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Directorate of Public Relations and Publications
Cochin University of Science and Technology
Kochi - 682 022, Kerala, India

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Cochin Unviersity of Science and Technology, Kochi - 682 022, India

Editorial

SCIENCE COMMUNICATION FOR SOCIAL CHANGE

The unbridled greed for wealth, jockeying with a heretofore unimaginably-intense consumerism have made our globe a dangerous place to live on. Man is plundering the natural resources like a nomad rather than a trustee. The result is severe desertification, pollution and global warming. The green-house gases from the industry and consumer goods challenges the very existence of life on the planet. Experts say that the melting of Arctic snowcaps that we are witnessing today is the result of the chemical pollution caused by severe industrial activities during the period from the 60's to the 80's. The environmental and ecological havoc that the present day industries and vehicles are going to make for our future generations can only be imagined.

At a time when the globe is on the verge of such a catastrophe, it is the duty of science communicators to inform and educate the citizens about the impending danger and become an oasis of badly-needed knowledge to provide solace to the uninformed millions. However the communicators have not yet initiated their mission with a visionary zeal. The people are neither well informed nor properly educated to face the challenge. It is true that we are communicating regularly through various avenues of media, but we fail to enthrall the target audience because of the lack of proper understanding. Unless and until a person is informed and made aware of the consequence of global challenges and its consequences upon his near and dear he/she will not become ready to accept the message in its totality.

Mere Science Communication or Scientific awareness will not be able to instill Scientific Temper among the people which is a pre-requisite for development. Scientific Temper is an attitude or rather a state of mind and behavioral outlook when a citizen undergoes an organic transformation with scientific awareness accrued through channels of communication. It is neither a collection of knowledge nor of facts although it promotes scientific knowledge and rational

thinking. The creation of Scientific Temper is not mastering of Science and Technology or developing a highly industrial society. But its inculcation in our society would help our people becoming more rational and objective, thereby generating a climate favouring the creation of a socialist society.

Effective science communication can catalyze the process of cultivation of Scientific Temper and ensure a sustainable way of living with harmony.

In this context it is pertinent to remember the words of Dr. A P J Abdul Kalam during the inaugural session of Eleventh International Conference on Public Science Communicators at New Delhi. While inaugurating the conference, Dr Kalam said, “Fortunately, science also has the potential to remove these imbalances and bring happy and prosperous order in the nations and societies across the world. One of the recent contributions has been in the field of communication; communication has advanced so much that we could transfer knowledge from the experts to the least empowered citizen without the concern of distance and time taken”.

According to Dr. Abdul Kalam, ‘the role of science communication is no longer limited by communication band-width, but the imagination band-width of scientists’. He proposes three important tasks for the experts engaged in science communication: to make all citizens, particularly those in remote and rural areas to feel excitement about science; to make all the citizens to know about the advances of science and their role in the society in economic and health development; and to bring more and more fruits of science within the reach of their daily lives while being sensitive to the sustainability of our planet and our responsibilities towards it.

As communicators of science and technology, let us join hands and work towards our common goal: to cherish and actualize the dream of His Excellency in making Science Communication an effective tool for social change, progress and harmony.

Editor

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Authors who wish to contribute papers may kindly contact the editor through mail: anilvadavathoor@gmail.com / akv@cusat.ac.in or by post. Subscription queries may be addressed to the Directorate of Public Relations and Publications, CUSAT, Kochi-22 or scicom@cusat.ac.in

POWERFUL SCIENCE COMMUNICATION AND TRANSFORMATION OF SOCIETIES

APJ Abdul Kalam

Public communication of Science and Technology is a great tool for societal transformation, since it enables interfaces among public, policy makers, industry and even among scientists and pave the way for scientific applications virtually in every facet of human development and inspires at all levels. I thank the organizers for giving me this opportunity to address on this 11th PCST 2010. Friends, my greetings to all of you. I was thinking what thoughts I can share with you. The topic I have selected is *"Powerful science communication, is an asset to the transformation of societies".* Let me first discuss about the purpose of science.

Purpose of Science

The purpose of science is to understand the nature where we live and continuously we have to give more than what we take from the earth and above all science is intended to improve the quality of life of the people. As it is known, science is linked to technology through applications. Technology is linked to economy and environment. Economy and environment are linked to technology, which promotes prosperity to the society. Science is very pure in its aims, and science does not know any borders, of either geography, political, linguistic or religious. But, science, has one disadvantage as well – in division of people between those who know science and those who do not; those who use it and those who do not. The divide, manifests itself in many names, such as, developed and developing nations; economically advanced and economically backwards; and the latest phrase used is; digital divide. This divide caused by imbalances in scientific knowledge has been one of the key factors leading to disharmony across the world including religious or political conflicts, terrorism and civil disobedience. Fortunately, science also has the potential to remove these imbalances and bring happy and pros-

His excellency Bharataratnam Dr. APJ Abdul Kalam is the former president of Indian Republic and a renowned space scientist. This article was his inaugural address at the 11th International Conference an Public Communication of Science and Technology in New Delhi on December 6, 2010 and published with the kind permission of his Excellency. E-mail: apj@abdulkalam.com.

perous order in the nations and societies across the world. One of the recent contributions has been in the field of communication. Communication has advanced so much that we could transfer knowledge from the experts to the least empowered citizen without the concern of distance and time taken. So time is most apt today for the usage of giga-bandwidth and eloquent capabilities of scientist to explain complex concepts with absolute ease to the common man.

Today, the communication through print media, electronic media, particularly internet, is almost real time, and presented in various form on the subjects sports, natural disasters, political upheavals. I wonder, why don't dais members and the friends who are in front of me, pave the way for real time success stories of science and technology through the fast mechanism available. The role of science communication is no longer limited by communication bandwidth but the imagination bandwidth of scientists. I have three important tasks for the experts engaged in science communication:1) To make all citizens, particularly those in remote and rural areas (e.g. India has 700 million rural population) to feel excitement about science.2) To make all the citizens to know about the advances of science and their role in the society in economic and health development and to bring more and more of fruits of science within the reach of their daily lives while being sensitive to the sustainability of our planet and our responsibility towards it.3) To motivate the students and entice them to embrace science as a profession. There are many young inventors and imaginative citizens (including from remote rural areas), sometimes without a formal training, who can be brought to public attention and encouraged.

Science communication profile

Friends, I thought of sharing some experiences with all of you. So far, I have met about eleven million youth below 20 years from various parts of India and abroad. Youth have their dreams, youth have their pain and above all youth have the immense power. I have come across thousands and thousands of questions. Most of the youth are concerned, about what type of India they are going to meet in a decade times. They have questions like “Will I have opportunity to study what I like?” But one thing I noticed, the youth of India are excited to know more about vision for the nation and the nation’s standing with reference to other developed world. The youth com-

pares India's standing with other countries and draw inspiration when India is very close in the race to the developed world.

When the visionary Prof. Vikram Sarabhai unfurled the space programme in 1970s, the nation was closely following how the space programme was cheering the hearts of young and experienced. Similarly, atomic energy programme brought proud smiles to millions of Indians. When India achieved its first green revolution and achieved the 230 million tonnes of food grains, the people of the nation gave the ovation to the both farmers and scientists. Of course, the young entrepreneurs entered into IT and communication field which progressed well and brought cheers to the youth of the nation. The science and technology communicators have contributed in a big way for such a happy scene of the nation. I have seen in many children at science congresses and conferences, how one of our greatest science communicators, Prof. Yashpal, has been inspiring the youth.

The working in science itself is the greatest award a scientist can dream

Particularly between the age 14 and 17 of students, it is very important to inject the beauty of science, challenge of science and bliss of science when one achieves. As one of our renowned scientist says “The working in science itself is the greatest award a scientist can dream”, I would like to recall one of the important questions answered by Prof. Yash Pal, which reflects this thought. In his book on “Discovered Questions”, I found an interesting answer giving hope to the young for the question “What does it take to be the Nobel prize winner?”. He says, “Nobel prize winners are not demi-Gods. But usually they are rather creative people. They are also those who have dared to think thoughts that were not very conventional or fashionable and they are astonishingly hardworking. Work for most of them is not arduous or unpleasant. It is something they just cannot help doing. They often are prisoners of great passion. Though some lobbying might help, usually it is superfluous, even counter productive. Your work must be exposed to the scrutiny of your peers. You cannot get a Nobel prize for doing something great and not telling anyone about it.” - What a great message for the young scientist of India and other countries. This message will definitely give the confidence to the Indian scientist that “they can do it”. There is also a clear message on the importance of science communication

Experience of Mobile Science Labs in rural schools

I am part of Viksit Bharat Foundation. Let me share an experience. The Viksit Bharat Foundation, Bihar Branch had successfully operated for nearly three months the Mobile Science Lab given by Agastya International Foundation (AIF), Bangalore along with Science Instructors during April-July this year. During this campaign, the mobile lab visited 14 high schools and 28 middle schools in the floodaffected rural areas of Bihar. This included six Kasturba Gandhi Girl's middle schools and Project high schools, run by the state government. With the help of this mobile science lab, the scientific knowledge could be made accessible to nearly fifteen thousand students in these schools. The Mobile Science Laboratory and the team of Science Instructors sent along with it, have become very popular among the school children in rural Bihar. The Mobile Lab van visited schools in remote areas, drawing large attendance in schools. The students of class VII to class X were given instructions with practical lessons in science subjects and taught with the help of models and experiments which made learning exciting.

The response from the students was overwhelming. Their attendance in class went up. Due to physical constraint of class room space in schools, the number of students had to be limited on average to 75. In order to reach the students of lower classes and in larger numbers, science exhibitions were conducted by Science Instructors with participation of a few selected senior class students as trainee instructors on weekend days at some of the schools. The Mobile Science Lab has covered schools in flood prone blocks of Ghanshyampur, Kiratpur and Gora Bauram, Biroul and Benipur in Darbhanga and Madhepur and Tardih Blocks in Madhubani district before onset of monsoon. It has drawn wide coverage in Press as well as appreciation of the local people in Bihar. Already Viksit Bharat Foundation is progressing to establish a full time mobile science laboratory in the rural areas of Bihar with also the help of Bihar Government. I would like to inform the science communicators that 40 mobile science laboratories established by Agastya International Foundation, Bangalore, are in operation in these two states covering over a lakh of students. The lesson we derive out of this experience is that innovative and student friendly solutions are needed to enable scientific learning in the youth, especially those in rural and remote regions of the nations of the world. Whenever possible, scientific education has to reach the remotely placed youth and excite them about science.

Missions for Science Communication

When I am with you, I would like to suggest the following missions for discussion in this Conference. 1. Bringing out a document and may be a website, on the number of science communicators available in different regions, nations and states and in different languages. Based on this data, efforts should be made to treble the available science communicators across the length and breadth of the country in multiple languages within the next three years. 2. Like the Discovery channel, there is a need to establish a science channel through innovative communication methodology. It would cover a vast array of innovations, researches and interesting scientific facts. 3. Promoting systems for science education among the youth and experienced for enabling informed debate on public policy leading to development oriented decision making. 4. Generating the content for primary and secondary level science education and putting it up on an open source web based media, which can be available in multiple languages5. Bringing out at least ten volumes on researched biographical information of scientists from different parts of the world within the next three years. These biographies must pay particular attention to describe the interest and enthusiasm shown by the young scientist in learning and applying science. These stories will motivate the younger generation to take up science as a career. 6. Bringing out "Science & Technology Daily" newspaper which can be internet-based, open source and contributed by the best of the scientific community and written in user friendly language. 7. Publishing case studies from experiences like Agasthya International, as to how exposure to imaginative simple experiments increase the broad base of scientific education in the country.

Conclusion

Friends, throughout the world, many advances in S&T are taking place in hundreds. The experts in Science Communication and the experienced scientists who have assembled here, can collectively ensure that in real time, these great advances find place in print, electronic and internet which can motivate more and more youth to align themselves with such missions. Communication system of the modern age should be a tool to communicate great scientific lives of triumph of scientific minds in the midst of difficult times and overcome the impossible problems. As you are setting your goals for creating a system of science communication to inspire the younger

generation and experienced, I would like to share with you an inspiring message from Maharishi Patanjali in Yoga Sutra an ancient Indian literature: *"When you are inspired by some great purpose, some extraordinary project, all your thoughts break their bounds, your mind transcends limitations, your consciousness expands in every direction, you will find yourself in a new great and wonderful world. Dormant forces, faculties and talents become alive and you discover yourself to be a greater person by far than you ever dreamed yourself to be.*

MIND BOGGLING VISTAS OF SCIENCE FICTION

C. G. Ramachandran Nair

Introduction

In the developed countries, science fiction is assuming an increasingly effective role in science communication. It is closely linked now with technologies of the future. Actually science fiction is a broad *sub-genre* of fiction. It is commonly abbreviated as **SF** or **sci-fi**. The abbreviation used by most of the science fiction *aficionados* and also by writers of science fiction is **SF**. Science fiction is often set in the future, sometimes the very far future. Occasionally, it is set in the far past also, although such SF stories are rare. Science fiction usually involves speculations based on science.

In SF, there must be a core of science and an envelope of literature (fiction). The golden rule in SF is that "*one may bend the laws of science a bit, but never break them"* SF takes us into the mesmerizing world of astounding possibilities. Sometimes, SF almost reaches the verge of fantasy too. But good SF is never pure fantasy. The distinction between FANTASY and SCIENCE FICTION has been defined by Rod Sterling(1962) thus: *"Fantasy is the impossible made probable. Science Fiction is the improbable made possible".*

However, some SF involves brilliant fantasies too.The celebrated American novelist and main stream writer Ray Bradbury has written wonderful SF stories with a great deal of fantasy built-in. On the other hand, there is practically no fantasy in the SF novels and stories of the great SF writer, Arthur C. Clarke.

According to Gilks, Fleming and Allen (2003), SF is a "literature of ideas". They stipuate that science fiction in general often involves one or more of the following elements:

Ph.D., Veteran Science Communicator, well known Science Writer and reputed Scientist. Dr. C. G. Ramachandran Nair is the Former Chairman, State Council for Science, Technology and Environment, Government of Kerala.

Resi. Address: Neckar, Tenra-102, Thycaud, Elankam Lane, Thiruvananthapuram-695 014, Kerala E-mail: profcgrm@gmail.com

- A setting in the future or on an alternative time line.
- A setting in outer space or involving aliens or unknown civilizations.
- A setting in other parallel dimensions.
- The discovery or application of new scientific principles, such as time travel or psionics, or new technology, such as faster-than-light travel or robots.
- Political or social systems different from those of the known present or past.

One may add the following crioteria also: SF often deals with:

- Man's attempts to evolve into a "superman"
- Advances in genetics
- Colonisation of other planets and even planets of other stars(suns)
- Parallel universes
- Abuse and misuse of science and technolgy
- Psychological breakthroughs

SF reaches for many other domains of imagination also.

Early SF

1. Let us first look at some early SF. Jules Verne (1828-1905) dreamed of a voyage to the moon and wrote an SF novel. When it was published in 1865, it was ridiculed as a poor form of literature, fit only for children and mad men! But this great work played a role in kindling man's imagination and man eventually reached the moon in 1969.

H.G. Wells (1866-1946) wrote an SF story about time travel—the "Time Machine", in 1895. Albert Einstein(1879-1955) has stated that the reading of this SF story of Wells during his childhood days helped him later to formulate his theories of relativity (1905 and1915) and to introduce the concept of time as a *fourth dimension* and to evolve the idea of a *space-time continuum.*

2. One of the finest examples of predictive SF is the article written by Arthur C. Clarke (1917-2008) in 1946 in a professional journal, "*Wireless World*". The article's title was "On the possibility of using

artificial satellites for communication purposes". At that time eyebrows were raised. Satellites? What? (Remember that the first artificial satellite Sputnik was launched only 11 years later, in 1957!). But in 1946, even highly informed people wondered:—Even if satellites were possible how could they be used for communication? The editor of the journal was even criticized for publishing such senseless papers! But now, can we think of a world without communication satellites?

The Golden Age of science fiction

The years from 1930 to about 1960 is regarded as The Golden Age of Science Fiction. During this period, writers like Robert Heinlein, Arthur C. Clarke, Isaac Asimov, James Blish Cordweiner Smith, Frederic Brown, Ray Bradbury and Brian Aldiss wrote SF stories that have lasting attraction for readers. Among these writers, Clarke, Asimov and Heinlein are often considered as the three Grandmasters of the Golden Age.

Arthur Clarke (1917-2008) for example wrote the famous novel "2001-A space odyssey". In this novel, Clarke tells us about an astronaut falling into a time warp and through a "worm hole" moves into other dimensions and becomes a Star Child (a kind of superman) and ultimately returns to earth and profoundly affects the destiny of all mankind. The reader is invited to conclude the verdict of the Star child as to what future man has! In another beautiful novel, called "Childhood's End", Clarke portrays humanity achieving the end of its childhood and maturing into real cultured adulthood and passing on to a state of super humanity and eventually merging into the cosmic consciousness.

Isaac Asimov (1920-1992) is a very different kind of writer. His 7 connected series of novels called "The Foundation Septet" imagines a future world when man has colonized all the habitable planets of our Milky Way Galaxy. These planets revolve around other stars (which are in fact like *suns* to those planets) in the galaxy. While it is true that, according to our present knowledge, only the Earth is habitable in the Solar System, it is conceivable that life may exist on other planets of other suns. Thus man has achieved Tsiolkovsky's dream. (The space science pioneer Vladimir Tsiolkovsky had said: "Earth is man's cradle; but no child can remain in the cradle for long!"). The Foundation novels are full of intrigues, adventure and may even qualify as science thrillers.

Isaac Asimov has also predicted and heralded the Age of the Robots. His SF invents "robots that can never turn against man", putting an end to the Frankenstein complex. Asimov's robots are ingrained with the Three Laws of Robotics in their brains. The laws are:

i) A robot shall not harm a human being, or, through inaction on its part, cause harm to happen to a human being.

ii) A robot shall always obey orders given to it by a human being, as long as such orders do not conflict with the First law.

iii) A robot shall always protect itself, as long as this protection does not conflict with the First and Second laws.

Let me just introduce some robot stories of Asimov to you:

a) Robbie. The story revolves around a semi-intelligent robot named Robbie. He has the intelligence of a 7-year old human child. He is purchased and given as a gift to Gloria as a "play-mate". Gloria is a middle class American girl. Oh, what complications gradually arise! Read the fine story yourself. You will find it in the anthology, "The Complete Robot"

b) Liar. Can intelligent robots lie? This brilliant story is woven around this question. (The story is available in "The Complete Robot). The reader will find that the First Law makes a robot actually lie to its masters!

c) In a later day robot story, Asimov imagines that America elects a Great President, named Stephen Byerley. During his rule, he unites all the countries of the world and a world government is set up. He then contests for the post of the World President. He wins; but a great psychologist, Madam Susan Calvin sees through his gimmicks. Byerley is a fraud! But Susan will never expose him! Why? Because, she is a *robopsychologist!* (God only knows, besides perhaps Asimov, what a *robopsychologist* is!) Susan Calvin knows that Byerley is not a man, but a humanoid robot. And Madam Calvin always said that she loved humanoid robots more than actual humans!

Robots are now being increasingly used in many industries (e.g. manufacture of cars, aeroplanes). Still, we are far from making Asimovian robots with intelligent brains, obeying the Three Laws! Such surprises may await mankind in future.

Robert Heinlein (1907-1988) is regarded as the third Grandmaster of the Golden Age of SF. He is also the senior most! His SF is remarkably realistic and almost free from the element of fantasy. His famous story "Blow-ups happen!" was written during the early period of the atomic age. It describes a nuclear reactor in such detail that the U.S authorities at first suspected that Heinlein got some secret information from the department of atomic energy. Later it was found that the story was based only on Heinlein's brilliant imagination!

The brave new world of SF

Modern SF embraces a variety of domains. For example, we have 'psychological SF', 'philosophical'. 'Religious SF', "hilarious SF','tragic SF' etc.

A good example of 'psychological SF is the brilliant story "*Noise Level"* by Raymond Jones. General Kallner is the top military boss of a country. He invites the nation's best scientists and engineering minds to come to a seminar. He presides over the seminar. First of all, he shows them a video clip. In the clip, a young man is seen adjusting some gadget. A small object is then seen apparently floating in air above the ground without any support. The General tells the scientists that the young man was an amateur inventor. He had come to see the General the other day and had demonstrated his gadget which he called an "Antigravity machine" (AGM). It is the AGM that caused the object hover above the ground unsupported!. But, as tragic fate would have it, the young man died next day in a car accident. He had left no information about how he made his AGM. The General has now invited the scientists to ask them to make an AGM. The scientists were deeply confused. Antigravity machine? Nonsense, said many. But the General had presented them with proof that the AGM was a *fait accompli*. It was actually built once by a young man. So the scientists must make it! Soon, some young scientists overcame their skepticism about the project, and after several months of hard work, managed to build one. But this machine is as huge and tall as a big building. Further it can only lift a small weight, a far cry from the elegance of the compact anti-gravity machine in the video clip. Yet, the breakthrough has been achieved. Now, it is only a question of improving the AGM. There is celebration all around. But then enters another scientist, a well-known psycholo-

gist, Dr Smith, accompanied by a young man. *My God, it is the very same young man in the video clip that was thought to be dead.* The young man apologizes to the confused and angry scientists, and says that he was only an *actor*, and that he played the role of the maverick inventor on directions from the psychologist and the General!.

The psychologist comes forward and explains that he was conducting an experiment of his own! Most people (including scientists) have 'mental blocks". For example, the scientists believed that it is impossible to annul gravity. So Dr Smith presented the AGM to them as an accomplished fact. He thought of this trick as a way to break the negative mindset. The story ends with the General musing about which was greater invention : the invention of anti-gravity machine itself OR Dr Smith's discovery that men could be made to achieve what was thought impossible by presenting it to them as a *fait accompli a*nd removing their " mental blocks"

I would like to refer you to other great SF stories by writers like Fred Hoyle, Cyril Kornbluth, Fred Pohl, Clifford Simak, Anthony Boucher, Avram Davidson, Poul Anderson, Ursula Leguin and others. These are available in SF anthologies listed below as References.

In India we have the great scientist of yester years, Sir Jagdish Chandra Bose, who also wrote SF in Bengali. We now have amidst us Dr. Jayant Narlikar, a great scientist, who has written good SF novels like "A Message from Aristarchus. He writes SF in English and Marathi.

In Kerala, we have writers like Konniyoor Narendranath, S. Sivadas, P. R. Madhava Panicker, P. N. Krishnan Kutty, G. R. Indugopan, K Prabhakaran Nair, K. K. Kurien, N.Suresh and many others, including the present author too. Yet, SF has to go a long way before it is acknowledged as a genre of literature in Malayalam.

Epilogue

No branch of literature can give you as much great intellectual enjoyment as SF. SF boggles your mind; it expands the mind and stretches it. SF is like Chess; you are an SF *fan*, or you are not! (You are a Chess Player, or you are not!). Let me conclude by telling you briefly an SF story centred on Chess Players, written in a lighter vein!

A chess game is on. Many chess masters are present to watch the game between two stalwarts. They are all well-known players. A robot, shaped like a big mouse, walks in and takes a seat and watches the game. The humans do not find anything unusual, because they know the robot and they also know that he is an expert chess player. But then, the secretary of the Chess Club, who is just an ordinary man and not a chess player, comes in and is surprised to find the mouse-robot sitting and watching the game. He shouts and orders the mouse-robot to get out. All the others are shocked and they tell the Secretary: "It is you who should get out! Our colleague (the robot here) is a chess player and he has a right to be here. We are all chess players here. You are not a chess player. You are *only a man*! Get out!"

So, are you an SF *aficionado* (a lover of SF)? If not, this article is not for you! *(I am only joking, you see!)*

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AS SIMPLE AS POSSIBLE, BUT NOT SIMPLER

R V G Menon

It was Prof. C G Ramachandran Nair, the doyen of science communicators in Kerala, who recounted this Einstein quote to me: "You must make things as simple as possible, but not simpler!" I think it could serve as a useful warning for all of us, who are engaged in science popularization.

Let me explain

Several years back, in the days of the Silent Valley agitation, the KSSP conducted several classes to make people aware of the relation between rains and forests. Naturally, the emphasis was on convincing the people that our copious rains would be affected if the forests were gone. Fortunately for the campaigners, that year turned out to be a drought year, and every one of the speakers grabbed the opportunity to drive home the point. "Look, what is happening! Our forests are being destroyed and nature is taking revenge!" The campaign, as everyone knows, was a huge success, and it is generally agreed that it was the Silent Valley campaign which generated a keen environmental awareness among the Kerala public. But as often happens, the very next year was blessed with copious rains, and people became sceptical about our exhortations. And that was the time when one of the most humourous MLAs of the Kerala Assembly asked quite innocently, "Does it rain in the Arabian Sea, because of forests?"

To be fair to the more scientific minded members of KSSP, it must be mentioned that quite a few of them were indeed uneasy about the simplistic approach of equating rainfall with the presence of forests. So, when the poetic minded campaigners chanted "*kaadillenkil mazhayilla!*" (No forests, No rains!) Dr A Achuthan, the incorrigible scientist, corrected them thus: "*mazhayundaakaan pala pala kaaranam; kaadathil ettam pradhaanamallo!*" (Many are the reasons

Ph.D., Veteran Environmentalist and Science Communicator. Former Director, ANERT, Govt. of Kerala and Professor, Electrical Engineering, College of Engineering, Thiruvananthapuram.
Address: Haritha, Kesavadev Road, Poojapura, Thiruvananthapuram-695012
E-mail: rvgmenon@gmail.com

for the rain, and amongst them forest is the most important!) But sad to say, the campaigners didn't find the new slogan catchy enough, and it failed to click.

In fact, this illustrates the dilemma often faced by campaigners and activists. As far as they are concerned, the most important thing is to reach the hearts of the people. For that, the message has to be simple and direct. There is no scope for subtleties or complexities there. The appeal is to basic emotions like love, hate or fear. Reason takes a back seat. This results in presenting things in a 'black and white' binary format. One side is obviously correct, and the other, obviously corrupted. The audience should have no confusion in deciding which side to take. Emotions are far easier to convey than facts and figures, and rational conclusions based on them. This is the simple and easy path.

But unfortunately, most issues are not so simple or straight forward, with the heroes and villains clearly mapped out and differentiated. Take for instance, the cutting down of some trees in the name of road widening, which happens frequently, these days. Normally, every tree loving, environmentally sensitive citizen is expected to rise in protest, and oppose any cutting down of trees, whatever be the justification. In fact, if you don't join the chorus of protest, your very reputation as an environmentalist might be in jeopardy! Fortunately, most of the times the case is clear and simple enough: the wrong trees being cut; or more numbers than are actually necessary; or alternatives not being seriously considered. But sometimes, the situation may be different too. The highway widening or the new construction might indeed be in public interest, and the cutting down of a few trees may be really be unavoidable. Or the alternatives, like rerouting, or settling for a narrower stretch, may be more harmful in the long run. It is then that the simple minded and emotional slogans, like "Down with the hand that cuts down trees" (*maram vettunnavante kai vettum*!) begins to bite back. It is almost as if we have become the prisoners of our own slogans. Instead of picturing tree cutting as some horrible sin, we should have educated the people about the value of trees in a scientific manner. We should also teach people about the difference between trees in a forest or in a fragile eco system, and the trees on the road side or in a compound, where they are a renewable resource. Even the role of trees in lessening the impact of global

warming has to be more critically explained to the people. There is a period when a tree grows, and it is then that it converts co_2 into food and stores some of the carbon in its trunk and branches, in the form of various organic compounds. After a particular stage, the tree stops growing, and then the co_2 that is taken from the atmosphere will be returned within a shorter time span, and its role in carbon sequestration will be minimal or negative. Once this is understood, the case should then be decided on aesthetic and practical grounds. True, the presence of trees adds to the beauty and coolness of a place. Its shade is a relief for us, and it is a refuge for all kinds of birds and insects. But all this can be compensated by planting more trees, and if possible, by nurturing the replacement long before the standing tree is cut down. As a matter of fact, planting, nurturing, cropping and replanting, should be done as part of a long term plan. Of course, we have to make exceptions in the case of natural forests, or other environmentally sensitive areas, where trees perform many complex ecological functions. But, extending the argument indiscriminately to all trees, is the over simplification that we have to guard against.

Even in the case of forest land, it is not as if we can take a rigid stand, admitting of no exemptions. Of course, most of us oppose large dams, which result in the inundation of pristine forest land or the eviction of large number of people. But here again, should we not be willing to examine the nature and extent of the forest that is destroyed, and the extent of economic and social benefit which accrues from the given project? One method is to do a cost – benefit analysis, and to check whether the benefits outweigh the costs significantly. The very concept of converting ecological damages into dollars or rupees, can be questioned. And rightly too. But we can accept it as a tentative beginning. Then we can make it more sophisticated by adding qualitative elements. Of course, we can hold that certain elements are non-negotiable, like the presence of threatened species or rare and valuable plants, irreplaceable biodiversity, etc. But all these must be properly examined and accounted for, before we take a decision either to imperil them or to leave them unmolested. Yes, it calls for a long and strenuous study and the gathering of a huge body of scientific information. But it has to be done. And until then, all judgments should be suspended, either for or against the project. Needless to say, it is the burden of the project proponents to make such a study and convince the sceptics about the validity of their claims.

But unfortunately, this is not what happens in our country. Even when the project is conceived, the proponents are convinced that it is in public interest, and that all those who oppose it are ill advised and ill motivated. Similarly, there are always some who have already made up their mind that the project is harmful and has to be opposed. What follows usually is a dialogue of the deaf, with very little communication or any real attempt to arrive at a scientific decision. This again, I would say, is the result of oversimplification of environmental issues. I suspect that we have tried to convey concern for the environment as a gut feeling or emotion, and not as a scientific understanding. It is a carry over from the days when we had an insufficient understanding of nature, and we tended to regard all natural phenomena as miracles and to worship nature as a goddess.

It is interesting to note that this initial blind reverence for, and total surrender to, nature was followed by a phase of conquest. We thought that we had mastered nature, and proceeded to upset the natural systems without any regard for the consequences. This was also a result of the over simplification syndrome, in the sense that we took a simplistic view of nature. We took into account only the first order impacts of our interventions, and neglected the complexity in nature. But now we know much more about the interrelationship of the various elements in nature and have learned to respect those relationships. Therefore we are able to correct our mistakes and proceed more cautiously. (At least, that is what we are supposed to do!)

But this does not mean that we know everything. Far from it. We still make mistakes. But we have learnt to recognize the limits of our understanding. That is why we insist that an Environmental Impact Analysis be done before every major project is approved, and are willing to even discard some projects, if their impacts are unacceptable. This calls for a critical approach, based on facts and reason. A reflexive approach, like “Forests are not to be touched” or, “Coasts are not to be disturbed” would be an over simplification of the issue, and will not be conducive to a rational evaluation of the costs and benefits. I am personally aware of a Micro Hydel Project, which had to be abandoned because some environmentalists objected to the diversion of a few cents of degraded forest land, with no trees in it, for the installation. It was a ‘Run of the River’ project with no storage, and would not have diverted any waters from the stream. True, it had a water supply component also, for meeting the drinking water

needs of 30 households. Yet a phobia was created saying that 'it would *affect*' the inflow into Malampuzha reservoir, and if the Malampuzha was *affected* it would *affect* the drinking water supply of Palakkad town, and also *affect* the rice cultivation in thousands of hectares of paddy land, etc., etc. How much water can 30 households drink, so as to affect the storage in Malampuzha reservoir? But, such calculations do not appeal to people. Instead of educating them to look at the causes and effects in a scientific manner, only a fear and distrust against all kinds of interventions has been conveyed to the people in the name of nature conservation.

The dangers of over simplification can be seen in our approach to many other environmental issues also. Even in the case of the Endosulfan disaster, the thrust of our agitation seems to be to get Endosulfan banned at the national level. Of course there is a strong case for banning it. But isn't it much more urgent for us to review the whole of our practices in handling chemical pesticides? We seem to be flouting all norms and precautions with impunity, in handling and applying pesticides. Banned pesticides are being sold, well accepted procedures and protocols are violated, and there is no mechanism to check or control all these. What we need is not an emotional outburst against the use of pesticides, but a rational approach to the proper handling and application of all dangerous chemicals. Here also, picturing Endosulfan as the villain, is an over simplification of the issue and will be a hindrance in developing a scientific approach to the problem. It will divert attention from our real failures and deficiencies. They will remain with us and will again surface in the form of some other disaster, with a new villain.

Yes, I think this is a danger that all science popularizers and activists should guard against: don't make things so simple, as to create the impression that things are really so simple!

WHAT AILS SCIENCE JOURNALISM IN INDIA?

Subash Kuttan

Abstract

The arena of mass communication in our nation has firmly established itself. One of the recent trends is the development of specialised areas of mediated communication, mainly based on thematic classifications .All branches have not attained the same level of growth. The branch of Science Journalism is yet to become popular in the Indian media scenario, in spite of the fact that dissemination of basic scientific news and information is essential for socio-economic development.

The study critically analyses the factors which impede the growth of Science Journalism in our environment.

A glance at the content portrayed in our print and visual media amply reveals the pathetic neglect of science news and information.

Too much of obsession with spicy political news is a major reason for media columns to be devoid of sufficient quantity of scientific information. In the midst of the media war to catch more readers and viewers our newspapers and TV channels are tempted to practise sensationalism in the depiction of events.

Due to increase in the onslaught of commercialism media organisations may be constrained to give least priority to science content or else allot only a negligible slot for it.

The paucity of popular science journals to act as really potential channels of science communication is pointed out in the paper.

An evaluation of course content reveals that Science Journalism as a branch of study is yet to achieve due recognition in conventional Journalism training programmes.

Research in science communication in the country has not made a mark, both quantitatively and qualitatively. Communication

Ph.D., Professor and Head Dept. of Communication and Journalism
University of Kerala, Karivattom Campus, Thiruvananathapuram
E-mail: subhash.kuttan@gmail.com

scholars have to take up studies to mould science communication research systematically, the study suggests.

It is observed that lack of specialisation among media personnel is an often felt impediment in science reporting. To overcome this shortcoming, soft skills required for producing comprehensible science reports can be imparted.

The suggestion put forward is that the existing media priority with regard to selection and dissemination of news and information should change to boost the practice of Science Journalism. Media commitment is required for a content shift oriented towards science coverage of pertinent issues with a focus on social welfare. Commercialism, sensationalism and obsession with trivialities should not deter the mass media from allocating space or time for science communication.

Media practice in our country has attained a stage of growth. It is poised to grow further in the coming decades. Technological up gradation and adoption of innovative practices could strengthen our media industry to steer through tides of tribulations. The journalistic profession has emerged as a major avocation for our educated youth to serve.

In the midst of its development, the noble profession has branched out into various areas of specialisation which itself is a sign of growth. Many branches of journalism have achieved their own identity based mainly on the nature of events covered, treatment of subject and style of presentation. Some glaring areas of specialisation have matured as Economic Journalism, Sports Journalism, Political Journalism, Film Journalism, Development Journalism, Agricultural Journalism, Science Journalism and others.

As the arena of mass communication spreads its wings due to its surveillance, more areas of specialisation based on thematic classifications emerge out slowly. Accordingly, now we have relatively upcoming branches like Auto Journalism, Defence Journalism, Fashion Journalism and so on. An assessment of the status of different branches of media practice in our nation clearly reveals their lop sided growth.

Branches like Sports Journalism and Economic Journalism have grown as exclusive domains of mass media. At the same time

some branches are yet to establish themselves as popular stream of mass communication. Science Journalism is a genre of this nature which has not yet become popular in the Indian media scenario in spite of the fact that it deserves more attention both from the media and the public. Interestingly, society's existence and progress depend on the growth of science and its popularisation.

The role of Science Journalism in popularising scientific temperament among the masses is often highlighted by media watchers and social critics.Disseminating basic awareness on day-to-day scientific developments is essential for democratising information in a society.The dissemination of fundamental scientific information can eradicate superstitions and wrongly held views which thwart the socio-economic development of a nation. It is obligatory on the part of mass communicators to impart needful scientific information to the common man. The mass media can play a great role in facilitating scientific growth leading to economic prosperity.

A glance at the Indian media scenario can unambiguously reveal the lack of efforts to mould Science Journalism as a popular form of mass communication. Media organisations which own big newspapers and television channels seem to devote less attention in spreading science communication among the masses, in comparison with other forms of news and information. In terms of reach and spread among the public, science communication is at a low ebb in our nation.

Actually, what ails Science Journalism in our nation? The answer rests on an edifice of multiple factors which thwart the growth of this specialised field of human knowledge.Media professionals who are socially committed should ponder over the dismal status of this area of mass communication.The reality that Science Journalism in India is yet to achieve a solid base for growth at a time when we are on the threshold of becoming an economic power to reckon with should motivate media scholars to search for the shortcoming.

The present status of Science Journalism in the third world countries should not make us complacent .If we make a comparison of the overall growth of mass media in our country with other developing nations, surely we stand ahead.This is visible in the adoption of new communication technology as well as modern professional

skills.In these aspects there is no need for hesitation to compare our media environment with that of economically advanced nations. Strikingly, we enjoy a high degree of press freedom among the less privileged nations. Of late, our mass media is becoming more assertive in playing the role of a watch dog. But then what makes Science Journalism not that popular in our society? An array of conditions amply demonstrate that Science Journalism in our country is yet to achieve a popular level of practice.

A glance at the content of Indian newspapers can reveal the pathetic neglect of science news and information which the general public should get. Our media columns are devoid of sufficient number of science stories . An often observed fact is that our newspapers are obsessed with raw politics. Content analysis studies done by various media researchers have shown that our daily news papers devote maximum space to political news.This obsession with politics is true with visual media also. Any day's news telecast by networks have more number of political news than other types of news.In the run after spicy political news, journalists tend to forget or neglect many useful events, the reports of which would be beneficial to the common man.

The display of too much of sensational news is an often quoted accusation levelled against our mass media.In the course of the circulation war our newspapers are tempted to go after highly sensational events or incidents with a view to catch more readers.Trivial sensational stories are overplayed to strike at the emotions of the people. Of course, science news may not provide scope for sensationalising and as such media personnel may be constrained to leave them out.

Sensationalism is visible more in the news aired by visual media. As the number of channels is on the increase, the ensuing competition to win the attention of the viewers is more.To get more viewership rating which in a way will bring in more advertisement revenue for the channels, depiction of sensational type of news becomes inevitable. This commercial undercurrent prompts the media houses to give priority to news or programmes which are titillating and spicy. In the rush for such events media shows scant interest in covering science related events.

When commercially successful programmes become the objective, our television networks give least priority to science

programmes. This attitude gets reflected in beaming more of entertainment oriented popular programmes. Most of the popular programmes in all regional languages provide maximum slot for film based entertainment content and science programmes seldom receive any importance. As the onslaught of commercialism is on the increase, the trend is rampant with national channels in English also. May be a few of them allot negligible time slot for information on science and technology. If the print and electronic media in our country take initiative in depicting more number of science news or information at the cost of risking commercial gains, the branch of science communication can be popularised to some extent. However, the science content in conventional media at present is not sufficient to sensitise the common media consumer in our society.

Our TV networks should encourage the production of popular science programmes to educate the masses on vital issues which affect their lives. For instance, on a really significant and time relevant issue like environmental protection, basic knowledge can be imparted to the common folk through well produced television programmes. Instead of visual media being a provider of only entertainment programmes, the role of a catalyst in social change can be ushered in by disseminating basic scientific knowledge needed for the welfare of human beings.

We have a paucity of popular science journals which can act as powerful channels of science communication. This is in contrast with the mass communication situation in the developed west. The strength of a discipline is reflected much on the availability of exclusive publications in that area.If that being the fact, Indian media scene lacks sufficient number of popular science magazines or other periodicals having the objective to inculcate scientific temperament in the minds of the people. The presence of scant number of journals in a few languages in our country which aim at popularising science or spreading the message of science have only limited reach in terms of circulation and readership. Curiously, well established media groups in different states do not show interest in bringing out quality journals for popularising science communication. The attempts by some non-commercial voluntary organisations to publish popular science journals are laudable,but resource crunch is their major impediment which negatively affects their impact.

Basically, we have a plethora of educational institutions which impart training in mass communication. The thrust of most of the academic programmes offered by our universities and other institutions is to equip the students to take up media jobs in the print and electronic sector. The syllabi and course content of mass communication courses are framed with this major objective. However, the syllabi of a few institutions offer scope for orientation in science communication or Science Journalism. A realistic introspection of these courses reveal that the science communication content is not conducive enough for creating a motivation among the media students to take up career in Science Journalism. As a branch of study Science Journalism has not yet achieved due recognition in conventional journalism training programmes. Only a very few teaching departments in Indian universities offer exclusive programmes or courses in science communication leading to a Bachelor's Degree or a Post-graduate Diploma.However,these programmes need to be publicised for attracting really interested youngsters who may be committed in popularising science communication.

Communication experts have the opinion that communication research in India is still at an infant stage.It is yet to mark growth both quantitatively and qualitatively. Inevitably, this condition gets reflected in the arena of research in science communication which is practically nill.Media scholars have to address this problem and initiate research oriented studies to build up the branch of science communication systematically.The development of any branch of knowledge depends on research output and as such communication researchers should venture to carry out studies in science communication.

A major problem pointed out by media organisations themselves with regard to Science Journalism is the lack of specialised personnel who can do reliable science reporting. In most of the situations science related events are reported by journalists who cover all types of incidents ranging from politics to sports. But science communication is an area which requires a little bit of specialisation to bring out really accurate reports.Basic knowledge in science is indeed an advantage for media men who are assigned the task of covering scientific developments and meetings. There is no need to have highly specialised knowledge in all branches of the wide spectrum of science. It is just enough to have a fundamental awareness of the world of science to aid a journalist in carrying out his duty without

flaw. Expecting deep knowledge in science and technology on the part of all media personnel is quite illogical.

A primary responsibility of science communicators is to interpret the implications of developments and issues in the world of science. Majority of the people may not be able to comprehend the implications or consequences of scientific breakthroughs. Hence, the responsibility lies with science writers and reporters to communicate effectively the meaning of scientific knowledge, in a language understood by common people. If there is any communication barrier which impedes the understanding of the information, that has to be removed. If we want to elicit people's attention towards science communication, the content or message should be interesting. Experienced science writers know that uninteresting messages will not motivate people to pay attention.

To over come the shortcoming in specialisation among the personnel, concerned media houses can organise short term in-service programmes with the help of institutions which offer orientation in science communication. In such workshops essential skills to create science reports comprehensible for common people can be imparted. The service of seasoned science reporters and editors can be made use of in giving a proper orientation to cub reporters who are interested in science communication. NGOs and voluntary organisations interested in propagating scientific awareness among the public, especially for social causes like environmental protection,prevention of communicable diseases, eradication of superstitions etc. can provide inputs for these type of programmes. Exposure to skill development needed for effective science communication through print and visual media can facilitate the production and dissemination of qualitative messages.

Media men have a social responsibility to make the common people aware of basic but pertinent issues which have a bearing on the life on the planet. Through portrayal of media content, people have to be sensitised on disastrous issues like Global warming ,climate change, depletion of natural resources etc. to create positive changes at the cognitive and behavioural levels. Journalists should make an introspection regarding the present status of coverage of life threatening vital issues appearing in media columns. The objective must be to create an adequate science coverage for disseminating proper awareness among the media

consumers. To achieve this, media personnel themselves have to comprehend the significance of specific problems which have real scientific dimension.

To give a boost to Science Journalism we need a change in the existing media priority regarding selection and publication of news and information. The focus on commercial interests and obsession with sensationalism may not disappear from media at one shot. However, if committed media groups take the initiative to create a content shift oriented towards social welfare, inevitably science will get due focus. But the present reality is that really pertinent scientific issues are not often assessed seriously and they escape media's attention. This situation denies people the access to beneficial science communication.

All media units cannot be expected to devote the same level of attention to science communication. If institutional support is extended, dedicated personnel will be motivated to indulge in collection and dissemination of information emanating from the world of science. As mentioned, priority for commercialism, thrust on sensationalism and obsession with trivialities may deter the allocation of space and time for socially beneficial science communication in print and visual media. A sound determination and commitment primarily on the part of media planners and owners is called for to facilitate an environment conducive for the popularisation of science communication.

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ENVIRONMENT AS A NON-ISSUE: THE STORY OF SOME LEADING INDIAN NEWSPAPERS

Silajit Guha

The conflict between protection of environment and sustaining the growth of industrial development has become an indelible part of the dominant discourse of the political economy. Media as a significant contributor to manufacturing of public consent (Lippmann, 1922) has a critical role to play in the continuance of the ongoing debate. At a time when environment related issues have started hitting the headlines yet again thanks to an active union environment minister, it is important to understand how and when major Indian newspapers decide to frame environmental news in their pages. Media all along have been accused of being driven by "spasmodic recurrence of events"(Downs,1972,pp 28)when it comes to reporting environment, but from a media watcher's point of view, most important point happens to be the average news hole accorded to environment at any given moment. According to Downs (1972), mass media coverage of environmental stories tends to reinforce a cyclical pattern. Dramatic turn of events catch media attention, as had happened with the appearance of celebrities in *Narmada Banchao* movement, but after a time the special interest groups feel threatened by media coverage and general public may lose interest after the drama is over and the media begin to look for newer issues to retain their audience base.

But McCommas and Shanahan(1999) argue that Downs' argument may be compelling but it ignores the role played by narrative factors in the construction of an issue. A content analysis of The Washington Post and The New York Times of news on Global Climate Change helps them to infer that narratives constructed about an issue with a clearly defined beginning, middle and ending moves generally in a one directional 'temporal fashion' (Mc Comas & Shanahan, 1999 PP 32). Their study concentrates on media attention rather than Down's theory on public attention which is basically linear (Hilgartner and Bosk 1988). They criticize Downs's theory as too linear and favouring a natural history approach. According to them,

Assistant Professor, Department of Mass Communication, Assam Central University, Silchar, Assam E-mail: silajitguha@gmail.com

social problems, instead of moving in linear progression from one stage to another can exist simultaneously in many stages of development. They contend that Downs ignores the interrelation between coexisting problems and a problem's lifecycle depends less on public attention and more to problem's construction in public forums such as media (Hilgartner and Bosk, 1988).

Hansen (1991) has also criticized this kind of linear perspectives, arguing media is just one of the factors contributing to an issue. He contends that it is extremely difficult to ascertain why issues 'fade in and out of focus', why some remain relevant and others not. Hansen is in favour of focusing more on the issue rather than media coverage because it illustrates how the wider 'cultural givens' and 'cultural resources' help privilege the advancement of some issues and not others' (P 454).

A systematic reading of the newspapers, articles, scientific journals and books by Ungar (1992, 1995) reveals that social events followed attraction as had happened in 1988 as U.S. experienced an exceptionally hot summer in the year which triggered a proliferation of reaction on global climate change. The dangers of pollution and climate change, greenhouse gas emissions had as usual existed before that also, but the experience of the summer forced the people to include greenhouse related terms part of their mutual vocabulary. He argues that as these events are transient by nature, the discussions about climate change that acquired a celebrity status soon lost its sheen with the passage of time. Thus public attentiveness to environmental issues increases when the issues piggyback on actual events that force the issues in public consciousness (Ungar, 1992).

In the backdrop of the argument that environment issues follow a narrative pattern in terms of hitting the headlines or media is only one of the many contributing factors in bringing environment on public scanner, the researcher felt it of paramount importance to delve deep into the fact to determine whether it really is a valid argument or not in terms of some leading newspapers in India. It is also important to asses the validity of the growing perception that environment and news relating to environment have earned a regular presence in terms of news hole in Indian newspapers in recent times.

Objective of the Study: The primary problem to be investigated here involves how *The Times of India, Indian Express* and *The*

Telegraph covered environmental issues over a span of five years in the first decade of twenty first century in India, and how that coverage relates to global concerns relating to environment. The purpose of this study was also to examine print medium coverage of environmental issues from 2003 to 2007; to point out significant trends and differences in coverage pattern of the newspapers under discussion.

A secondary purpose was to investigate in some detail how *The Times of India, Indian Express* and *The Telegraph* covered an important, emerging issue.

Research Frame: It is important to state for purposes of later data analysis that once a decision was made as to the time frame for the study, all environmental articles in *The Times of India, Indian Express* and *The Telegraph* were coded. Thus, the media content studied constitutes more of a census than a sample in the strictest statistical sense.

The inquiry focused on the following questions:

1. From 2003 to 2007, the period during which the environment emerged as an issue of significant national concern, how much coverage did *The Times of India, Indian Express* and *The Telegraph* devote to the environment? Did this coverage vary over time?

2. What kind of emphasis did *The Times of India, Indian Express* and *The Telegraph* place on environmental coverage as measured by placement of articles above or below the fold? Did this measure of emphasis vary over time?

Methodology: A descriptive research method employing quantitative tool was used to arrive at some systematic and credible findings. A content analysis methodology was employed enabling an objective, systematic, quantitative description of the content and assessment of the relative extent to which specified references, judgments, attitudes, or themes permitted the items to analyse 455 newspapers.

The study begins in 2003 with the collection of news, articles and features of *The Times of India, The Telegraph* and *Indian Express* articles. All environment related articles, news items were collected over a selected 30-day period, selected purposively, in every year from 2003 to 2007.

These three newspapers were selected with a view to understand the importance of Environmental News in the Agenda Setting

Newspapers of the nation. These newspapers are called agenda setters because *The Times of India* happens to be the most widely circulated English newspaper of the nation with an unquestioned hold over the imagination of its readers all over the country. *Indian Express* was chosen because it constitutes the bedrock of issue based journalism in India, its unflinching dedication to investigative and agenda setting journalism remains unchallenged thus far even taking *The Hindu* into consideration. *The Telegraph* was chosen because it is unquestionably the number one newspaper in the Eastern and Northeastern part of India and the researcher, also is, incidentally based in Northeast, an environmentally fragile region.

For the purposes of this study, an environmental story was defined broadly to include any news story, editorial, or column that has as its primary focus some aspect of the global, national, regional, or local environment. This could be primarily a political story about the need for government action to foster clean air or water, a science story having to do with a study revealing health threats from a particular pollutant, or virtually any story one would expect an environmental beat reporter to cover. It also included a few business stories, which primarily dealt with the economic impact of pollution, and a few legal stories, which dealt mostly with prosecutions for environmental crimes or Supreme Court rulings involving environmental legal disputes. The unit of analysis for this study was the article or story. Photographs and graphics were coded separately, although the presence of related artwork was taken into consideration in calculating the length variable. The stories which have hinted at an impending policy decision or tried to break a news or brought into focus some neglected news have been termed as pro-active stories. The opinion pieces have also been clubbed under the same category. The news items which have merely reported a newsworthy event, however serious, have been categorized as reactive. The researcher has applied both parametric and non-parametric statistical treatments to collected data on Excel sheet. Since this was basically a trend study, non-parametric statistical measurements like ANOVA, Chi-square test were applied to determine the trends while Parametric tests like regression analysis was applied to ascertain the exact degree of increase or decrease of environmental space in three newspapers under discussion or their relative significance vis-à-vis other three components in the newspapers like total print space, space for

news (news hole) and space for advertising, comic trip, horoscope and letters to the editor together or to be precise, the non-news space in the newspapers.

Quantitative aspects

Measures of prominence:

- Frequency of reporting
- Page of item
- Location in page (upper and lower fold, left or right quadrant)
- Photo space

CSH	=	Advertisement, comic strips, cartoons, horoscope section, letters to the editor.
SFN	=	Space for n ews or news hole . It was brought out by subtracting CSH from total print space.
TPS	=	Total print space, which is the addition of CSH and SFN.
ES	=	Environmental stories.
EP	=	Environmental photographs. Sometimes they didn't have any story tagged with.

Data Analysis: The data shows that the news related to environment has failed to get any significant space vis-à-vis total print space, space for news and the space for advertisement, comic strip, horoscope, and letters to the editor or the non-news print space in all three newspapers during the period as revealed by *ANOVA* Test and Chi-square test though there was a variation among the treatment of different newspapers overtime and even at any given time.

The study shows that *The Telegraph* had maximum amount of total print space as well as print space allotted to news-editorial-articles, but it has spent lowest amount of print space for news and photos related to environment.

The Times of India had spent second highest amount of print space on non-news space in absolute measure but had given highest print space to environment related issues among the three newspapers.

However, since *Indian Express* has lowest total print space, space devoted on environment related news-articles comes highest in that newspaper as a percentage of total print space.

ANOVA

Sum of Squares	df Mean Square	F	Sig.				
EN	Between Groups	376735.623	92 4094.952	.806	.894		
	Within Groups	1830097.606	360 5083.604				
	Total		2206833.228	452			
SFN	Between Groups	931740825.662	92 10127617.670	20.44 0 .000			
	Within Groups	177877001.813	359 495479.114				
	Total		1109617827.476	451			

Table: 1.1

An *ANOVA* test was conducted to find out the relative significance of environmental news, EN(environmental news and environmental photos taken together) in comparison with SFN(space for news or the news hole). The test reveals a depressing picture as EN was found to be insignificant with an **F statistics** of **0.806 vis-a-vis** SFN. SFN or news hole in more popular terms is basically the accumulation of all news items in the newspapers excluding environmental news and Photos. SFN was found after deducting the space given to CSH (letters to the editor, comic Strip, horoscope, advertising space) from total print space of the newspapers, i.e. the space from below the Masthead to the borderline in the lower half of the newspapers. SFN or news hole quite expectedly stands significant at **20.440** at **0%** level implying validity in **100** newspapers out of **100** newspapers of the sample period.

A chi-square test was undertaken to ascertain the frequency of appearance of Environmental News and Photos together in the three newspapers under discussion. The number of stories and the space awarded to them during the study period were put together for each newspaper and were calculated against Space for News,(SFN) to find out whether compared to other news items in the newspapers put together, Environmental News(EN) has got a specific and frequent existence or not.

Year SFN as a % of TPS	EN as a % of SFN	
2003	68.76*	0.56
2004	64.99*	0.14
2005	51.86*	1.75
2006	46.05*	1.48
2007	65.25*	0.69

Table: 1.2 *Indian Express*

[Note: * implies the value is significant at 1 percent level (The table value of chi-square with 1 degree of freedom for 1, 5 and 10 percent level of significance is 10.88, 5.02 and 2.71 respectively)]

The result of chi-square test as revealed by Table 1.2 is that the frequency of appearance of EN (environmental news and environmental photos taken together) vis-à-vis total space awarded to news only (SFN) is insignificant in all the years during the period of study at 1.5 and 10 percent level of significance with 1 degree of freedom. The table rather reveals the relative fluctuation of space given to Advertising space, comic strip, horoscope, letters to the editor because SFN is the space one gets by deducting CSH(advertising space, comic strip, horoscope, letters to the editor) from total print space(TPS). One has to remember that space given to especially comic strip, horoscope and letters to the editor remain static in the newspaper with minor variation in letters to the editor space while there is always a great deal of variation in advertising space . The fluctuations in the second column are largely the outcome of variations in the advertisement space depending on the newspaper's ability to arrange advertising revenue.

Year	SFN as a % of TPS	EN as a % of SFN
2003	58.52*	0.40
2004	62.99*	0.63
2005	55.37*	0.48
2006	58.95*	0.27
2007	57.90*	0.24

Table: 1.3 *The Telegraph*

[Note: * implies the value is significant at 1 percent level (The table value of chi-square with 1 degree of freedom for 1, 5 and 10 percent level of significance is 10.88, 5.02 and 2.71 respectively)]

The chi-square test for The Telegraph reveals almost the same trend. Environmental News or EN is insignificant vis-à-vis SFN or space for news at 1, 5 and 10 percent level of significance with 1 degree of freedom. In case of The Telegraph the EN has much lower percentage of space for news as compared to Indian Express. The figures in the second column of graph 1.3 also reveals that The Telegraph, irrespective of where it is being published from, tends to have almost the same percentage of advertising.

Year	SFN as a % of TPS	EN as a % of TSN
2003	46.87*	0.78
2004	52.45*	2.18
2005	61.90*	0.71
2006	46.15*	0.42
2007	40.09*	0.60

Table: 1.4 *The Times of India*

[Note: * implies the value is significant at 1 percent level (The table value of chi-square with 1 degree of freedom for 1, 5 and 10 percent level of significance is 10.88, 5.02 and 2.71 respectively)]

In case of The Times of India, the frequency of environmental news or EN remains insignificant as well vis-à-vis SFN or news hole at 1,5 and 10 percent level with 1 degree of freedom. In case of The Times of India, only in 2004 the frequency of EN comes quite close to level of significance which implies a slight better coverage pattern than other two newspapers under consideration.

A regression analysis was undertaken to ascertain how far environmental news would increase or decrease if there were some additional space in the newspapers under consideration. The space for EN(environmental news and photos together) was put to regression analysis to find out their relative importance vis-a –vis total print space and space for news or the news hole. All the results found are significant at 0% level, i.e. they hold true for all newspaper samples under discussion during the period of study.

Dependent Variable: LOG(EN)
Method: Least Squares
Date: 02/07/08 Time: 17:33
Sample(adjusted): 17 143
Included observations: 18
Excluded observations: 109 after adjusting endpoints
Convergence achieved after 3 iterations
White Heteroskedasticity-Consistent Standard Errors & Covariance

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(TPS)	0.406642	0.019441	20.91677	0.0000
AR(1)	0.115312	0.159286	0.723929	0.4796
R-squared	0.037514	Mean dependent var		3.777061
Adjusted R-squared	-0.022642	S.D. dependent var		0.529678
S.E. of regression	0.535641	Akaike info criterion		1.693735
Sum squared resid	4.590585	Schwarz criterion		1.792665
Log likelihood	-13.24362	Durbin-Watson stat		0.793527
Inverted AR Roots	.12			

Table: 1.5 *The Telegraph*

In case of The Telegraph where two editions, namely Calcutta and Guwahati editions were taken into account, the regression analysis shows some variations when editions were taken in isolation and when taken together. Both editions of The Telegraph taken together show an increase of 40% of existing Environmental News and Pictures if there is an increase of 100% in Total Print space of The Telegraph.

TOI-03-07

Dependent Variable : LOG(EN)

Method : Least Squares

Date : 02/07/08 Time : 17:38

Sample (adjusted) : 3 146

Included observations : 33

Excluded observations : 111 after adjusting endpoints

Convergence achieved after 3 iterations
White Heteroskedasticity-Consistent Standard Errors & Covariance

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(TPS)	0.482702	0.023389	20.63801	0.0000
AR(1)	0.502094	0.139136	3.608660	0.0011
R-squared	0.287962	Mean dependent var		4.343287
Adjusted R-squared	0.264993	S.D. dependent var		0.707435
S.E. of regression	0.606502	Akaike info criterion		1.896474
Sum squared resid	11.40318	Schwarz criterion		1.987171
Log likelihood	-29.29182	Durbin-Watson stat		1.787043
Inverted AR Roots	.50			

Table: 1.6 *The Times of India*

The regression analysis shows that The Times of India over a span of five years and all thee editions taken together, shows a likely growth of environment news by 48% if there is an increase of Total Print Space by 100%.

IE 03-07
Dependent Variable: LOG(EN)
Method: Least Squares
Date: 04/18/09 Time : 14:01
Sample (adjusted) : 2 149
Included observations : 53
Excluded observations : 95 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(TSN)	0.506193	0.013575	37.28922	0.0000
R-squared	-0.199166	Mean dependent var		4.245611
Adjusted R-squared	-0.199166	S.D. dependent var		0.754589
S.E. of regression	0.826324	Akaike info criterion		2.475028
Sum squared resid	35.50618	Schwarz criterion		2.512203
Log likelihood	-64.58823	Durbin-Watson stat		2.511997

Table: 1.7 *Indian Express*

A regression analysis of the total print space related data and environmental news related data of five years shows that in case of Indian Express, if there was an increase of 1 (One) in TPS of

newspaper, there would be an increase of 0.48 of in its existing pool of environment news. To put it in simpler terms, if on an average day, Indian Express' Delhi Edition increased its pages from normal 16 Pages to 32 Pages, it would have nearly 48% more environmental news than what it printed in a 16 page newspaper during the period of study.

TOTAL NEWS PAPER 03-07

Dependent Variable : LOG (EN)

Method: Least Squares

Date: 02/07/08 Time : 17:53

Sample (adjusted) : 3 448

Included observations : 73

Excluded observations : 373 after adjusting endpoints

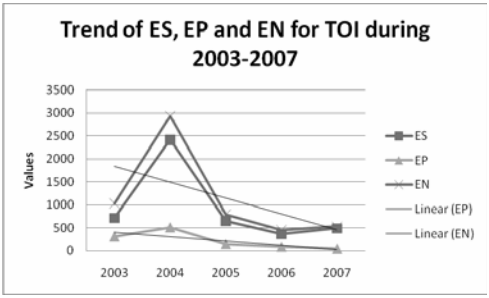
Convergence achieved after 3 iterations

White Heteroskedasticity-Consistent Standard Errors & Covariance

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(TPS)	0.462519	0.012337	37.49187	0.0000
AR(1)	0.190341	0.112928	1.685504	0.0963
R-squared	-0.014079	Mean dependent var		4.209337
Adjusted R-squared	-0.028362	S.D. dependent var		0.750447
S.E. of regression	0.761015	Akaike info criterion		2.318688
Sum squared resid	41.11922	Schwarz criterion		2.381440
Log likelihood	-82.63211	Durbin-Watson stat		1.232483
Inverted AR Roots	.19			

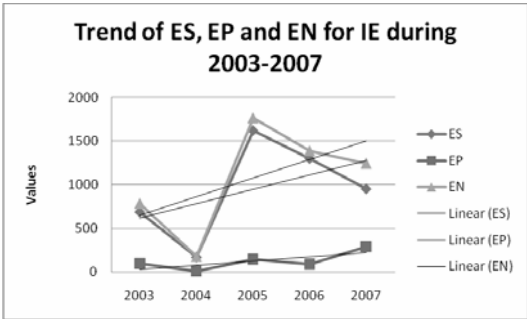
Table: 1.8 *Total Samples*

When all the sample news items collected during the study period were put to regression test, the regression coefficient turned out to be 46. This parametric test reveals that all newspapers under the discussion, namely, The Times of India, Indian Express and The Telegraph, irrespective of their editions would have 46% more space for environmental news than what it printed during the study period if there was an increase of 100% in their total print space.



Graph 1.1: *TOI*

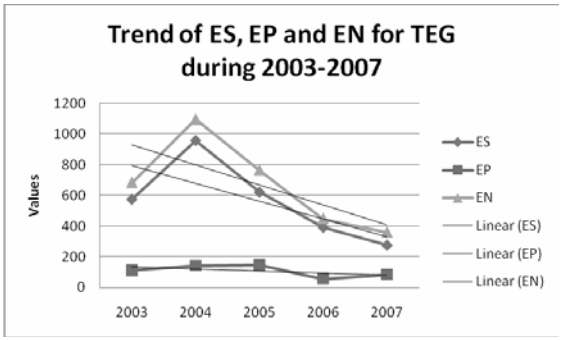
The graph 1.1 shows the trend of coverage of environmental stories,(ES) environmental photographs(EP) and EN stands for the addition of both environmental news and environmental photographs. The graph shows how the coverage pattern reached its climax in 2004, the year of general election in the country, in its Kolkata edition, the early days of the newspaper in the city. The trend took a nosedive in the same edition in 2005. Mumbai edition of the newspaper showed no special upward turn in 2006 while in 2007, the Guwahati edition of the newspaper showed a slight upward trend, or rather the correction of the downward trend.



Graph, 1.2: *Indian Express*

The trend graph shows that contrary to The Times of India, Indian Express registered a reverse trend in the year 2004. Rather in the year 2005, they reached the zenith of their environmental activism. The graph records a downward trend in succeeding years but even then it never really goes down beyond the coverage recorded in

2004. Rather they have maintained a moderately regular standard every year except for 2004.



Graph 1.3: *The Telegraph*

The graph 1.3 registers the trend of coverage pattern in The Telegraph for the period of 2003-2007. The Telegraph also records its highest coverage in 2004 in its Kolkata edition. It records a sharper downward trend afterwards in its Kolkata edition in comparison with The Times of India, Kolkata edition. The important aspect of this trend card is that Guwahati edition of The Telegraph shows a marginal increase in printing environmental photographs in 2007 compared to its Kolkata edition in 2006 while environmental stories covered by The Telegraph in 2007 in its Guwahati edition registers a downward trend compared to 2006 Kolkata edition.

Major Findings: The data tables have revealed that environmental news has to cross many miles before it becomes a separate and independent item in the newspaper. It's a fact that parametric tests like regression analysis and correlation tests have been able to delineate the picture in more concrete terms about the state of affairs of environment news in the newspapers under discussion. The ANOVA test quite unmistakably reveals that there is a near absence of editorial policy so far as accommodating environmental news as an inseparable part of newspaper content is concerned. Environmental news has become a reality in the newspapers, it appears time and again; sometimes there is a conscious effort also on the part of the newspapers to make an agenda of an issue, as has happened with *Indian Express* on animal poaching and the need for conservation of animals during the period of study or for that matter with *The Times of India* during the whole period of the study on the issue of global

warming and climate change. But so far as the existence of environment as a serious beat like sports or politics is concerned, the ANOVA Test has failed to determine it as a significant specific news item in the pages of agenda setting newspapers under discussion during the period of study.

Chi-square test also reveals the insignificance of environmental news. As a whole it reaffirms the result of ANOVA that the appearance of environment news is at best a sporadic phenomenon. It portrays, irrespective of newspapers under discussion, an absence of editorial policy on the allotment of space to environmental news.

Indian Express, among three newspapers under discussion, tries to give space to environment but it has a tendency to sacrifice environment news at the altar of other news which it considers as more serious news.

In case of *The Telegraph*, it is unarguably the most insensitive newspaper in terms of environmental news.

So far as *The Times of India* is concerned, the newspaper has been able to develop an editorial policy regarding environment news. They have a policy to accommodate environment news which they treat as significant. Across the editions, they have been able to accommodate environment news and more importantly the newspaper has the ability to understand that environment matters whether as a life style issue or as a tool to fill in the space.

The regression analysis being a parametric test has been able to reveal that the increase of environmental content in terms of space given to it during the study period in all three newspapers under discussion is significant.

The Indian Express would have nearly 50% increases in its environmental content if there were an increase of 100% in space for news during the study period.

In case of *The Times of India*, it was even more at 52% vis-à-vis space for news during the study period across the edition.

The increase in *The Telegraph* would have been much lesser than the rest two but it would have also accommodated a considerable portion of environmental content and it was as high as 46% in case of 100% increase in space for news and at the same time it was also much less than the expected increase of 49% when three newspapers were taken together for consideration.

Another significant aspect in case of Northeast edition of *The Telegraph* during the study period was that there would have been more increase in environmental content if there were an increase in total print space which includes advertisement space also. But when it comes to measure the significance of environmental news vis-à-vis space for news is concerned, *The Telegraph* would accommodate environmental news only if there were additional space because of advertising.

In case of *The Times of India*, the phenomenon would be reversed. The Northeast edition of *The Times of India* would have less increase in environmental news than their average increase across the editions and also than their Mumbai and Kolkata editions, but the increase was higher vis-à-vis space for news than the increase vis-à-vis total print space turning environment as an issue serious enough to be accommodated even at the cost of sacrificing other news.

So far as the increase in environmental content vis-à-vis space for news was concerned, *The Times of India* has been found to have the highest increase among the three newspapers under discussion making it a newspaper with an eye for environment. But one has to remember that the significance of regression coefficient is limited to the increase or decrease of environmental news vis-à-vis the presence of environmental news in the newspapers under discussion during the period of study. The increase was only in terms of existing news space because as a separate entity, environment news has been found to be insignificant by all other statistical tests; both parametric and non parametric, applied to the collected content during the period of the study.

The study reveals that there are significant similarities in terms of placement of stories and the amount of overall space given to environmental news. *The Times of India* contributed highest amount of space to environmental news during the period of the study and the distribution of news in the upper fold of the newspaper. This trend persisted across the editions as the researcher had taken three different editions of the newspaper, namely, Kolkata, Mumbai and Northeast editions within the ambit of the study.

All three newspapers have been found to have done a substantial number of pro-active stories but that does not reveal the whole story. There were many proactive stories but it included very few investigative stories.

Though in most cases the newspapers depended overwhelmingly on their reporters for the collection of news except in case of *The Times of India*, Mumbai edition of 2006, the problem with the stories was the near absence of views of the experts on the issues.

So far as the providing cues to the readers for them to get involved in working for the environment was concerned, the performance of the newspapers was pretty dismal. Except for some sporadic news items on people's collective effort for conservation of water or rain water harvesting and *The Times of India*'s *Save the Tree* campaign launched in Kolkata in 2004, there were hardly any efforts to inspire people to participate in the process called *save the environment*.

So far as the major issues were concerned, *The Times of India* had global warming or climate change as its major contention, *Indian Express* had animal poaching or wild life conservation as its most important theme while *The Telegraph* had none.

Conclusion: The first thing that can be inferred from the investigation is that during the study period, environmental content in the newspapers under discussion failed to secure a niche position for it. It is present there but only as *also there*. In terms of space occupation, it is insignificant but in terms of placement of stories, another important yardstick in newspapers to judge relevance, it has got some importance. Environment as an issue matters but so far as converting the issues into agenda through investigative and exclusive stories, the attempts have been at best sporadic. There have been campaigns but it never really tried to unsettle the ruling ideology and an attempt was hardly made to develop or encourage an alternative discourse unacceptable to dominant discourse on development. Environment as an issue of serious discourse, an issue of survival for present or future generations and as important as political or economic issues that rock the nation very often has never really made an entry into the newspapers under discussion, except sometimes in articles or editorial.

The attempt to measure the trends of coverage of environment in the newspapers unfolds some typical phenomena which if elaborated upon, portray a picture of journalistic practice undertaken in these newspapers. *The Times of India* and *Indian Express* have got their own issues to focus upon, and their choice of focus area

also largely depends on the nature of their journalistic practices. *Indian Express*, a practitioner of *investigative journalism* focused on wild life while *The Times of India*, believing in *lifestyle journalism* tried to cover as many issues possible while putting a special emphasis on global warming because it has many takers in the urban centres. On the other hand, *The Telegraph*, practiced a brand of *headline journalism* and went for eye-catching headlines on doomsday stories without ever connecting it to an Indian setting.

Across the globe, there is now a serious discussion about the impact of environmental degradation on women. Women in poor households constitute a significant contributor to maintenance as well as to survival based on common property resources. Children and women have been found to be the worst victims of environmental degradation in terms of health and maintenance of family life. Not a single story has been found during the period of study which even obliquely hinted at the lot of women and children as the victim of tussle between environment and development.

There has been another knowledge gap, in the reporting of environment in the newspapers under discussion and it is their inability to accept the existence of *new politics*. Environmental reporting in India involves another serious flaw in the process as it has been thoroughly city based, except in a few cases. The tragedy of the whole phenomenon is that these are the agenda setting newspapers in India, and their every negligence has a deeper connotation.

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ROLE OF COMMUNITY RADIO IN COMMUNICATING CLIMATE CHANGE WITH SPECIAL REFERENCE TO ANNA RADIO

C.Velayutham & M. Srividhya

Introduction

Global warming has emerged as a major threat to human lives across geographical borders From 2000 to 2005, the number of deaths worldwide due to extreme rise in temperature alone is 55,279. More than 1500 fatalities in India in 2003 were caused by rise in temperature over 50 Degree Celsius (Dow & Downing, 2006). There is 95% probability that both Northern Hemisphere ice sheet and Southern Hemisphere ice sheet reached minima at which they were at least 2.5m smaller than today, although not necessarily at the same point in time (Kopp & et al, 2009).

An increase in global sea level is from both expansion of warming water and addition of new water from melting ice on land. According to sea rise projections for the twenty first century, the 145 million people living within a metre of the present sea level risk losing their land and their homes. Many more would be affected by the resulting socio – economic disruption (Clark & Huybers, 2009). Global warming causing environmental decline plays a statistical significant role in out migration, pushing people to leave their homes and move to other places or countries. This migration also leads to conflict between migrants and residents (Revveny, 2009).

Climate change and media

The mass media are predominantly still presenting human induced climate change as a basic argument between 'believers' & 'unbelievers'. In many minds, climate change is just one issue clamoring for media and public attention in a world that is exploding with

Assistant Professor, Department of Media Sciences, Anna University Chennai Chennai – 600025, Tamil Nadu, India *Email: vels@annauniv.edu
M. Srividya is a Student in MSc Science & Technology Communication

injustice, suffering, inequality, violent conflict, disease disasters, corporate greed and resource wars (Cromwell & Levene, 2007).

Experience shows that the conundrum of the growing urgency of the problem vis-a-vis the lack of action is compounded by common communication practices of scientists, communicators, and advocates in the area of climate change. Many of these are not unique to the problem of global warming. Issues such as uncertainty, complexity, media practices, opposition, and people's mental models often play a role in controversial social issues. Those who are skilled in communicating and moving toward action have found modes of operating that recognize these pitfalls and remain focused on strategies that appeal to the constituencies they are working with (Dilling and Moser, 2007).

Role of community radio

Community radio as the media for the community, about the community, and by the community need to be encouraged and fostered by a community-friendly policy environment. Sources of funding should be regulated to avoid dependence on sponsors and founders, which could clash with the community's goals. An effective system for feedback and monitoring should be put in place to make sure the licensing and funding schemes work, and that beneficiary broadcasters comply with requirements (Milan, 2009).

The history of Community Radio dates back to 1930s to the mining radio service in Latin America followed by various countries in the world. Community Radio service in various parts of Africa has many success stories which tunes to the other parts of the world. The Community Radio movement in south Asia started with Nepal's radio Sagarmatha in 1996. Sri Lanka Broadcasting Corporation's extended service at Kothmale has also contributed significantly in success stories of South Asia Community Radio scenario (Satish, 2007).

Anna Community Radio

ANNA CR is the first campus based Community Radio in the country. ANNA CR is aired from the smallest, completely digital,

tape less, and multipurpose Studio in Anna University at 90.4 CR. It is on air seven days a week between the hours of 12.30PM-6PM (live programs) and 7AM-12.30PM (repeat broadcast).

As a non-commercial station, ANNA CR takes pride in being an alternative to mainstream media and offers the public a forum for expressing points of view that otherwise may not be heard. A small staff, several student volunteers from the Department of Media Science and community at large run the station.

Anna CR programmes are indigenously produced. There's no news, no advertisements, no film-based programmes and no programmes violating Intellectual Property Rights or broadcast guidelines. The focus areas are education, health, environment, women's issues and community development.

Aim of the study

This article looks at the Role of Community Radio in Communicating Climate Change and related issues with Special Reference to Anna Community Radio.

Content analysis

The regular environmental programme (Puviyin Thumai Vazhvin Menmai) in Anna CR for a week from March 15, 2010 to March 21, 2010 is analyzed with different parameters.

March 15, 2010

Parameters	**Programme**
Theme	Children and Environment
Total duration	15 min
Song duration	1 min 50 sec
Sources used for inputs	TN Pollution Control Board, Nizhal Environmental NGO
Programme formats	Experts talk, folk song, debate
Target group	Local community within its radius

March 16, 2010

Parameters	**Programme**
Theme	Environmental Laws
Total duration	14 min 40 sec
Song duration	1 min 30 sec
Sources used for inputs	TN Pollution Control Board
Programme formats	Expert view, folk song, drama
Target group	Local community

March 17, 2010

Parameters	**Programme**
Theme	Environment and Population
Total duration	15 min
Song duration	3 min 20 sec
Sources used for inputs	TN Pollution Control Board
Programme formats	Expert view, folk song
Target group	Community

March 18, 2010

Parameters	**Programme**
Theme	Environmental Health
Total duration	15 min
Song duration	2 min 50 sec
Sources used for inputs	TN Pollution Control Board
Programme formats	Expert View, Folk Song
Target group	Community

March 19, 2010

Parameters	Programme
Theme	Women and Environment
Total duration	15 min 30 sec
Song duration	-
Sources for inputs	Centre for Environment , Anna Univ.
Programme formats	Expert View, Folk Song, Drama
Target group	Only Women

March 20, 2010

Parameters	Programme
Theme	Ozone Layer Depletion
Total Duration	13 min 30 sec
Song Duration	-
Sources	Centre for Climate Change Adaptation, Anna University
Formats	Expert Interview, Folk song
Target group	Community

Survey analysis

In this study, the survey analysis is used to find the impact of the climate change program broadcast in Anna CR.

Sample size	:	50
Sample type	:	Convenient sampling
Target population	:	Community people within the radius of its reach
To analyze	:	Impact of the programme

Data Interpretation

The samples are in the age group of 21 – 51. All of them listened to the programme and answered the questions.

Programme Reach - 60% of the repondent agree that the programme was interesting while 32% of them strongly agree and 8% of them disagree.

Content of the programme -68% of them agree that every aspect of the programme is good and 32% of them disagree to that. But none of them strongly agree or disagree to that.

Reach of the song -None of them said the song was bad but 16% of them felt it was not good while 44% of the said it was good and 40% of them said it is so good.

Usefulness of programme - 4% of them said that the programme was informative, 22% of them felt it creates awarness and 17% of them said it was educative and 57% of them said it gives all the three.

Format of the programme - 4% of them liked the people views, 12% of them liked the expert views, 24% of them liked the drama and 20% of them liked the song while 40% of them liked the whole programme.

Extending the programme 88% of them want similar types of programme and 12% of them don't want it.

Participation in the programme - 88% of them are satisfied about the community participation while 12% of them are not satisfied with it.

Duration of the Programme - 92% of them want the programme to be extended while 8% of them don't want an extension.

Climate change awareness - 92% of them realised that the climate change is a major threat for human beings.

Global warming & climate change - 88% of them said the climate change and global warming are not the same and 12% of them said they are same.

Ozone layer depletion- 96% of the respondents say that ozone layer depletion is not due to the climate change.

CO2 contributing to Climate Change - 80% of the respondent agree that the main gas contributing to climate change is carbon dioxide.

Findings

- Awareness about Anna Community Radio is higher in its coverage zone and so the climate change can be communicated effectively through Anna Community Radio.

- Majority of them listen to Anna Community Radio.
- Useful tips given in the programme attracts the audience more.
- Climate change awareness is less among community people, but they are interested in knowing the facts and participate in the campaigns. The programme produced has reached them and 88% of them wants that programme to be extended.
- Majority of them prefer to participate in the training and programme production in the climate change slot in the Anna CR.
- Community people are very much interested in the following media formats drama, folk songs and community interaction in the programme broadcast.

Hence, this study concludes that the action to combat climate change in the individual and community level can be induced by the community radio to their community effectively.

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REPORTING SCIENCE AND TECHNOLOGY IN PRINT AND ELECTRONIC MEDIA

Swati Jaywantrao Bute

Abstract

The advancement in communication technology has made a huge impact on media industry and also has given a freedom to set new professional trends. The convergence is apparent in many different ways. Media is growing and flourishing but with this growth many questions are emerging on the credibility of its content and the journalistic norms which print and electronic media are inheriting.

A free market gives birth to the opportunities for growth and also freedom and confidence to explore new things. Media is not only a great source of information but it also gives us a platform to voice our opinions. It is a fourth pillar of the democracy which has the power to ask questions. Media can set new trends by making people well informed citizens, at the same time media has the power to influence public understanding on subjects like science and technology.

To get the answers to all these questions the researcher has done a study of print and electronic media through a content analysis of two mainstream newspapers and Four TV channels.

It was found in the study that people are very much interested in reading and watching science and technology news/ programs but they are not satisfied with the quantity of coverage being given by TV channels and newspapers to science and technology. Foreign channels like Discovery and National Geographic Channels which have higher percentage of science and technology programs show more foreign countries based programs. National News channels hardly cover science and technology in news shows. The survey of the school kids, college students and professionals shows that they want a channel devoted to science and technology news and programs. They want to see what is happening at world level in the field of science and technology but they are not getting that kind of

Ph. D., Assistant Professor In-charge Public Health Museum, National Institute of Health and Family Welfare, Baba Gangnath Marg, Munirka, New Delhi 110067
E-mail: swatibute11@gmail.com, scholarsworld11@gmail.com

information from media. Even the content of the programs does not match with viewers/ readers choice. While the coverage of science and technology in print media has improved over the years, they are still not getting the deserved space and importance.

Key Terms – Science and Technology, Readers and Viewers, Content, News shale, Prime Time, News Papers, News Channels, Purpose, Treatment of the program.

Introduction

The advancement in communication technology has made a huge growth in media industry and also has given a freedom to set new professional trends. The convergence is apparent in many different ways. A free market gives birth to the opportunities for growth and also freedom and confidence to explore new things. Media can set new trends by making people well informed citizens, at the same time media has the power to influence public understanding on subjects like science and technology. To get the answers of all these questions the researcher has done a study of print and electronic media with the topic "Reporting Science and Technology Communication in Print and Electronic Media". It was a content analysis of two mainstream newspapers and four TV channels.

Method of Research **–** Qualitative and Quantitative methods

General objectives of the study:

1. To identify the information needs of the audiences.
2. To evaluate the percentage of science and technology based news in print media.
3. To analyze qualitatively the extent of coverage and relative importance to various issues in print and electronic media.
4. To evaluate the percentage of science and technology based news in selected TV channels.
5. To evaluate messages of science news in print.
6. To evaluate messages of science news in television.
7. To assess the relevance of science and technology reporting to their utilization.

Specific objectives of the study:

- To analyse percentage of news space devoted to science and technology news.
- To understand how much space is covered by foreign news and how much covered by Indian news related to science and technology.
- To understand what is the content and structural element of the news of science and technology.
- To evaluate and comparatively analyze science and technology based news on TV Channels and reasons of selecting news and programs of some specific categories of science and technology.

Time band:

Two months for newspapers and four months for four TV channels (One month for each channel)

Languages: English - Hindi

Sample Size: Two mainstream Indian Newspapers comprising Hindi and English languages and four channels of electronic media i.e. Doordarshan, National Geographic, Discovery and Aaj Tak.

Data collection

1. Questionnaire for interviews with school children, college students and professionals
2. Questionnaire for interview with science communicators and journalists
3. Log Sheet for Data collection of the News items and programs of newspapers and TV channels

Findings

Part 1 – *What do readers/ viewers think on science and technology, their knowledge on subject and coverage in newspapers and TV channels?*

Results show that readers/viewers are pretty conscious about what is being telecast on different channels and published in news-

papers on science and technology, they showed high interest in reading and watching science and technology related news and programs. Readers and viewers were not satisfied with coverage being given by newspapers and TV channels to science and technology. They wanted a separate page in newspaper and a separate channel for science and technology. At the same time they showed keen interest in programs which can provide them knowledge and entertainment. Study shows that readers/ viewers think that science and technology not only update the knowledge but also improves their quality of life and mindset. For most of respondents science and technology related information means –

1. Information on happenings in the field of science and technology at world level
2. Information on science and technology news that directly affects our day-to-day life.
3. Information on new inventions and discoveries
4. Information on new researches
5. Information on space science

On the basis of readers'/viewers' choice of most relevant categories of science and technology, researcher opted only these five categories for the further analysis of newspapers and TV channels and monitored only those news and programs.

Part II – *What do science communicators, journalists and scientists think on Science and Technology Coverage?*

- Experts' view show that people have interest in science and technology news and programs; however media is not generating awareness among people by giving more coverage.
- It reveals that information about changing patterns, new findings and discoveries, news worthiness, relevance, news which develop scientific temper among people, awareness generation should be the criteria for selecting science and technology news.
- It shows that wide coverage of science and technology can help in changing people's understanding about the subject.
- Research findings show that scientific controversies are good but they should not be cheap and shallow.

- Experts' views show that science and technology coverage helps in fostering better understanding and practices in the society.

Part III - *Analysis of Newspapers - THE TIMES OF INDIA*

- Category - The category which was covered in the news items of the Times of India newspaper in higher percentage was "what is happening in the field of science and technology around the world".
- Columns – The space given to science and technology news in the Times of India Newspaper was not sufficient. The news stories published in two columns were higher in percentage.
- Geographic Focus – The study revealed that the percentage of science and technology news was higher in percentage on the international page.
- Type of news stories – It was found that most of the science and technology news was published as other news stories.
- Tables – The number of stories, which were published without tables, was higher in percentage.
- Statistical Formula - The number of stories, which were published without statistical formula, was higher in percentage.
- Mathematical Formula - The number of stories, which were published without mathematical formula, was higher in percentage.
- Visuals - The number of stories, which were published without proper visuals, was higher in percentage.
- Story Source – In this study researcher discovered major change in the findings, it was found that the number of news stories with Indian Source was higher than one with the foreign source.
- Tone of News – It was found that the stories with positive tone were higher in percentage.
- Purpose of news – The researcher found that in the Times o India Newspaper the maximum coverage was given to news stories which were scientifically explaining the unusual events, phenomenon, claims and reports.

THE HINDU

- Category - It was found in this part of analysis of newspapers that the category which was covered in the news items of The Hindu newspaper in higher percentage was "Information on new Researches".

- Columns –The news stories which were published in four columns were higher in percentage.

- Geographic Focus – The study revealed that the percentage of science and technology news was higher in percentage in the special edition of Hindu Newspaper which published every Thursday by the name of science and technology page.

- Type of news stories – It was found that most of the science and technology news was published as other news stories.

- Tables – The number of stories, which were published without tables, was higher in percentage.

- Statistical Formula - The number of stories, which were published without statistical formula, was higher in percentage.

- Mathematical Formula - The number of stories, which were published without mathematical formula, was higher in percentage.

- Visuals - The number of stories, which were published with proper visuals, was higher in percentage.

- Story Source – In this study researcher discovered major change, it was found that the number of news stories with Indian Source was higher than one with the foreign source.

- Tone of News – It was found that the stories of positive tone were higher in percentage.

- Purpose of news – The researcher found that in the Hindu Newspaper the maximum coverage was given to news stories which were scientifically interpreting complex phenomenon, research and development results and scientific work in laymen's language.

Analysis of TV channels

DOORDARSHAN

- Researcher recorded one month prime time news from 8 PM to 8.30 PM.
- In one month study, the total number of news stories telecast were 138, while the news stories on science and technology was only 14, which means only 10.14% coverage

AAJ TAK

- The researcher recorded one month prime time news from 8PM to 8.30 PM
- Total 161 news reports were telecast and 91 news programmes of high hour duration were telecast but no news report or programme was telecast on science and technology.

DISCOVERY CHANNEL

- The researcher analyzed one month programmes of Discovery Channel; total 920 programmes were telecast from the channel.
- Out of this 49 programs with repeat telecast were based on science and technology.
- If we can remove the number of repeat telecasts only 19 programmes were telecast on science and technology.
- Out of 19 programs on science and technology only one programme was based on Indian science and technology.
- Out of five categories selected for the analysis of science and technology only one category "What is happening in the field of science and technology around the world" was covered in most of the programmes telecast from Discovery Channel.
- Researcher found that out of some units decided for the measurement of the purpose of the programme, the unit which was mostly covered in the programmes was "Bring out the potential of scientific/technical inventions in research and development works in an area.
- It was also found that most of the programmes were in documentary format.

- The study revealed that research, good scripts, excellent camera work and good narration were some of the incentives of the interest of the programmes.
- The analysis of objectives and concept of the programme showed quality of content, treatment and presentation of all the programs telecast from Discovery channels was good.
- Duration of each program was one hour.

NATIONAL GEOGRAPHIC CHANNEL

- The researcher analyzed one month programmes of NGC, total 900 programmes were telecast from the channel.
- Out of which 69 programmes with repeat telecast were based on science and technology.
- If we can remove the number of repeat telecasts only 12 programmes were telecast on science and technology.
- Out of 12 programmes on science and technology only one programme was based on Indian science and technology.
- Out of five categories selected for the analysis of science and technology only one category “What is happening in the field of science and technology around the world” was covered in the programs telecast from NGC.
- Researcher found that out of some units decided for the measurement of the purpose of the programme, the unit which was mostly covered in the programmes was “Bring out the potential of scientific/technical inventions in research and development works in an area".
- It was also found that most of the programmes were in documentary format.
- The study revealed that research, good scripts, excellent camera work and good narration were some of the incentives of the interest of the programs.
- The analysis of objectives and concept of the programme showed quality of content, treatment and presentation of all the programmes telecast from Discovery channels was good.
- Duration of each programme was one hour.

Conclusion

- Readers and viewers were pretty conscious about what is being telecast on different channels on science and technology and also what is being published in the newspapers. Results of this study revealed that respondents were very much interested in reading and watching science and technology news/programmes. They wanted a separate page in newspapers and a separate channel for science and technology programmes. However, they also showed keen interest in programmes which can provide them knowledge as well as entertainment through such programmes. Responses showed that science and technology news not only update the knowledge of readers/viewers but also improves quality of life and mindset.
- At the same time, it also comes out from the study that readers/viewers are not satisfied with the quantity of coverage being given by TV channels and newspapers to science and technology news. The study examines the programmes of two of the most popular channels Discovery and National Geographic Channel which give a wide coverage to science and technology programmes. They telecast science and technology related programmes on a regular basis but the programmes are generally based on researches done in foreign countries. It was found that though the quality of production and content in all their programmes was excellent, these two channels still do not satisfy audiences' needs as far as quantity is concerned, especially in the context of the number of programmes based on Indian science and technology.
- More focus on country specific topics by understanding the information needs of people will not only help in making a channel more popular but it will definitely help in generating a scientific temper among masses.
- For channels which telecast news for 24 hours, it is an ample opportunity to cover science and technology news. But as discussed the coverage of science and technology news is very low, regional and need specific issues hardly get any place in the television programmes. It was found in the study that news channels do not give much coverage to science and technology news/programmes. It was also found that there is no regular slot

for the science and technology news/programmes during the primetime on Doordarshan and Aaj Tak Channel. The irregularity in science and technology news/programmes definitely affects the interest of readers and viewers. These findings also match with the hypothesis of the study.

- The content of any science and technology news/programmes plays very important role in deciding its quality. However, sometimes the content of a programme does not match with the choice of viewers/readers, which is one of the reasons behind lack of interest in science and technology news/programmes. Sometimes television channels overlook viewers' level of knowledge, choice, interests and expectations. Hence, science and technology related news/ programmes should be published/aired in a simple language to increase their popularity.
- Continuity and repetition of programmes, time, space, topic, quality, presentation, readers/viewers' need and usefulness of the topic also play a very important role in holding the public attention.
- For readers and viewers, proximity matters a lot. If the televised/ published content is not related to their area, they lose interest in the programme/news.
- Similarly, viewers/readers have a keen interest in the news/ programmes, which provide them some answers or solutions of their day-to-day problems, needs and queries.
- The study reveals that these are some of the points which have been overlooked by the newspapers and TV channels in their science and technology news/programmes. These findings also match with the points which researcher had mentioned in the hypothesis of this study.

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SCIENCE COMMUNICATION FOR COASTAL MANAGEMENT

Mary Antony

Abstract

There are different agendas in the format of the coastal management. The one area that stands apart is the fisheries sector. The marine fishery industry is in the forefront in the wide spread usage of science communication materials. This has revitalized, in small measure, the fisheries sector which is an important component of coastal management in Kerala.

Kerala state has a coastline measuring to the length of 590 k.m. Embedded along this coastal belt, there exists 222 fishing villages which form the backbone of the fishing industry. The fishermen have accepted and adopted the introduction of sophisticated science communication devices for the overall development of the fishing industry. An important gadget in this regard has turned out to be the mobile telephone as it is quite handy and most efficient and of great utility in the day to day dealings and operation of the fishing industry.

But conflicting signals do exist in exploring and exploiting the communication revolution in its totality. This has been to some extent due to the socio – cultural and economic factors.

In the final analysis, the science communication revolution provides a solid foundation for formulating a systematic and sustainable industry in the marine fishery sector of Kerala.

Introduction

Coastal management in its widest sense can be compartmentalized into different sectors. This may include laws for maintaining coastal safety, creation of Special Economic Zones (SEZ), disaster management in times of emergencies like the occurrence of tsunami, tapping resources for tourism projects and health resorts,

Part-time Research Scolar, Dept. of Applied Economics, Cochin University of Science and Technology, Kochi-682 022.
E-mail: maryantony10@yahoo.com

planning recreational facilities in beaches, designing beaches and its structural pattern in an eco – friendly manner. In short there should be a monitoring cell for all these activities.

But the cynosure among these sectors is none other than the marine fisheries sector in its totality. This is the one area which needs close scrutiny and an in depth analysis. So the marine sector is on the threshold of embracing science communication materials with a religious fervor for its survival, growth, development and progress. Science communication hardware and software will have a direct bearing on all activities and issues confronting the fishery mainstream.

Communication concepts, its scientific techniques and its technological devices have played a stellar role in spearheading and providing fruitful and modern development strategies for the different sectors and areas of coastal management.

The main sector which has immensely benefited in this regard can be identified as the marine fisheries sector of Kerala. Historically the state of Kerala is blessed with a vast coastline due to its unique geographical position and layout. This coastal belt measures 590 K.M in length which provides an ambient atmosphere for the introduction and induction of communication gadgets for the establishment and development of fishing units and villages presently numbering about 222.

It is an established fact that the main proponent of the modernizing process in the whole industrial and commercial world is none other than the communication revolution. So the marine sector has also embraced this model of revolution with all its vastly advanced communication system.

This has outlined the churning process of the marine fishery segment and the onslaught of science communication equipments has turned out to be the principal and pioneering force in promoting developmental strategies in every stage of the marine sector. This has been quite notable and remarkable in the catching, processing and marketing of the marine produce.

So this analysis provides a close look at how the science communication and its vastly and varied revolutionary technological

products which are making waves in other parts of the industrial world can be adopted to existing Kerala conditions for transforming the marine industry in a positive manner and make it quite sustainable in Kerala's commercial and industrial sector.

Background

The Kerala marine industry is quite unique by the confluence of tradition and modernity existing side by side. On the one hand there are kattamarams, offshore and inshore nets in use and individual angling – all of which have manual labour in application. On the other hand there are deep sea fishing vessels, trawler boats and engine- operated country boats.

The Kerala marine products have a very lucrative market in India and especially overseas. Lobsters, shrimps and shell fishes of all hues and kanavas (cuttle fish) are in the forefront in procuring precious foreign exchange earnings.

Hence technological products which lead to the modernization process of the fisheries sector have a pivotal place in the marine industry.

The modernization process in Kerala was initially unleashed by the Indo – Norwegian project in the year 1953 at the Neendakara region of Kollam district. The traditional ways and means of fishing, processing and marketing had to be abandoned. A new scientific temper was introduced in this sector. Traditional fishing gave way to motor and trawler boat operation. In the processing area dried fishing gave way to icing and freezing. In the marketing area wide spread use of communication equipments, especially mobile phones, became the order of the day.

Present scenario

The fishing industry in Kerala is facing increased competition with the depletion of marine resources. To overcome these and other concerns, modernization process is taking place at several levels. In this modernization process and operations, Information and Communication Technologies have played a truly significant role.

For the fishing industry the impact and influence of communication technology have been gradual. But more recently it has been evolving into a valuable tool for the industry.

Developments in mobile communication have had a greater impact on the marine industry by its practicability. But it is possible to

summarise that a significant part of the industry is resistant to change and distrusts the involvement in their affairs by those external to the industry.

In essence, the fishing sector of Kerala remains a community based industry which is steeped in tradition. The recent past has brought changes to the industry. These changes have forced the industry to re-examine its whole operational approach. Some have responded positively and have grabbed at the opportunity to modernize, but others are more reluctant and see factors such as the introduction of technology as a threat to either employment levels or their way of life.

In the future, it is quite likely that the management of the knowledge regarding the communication technology will prove to be an important enabler in overcoming the barriers to change. The various science communication technological devices and gadgets now in vogue and adopted in many parts of the marine fishing industry are analysed in table 1

Table:1 Technologies adopted by the fishing industry

Technology	Application	Implication
Satellite positioning	• Targetting boat's position (GPS) • Monitoring fishing vessels	• Supports sustainable fisheries management •Transparent regulation
Satellite Communication	• Send catch data to the shore • Vessel location to help in times of distress	• Increases health and safety levels • Improves supply chain efficiency
Satellite remote sensing	• Information used to locate fishing grounds	• Scientific monitoring and easy to find catch
Electronics- Echo sounder, Sonar and Sensors	• Information on the depth of sea bed and species of fish	• Increases catch efficiency and quality
IT Systems	• Data management and communication • Computer Aided Design(CAD)- vessel, engine and fishing gear design • E commerce including mobile telephony	• Improves supply chain and efficiency • Increased production and reduction in functional costs •Transparent marketing activities and more accessibility

Source: EMCC (2003)

All the above technologies applied either individually or in combination can potentially add value throughout the supply chain. So the use of information technology enables to categorize the fishing industry into two areas.

1. In a larger perspective, covering satellite systems provides detailed information of the weather, environment and the opportunity to monitor and manage fishing ground and fleet.
2. At the individual level, the technologies on information support the supply chain and marketing.

Thus the motives behind the use of technologies by the fishing industry are as follows.

1. Increasing productivity and reducing operational costs
2. Improving products quality
3. Enhancing safe working condition of the fishermen

Impact

The main impact of the use of communication technologies was realized only a few years ago. Fishermen now can send detailed catch information ashore in advance of landing, speeding up delivery to the end consumers.

Another important impact of the communication technology is that it provides opportunities for developing co–operative activities. Many fishermen experience problems of environmental, economic and political issues which are common to all in their daily operations. This could be resolved, to some extent, by sharing information and knowledge in a non-competitive fashion i.e. through co-operative activities.

Employment is another area which may be affected by the communication technology, with its devices. As tasks become automated, the industry will need less number of crew members

Table 2
Impact of Technology on Marine Fisheries Industry

A – Reducing functional costs
1. Manpower – Smaller crew 2. Fuel - Improved navigation and better engine reduce fuel consumption 3. Fishing effort – saving time and effort by the use of technology which in effect will reduce time at sea
B – Market access
1. Communication of catch information to market makes selling process more efficient. 2. Produce can be sold more widely. 3. Greater price competition 4. Better quality fish would attract premium price

Source: EMCC (2003)

Now it is quite obvious that from a regulatory level, all information services can be pulled together electronically. Thus electronic commerce offers the fishing industry a powerful tool to raise competitiveness of the industry. However in one aspect the industry has to be cautious and watchful i.e technology is changing rapidly and any advantages may be short lived unless there is investment to continually optimize services.

Another perceived drawback is that technological progress has made recruitment to the industry more complicated. Traditionally, fishers learned their trade from their forefathers. This situation has changed. Modern fishing techniques require a minimum level of training in the use of these systems. So an increase in commercial knowledge is required to ensure that smaller catches are compensated by quality and better price in the market.

Another issue is that safety on board has to be addressed because still a number of accidents occur each year in the Kerala coast.

The communication revolution has played a significant role in the modernization process of the Kerala marine fishing industry. Information technologies have gradually evolved as a valuable tool in this industry.

Science communication has provided a base to streamline the supply chain and thereby introduced efficiency as well as the opportunity to explore new markets and commercial opportunities. The fishing industry which is steeped in tradition is now forced to open itself to new technologies, but not wholeheartedly.

Progress of communication technology has developed hand in hand with other issues that have impacted on the marine industry. These important issues are

1. Environment – the study of environment shows the stark realities of the depletion of fish stocks and change or damage to the marine eco system.
2. Policy areas – in the realm of policy making the introduction of policy frameworks has helped to restate the fishing industry by remaining competitive.
3. Globalisation – Globalisation and the introduction of communication technologies have been able to accelerate access to global markets.

4. Social relationships – socially there is an increasing awareness of meeting social as well as economic needs. There by inter personal relationship has become better and stronger among the fisher folk.

5. Economic and political fields – in the economic and political fields the impact of science communication has resulted in the collapse of the geographical frontiers, the blurring of ideological fundamentalism in the economic and political fields. Thereby making way for global participation possible from every nook and corner of the world, unimaginable in the past. For the economist the world has become a single market arena.

By the adoption of science communication in the fishing industry it has been able to respond to the changing environment viz. political and commercial climate. Thus communication equipments will play a significant role in the transition from the industry of yesterday to an agile sector of tomorrow.

Conflicting Signals

Communication technology has been adopted for a number of reasons. But most important among them are that it has a direct commercial benefit.

However there are a number of barriers in the adoption of information and communication technology due to the following reasons.

1. Lack of knowledge – ie. The complexity of the technology and unfamiliarity in the use of the new system

2. Culture – ie a general distrust of technology and the regulatory bodies.

3. Industry structure – ie lack of co-ordination

4. Level of investment – these include limited budgets, other investment priorities and lack of appropriate governmental support mechanisms.

Communication technology has been able to exploit the marketing potential of the resources in many ways. On the one hand it can provide details of fish sales. While on the other hand it has been able to supply local needs with direct contact to customer base. It

also has been able to bring savings for both the processors and retailers.

The use of mobile telephony has revolutionized many industrial sectors and fishing industry has also been able to exploit them. The mobile phones have helped merchants to check the prices and also the availability of fish at more than one location. Mobile telephony also uses small messaging services (SMS) which help the enterprises in off shore and on shore positions.

Overall there has been a significant change in the use of communication equipments and this has had great impact on the fishing industry in a number of ways as outlined above.

Conclusion

The adoption of science communication technologies has revolutionized the marine industry in more ways than one. As these technologies are now being adopted and accommodated to the local needs, several issues and concerns are confronting this sector as outlined in this paper. But the conflicting signals that are being heard are only birth pangs of a new vibrant and dynamic fisheries industry which will become a major partner and a shining spot in the commercial and industrial map of Kerala.

Research in science communication materials has multi – functional applicability in the various sectors of the industries all over the world. So there is a great demand for indigenous communication materials with advanced technological know how for use. The researchers in India are also at the forefront in developing communication aids in tune with global standards. The end result of these activities would be the production of radically up to date designs with functional utility of communication articles and its ancillary tools. So examining the futuristic trend evolving in the science communication system, it can be predicted that ultra modern devices, gadgets and instruments will be discovered at a rapid pace which will have revolutionizing effects in various and multiple dealings in the commercial and industrial sectors. So in future the marine fisheries sector in Kerala will be forced to streamline its activities in due collaboration with the newly invented science communication materials for its robust development and solid growth. Thus we can visualize a booming commercial industry in the fisheries sector.

So the long term use of communication revolution offers much wider opportunities for the development of more sophisticated services at a cost effective price. Thus there is potential for cost effective operation in all segments of the fishing industry in Kerala and looking from this angle science communication material inputs have a great potential for the sustainable development of the whole fisheries sector of Kerala.

It is evident from the study of the fishery sector that science communication materials have made a deep penetration in the various dealings and activities of the fishing industry. Undoubtedly, its presence is constantly felt in the day to day activities of men and material engulfing the whole marine fishery segment of the Kerala sea coast. Such a momentum in science communication hardware materials can be capitalized and put forward for various levels of coastal management.

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