3m	0- 0.6m	0- 1m
Thane	8	0.95	1.04	1.45
Mumbai	5	0.12	0.19	0.28
Raigad	19	0.29	0.38	2.03
Ratnagiri	16	0.005	0.05	0.332
Sindhudurg	27	0	0	0.905
TOTAL	75	1.365	1.66	4.997

To conclude, he emphasised the need for research and an action plan to address the various issues affecting the fisheries sector because of climate change; this could be done only through the combined efforts of the people and the government

COASTAL DEGRADATION AND MARINE ECOSYSTEMS

Speaking on “Coastal degradation and its impact on marine ecology”, Dr. Vasudevan, Chief Conservator of Forests (Mangrove Cell), Maharashtra Government, said that the role of the government was crucial in dealing with the crisis presented by climate change. It is a general assumption that the administration is incompetent and takes no action to cope with the situation. Though the government was at fault, it was not totally ineffective, he said. It is taking some measures but these are not much known. From this perspective, he discussed what was being done by the administration to protect mangroves and fisheries. .

Maharashtra has a coastline of 720 kilometres. Mangroves, which are a crucial element of the coastal ecosystem, cover 30,000 acres of the coastal area. Of this, only 17,000 acres are owned by the government; the rest is privately owned. The private owners are dissatisfied because they think that they are suffering a loss of revenue as mangroves, protected by law, cannot be cut down and the land used legally for construction, etc. Their self-interest overrides environmental protection.

Mangroves on government land were declared as reserve forest areas by a High Court order in 2005. The government is trying to acquire the remaining land which holds mangroves but it is a long and tedious process because of the several illegal dealings and encroachments, especially in metropolitan areas. It is also taking steps to promote growth of mangroves on recovered land by making water channels and plantations. Boundaries will be put up around these areas so that people become aware that these are forest land. Such awareness is spreading gradually; and people refrain from encroaching when they realise action will be taken and they will lose money.

However, problems continue on private land where people tend to illegally cut mangroves to generate income. One solution to this problem is to explore some means of income generation from these lands. Several small-scale businesses can be done in these areas -- for example, crab-farming. This is being done in Sindhudurg district. Oysters and mussels can also be cultured. Apiculture or bee-farming is another option. The government is designing and implementing several new schemes. These may not show immediate results but, over the years, mangrove density on forest land has increased (compared to the year 2005).

Destructive fishing practices and adverse impact

Several fishing practices can be destructive for marine habitats and ecology. Trawler nets trap a lot of material (by-catch) – small fish, other pelagic creatures, phytoplankton, etc on which fish survive -- along with the fish they target. About 70 per cent of this catch is discarded. Hence, an improvisation in the mesh of the nets was suggested – using square-shaped mesh instead of diamond-shaped so that small or young fish do not get caught. As many as 143 trials were done using these improvised nets and many fishermen agreed to

use these. The government is also taking several small steps such as formulating devices to ensure sustenance of fisheries, reducing the by-catch, spreading awareness about responsible fishing practices, etc. Steps are being taken to see that fishing does not affect other sea creatures. Steps are also being taken to prevent sea pollution and coastal degradation owing to the rampant use of plastics. Fluctuations in the sea level and coasts affect turtle population. The government had undertaken a programme to identify the affected turtle species and protect them. Maharashtra has almost 300 turtle species.

At the coast, a process of erosion and sedimentation goes on simultaneously. The balance between these processes is important for the stability of the coast. This balance has been disturbed greatly due to dams on rivers, sand extraction, etc. Therefore it is important to carefully assess developmental projects undertaken in the coastal areas, or they can lead to hazardous situations.

There is a lot of research happening -- modern technology is at our disposal. It is the government's responsibility to use available resources in the best way possible. On the other hand, people need to be aware and vigilant, beware of misinformation; they should support the good measures and projects and take a stand against the bad ones.

In the discussions that followed, he answered questions about the steps being taken against mangrove encroachment, inadequacies in policies and lack of severity of punishment for unlawful practices, crab-farming on government land, joint mangrove forest management ventures (between communities and the government) and implementation of 'wetland rules'. He appreciated certain steps taken by the government but expressed the need for a more proactive role. He requested the senior marine scientists present to include representatives from fishermen's federations in the loop in their studies and analysis/appraisal of loss of marine resources and biodiversity and the threat to livelihood because of environmental reasons so that they can get some sort of compensation or concur on some measures to sustain livelihood.

SOCIO-ECONOMIC STATUS AND LIVELIHOOD ISSUES

Ms. Shuddhawati Peke, representing the International Collective in Support of Fishworkers (ICSF), spoke on the socio-economic status of fishing communities in Maharashtra. . There are 456 marine fishing villages in the six coastal districts of Maharashtra, with a population of around 3.5 lakh of whom 91 per cent belonged to traditional fishing communities. Education was largely limited to the primary or secondary level. Forty per cent were directly involved in fishing, and these were predominantly men. The other 60 per cent, mostly women, are engaged in allied activities. Women often have to shoulder household as well as occupational responsibilities. Due to the predominant patriarchy, women, though active on the economic front, play no role in decision-making processes or in the social sphere.

Fishing communities, particularly small-scale fishing communities, observe some socio-cultural taboos related to fishing practices like a voluntary ban on fishing during part of the monsoon for better regeneration of resources and out of respect for the sea, mangroves and the aquatic ecosystem which are the sources of their livelihood.

Climate change is now emerging as a new threat to their resources and livelihood. Small-scale fishing communities are the victims. The key climate-change-related factors that affect the lives of fisher folk are sea level rise, sea surface temperature rise, salinity, changes in wind patterns, tidal action, changing rainfall pattern, shoreline changes, etc. The direct impact of these changes can be seen in the availability of fish and other coastal resources, fishing systems, quality of life, fishing investments, etc. In this context, she showed a video titled the 'Sea of change', in which fisher people talked about climate change and its effects on them.

She outlined some adaptive and mitigation strategies, like diversification in terms of targeted fish and fishing grounds, use of technological innovations, adapting cost-saving measures and changing ownership and sharing patterns, that should be undertaken by fishing communities to deal with the threats from climate change.

She pointed out that even though coastal fishing communities are widely regarded as among the most impacted by climate change, there is no specific focus in the National Action Plan on Climate Change (NAPCC) on the coastal ecosystem or on coastal communities. Even in the state-level action plans and research, there is no representation of fishing communities nor any effort made to consult coastal communities and seek their views on the perceived impact of climate change and the sort of responses needed. These are certain shortcomings on the part of policy-makers, which need to be overcome in the future.

She suggested several steps that can be carried out to reduce vulnerability and enhance resilience of fishing communities. Primarily, there needs to be access to basic services and decent housing for the communities. Livelihood diversification through a consultative process should be encouraged. On a broader scale, it is necessary to provide new scientific and technological knowledge to the community, improve fisheries management through adaptive processes, improve engine efficiencies for economic benefits and to reduce adverse ecological impacts. It is also essential to strengthen planning for disaster preparedness and disaster management. The issue of sea safety and migrant fishers needs to be addressed. Non-fishery issues that affect fisheries resources and the quality of life of fishing communities should be taken into consideration.

COMMUNITY PERSPECTIVES, ATTITUDES AND RESPONSES

Ravikiran Tolaskar, from Malvan, who is with the National Fishworkers' Forum, talked about fisher people's attitudes and community perspectives on climate change. Climate change posed a threat to fisheries and livelihood but people's attitude and their greed was an equally calamitous threat. Citing a personal experience, he related that the coastline from Redi to Vijaydurg (in southern Maharashtra) had been declared as one of the world's 11

most sensitive coastal areas. The United Nations Development Programme was planning a development project there for the sustainable use of marine resources and to sustain fishing livelihood. However, the area continues to be assaulted by destructive fishing practices for profit. Initially, he was not in favour of having the area declared as a protected marine area under the Wildlife Protection Act as it would affect people's livelihood. However, after observing the uninhibited exploitation by some elements in the community itself, he now advocates having it declared a protected area.

Whenever the livelihood of fishing communities is at stake and they need to be rehabilitated or the issue of sustenance of fisheries comes up, people or the government talk about provision of alternative livelihood. He expressed strong disapproval of this. He said fishery was the heritage of this community; and they needed additional livelihood and income and not an alternative one.

Policy-makers need to be made aware of all these factors and they need to act accordingly keeping in mind the interests of the masses, not just the influential. He referred to a book written by Mr. Banerjee on the impact of coastal projects on fishermen's livelihood which explained that economic and political changes in the country have as much impact as climate change, if not more, on coastal fisheries and livelihood.

Rambhau Patil concluded this session by summarising the serious impacts of climate change. He reiterated the importance of responsible fishing practices, awareness among people and willingness to act to deal with the situation. He called for everyone to make a resolve to adapt changes at a personal level before expecting state-level or national policy changes to help them adapt to the changing situation.

In the discussions that followed, one of the participants spoke vehemently against the lack of action from the government. He pointed out the various failings of the administration to punish the guilty when they overstep pollution control guidelines, when there are rampant malpractices happening everywhere. Political pollution is more dangerous to us than climate change, he said. It is not the people who need to have awareness but the policy-makers and those in power; they need an awakening. They need to make an earnest and honest attempt to implement the various laws, and put in place a system to address and resolve the common man's problems. It is important to have discussions involving all organisations of fishermen to reach a consensus regarding the steps to be taken and conversion of these decisions into policies.

Another participant said that it is not that the fisher community did not know about climate change, they may just have been unaware of the terminology. He questioned the veracity of the statistics that the institutes and the government have. He said he had seen the discrepancies in the information people give during data collection.

He also said that solutions are available for some of the problems but they are not being implemented either due to mismanagement at the bureaucratic level or corruption. He suggested having a separate federation for marine fisher folk. This federation should have representation from various cooperatives, NGOs, etc. And the policy decisions should be made in concurrence with scientists, members of this federation and the government.

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Institute for Community Organisation Research: Organisation Profile

The Institute for Community Organisation Research [ICOR] is a non-profit organisation established in 1989 and registered under the Society Registration Act 1860, and the Bombay Public Trust Act 1950.

The primary goal of ICOR is to come up with a body of knowledge indigenous to India and its culture that will enable the empowerment of grassroots workers / non-government organisations (NGOs) / community based organisations (CBOs) in the field of human development. Towards this end, ICOR is mandated to focus on:

- Undertaking empirical research, including secondary analysis of available data, on fundamental concepts relevant to human development including studies of organisations, personnel, and people involved either as benefactors or beneficiaries or initiators of the human development process
- Developing models of monitoring and evaluative studies in the field of human development
- Documenting and disseminating information to individuals and organisations involved in the pursuit of human development
- Training in research and social analytical skills
- Collaborating and networking with other organisations in training, research and community building activities that will further the understanding and practice of human development.

ICOR'S Thrust

The institute has adopted the following nine-point thrust which may be classified under three headings:

Target Group

- Work with and for people's organisations, NGOs and CBOs
- Networking through and with like-minded organisations to further the ICOR thrust
- Collaborate with those committed to people's empowerment.

Inputs

Work relating to

- Concepts relevant to community organisation
- Global trends relevant to community organisation
- Processes at work in various organisations, and especially people's organisations, NGOs and CBOs, devise alternate target group specific models.
- Seminars and training programs flowing from these works and addressed to specific groups and bodies

Outputs

- Documentation that is specific and service oriented
- Periodic publication of research papers in addition to other publications