

Indian Journal of Science Communication

Communicating Science of Science Communication

Inclusive development:

Role of dissemination of appropriate knowledge

Communication strategy for preventing new amoebae diseases

Strategic communication for sustainable development

**How the Indian English-language press covers environment?
Training science writers and science journalists in Nepal**

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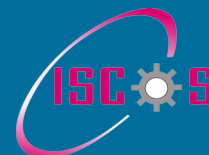
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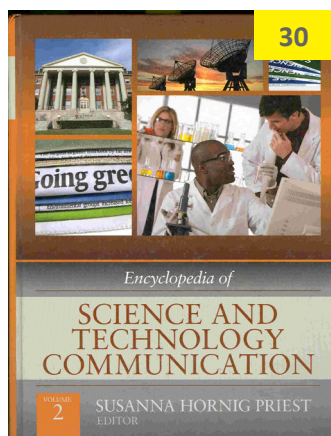
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Public Understanding of 'Science Communication'



Public understanding of 'science' has roots in public understanding of 'science communication'. Unless science communication is understood in its right earnest by public and policymakers, many efforts focussed at public understanding of science may not yield results. This is exactly what is happening with many science communication campaigns and programmes in various places. If without understanding the 'process of (science) education', (science) teaching may not be successful, and similarly without understanding the 'process of (agriculture) extension', (agriculture) extension is not a triumphant. Then without even appreciating the 'process of (science) communication', how it can be possible to make inroads or even successfully run a science campaign especially in today's age of super speciality in all walks of life!

Incidentally, you require a Trained Graduate Teacher (TGT) qualification for educating primary level students (...no intention to undermine...in fact they are founders of future generations...), but surprisingly, for shouldering the responsibility of communicating science to the entire nation, there are instances where you do not require any academic specialization in 'science communication', or at least in 'mass communication', despite the fact that such specializations are available in India and abroad for several decades. If the countries like India have achieved tremendous success in agricultural production and undisputable self-reliance in the field, the equal amount of credit goes to 'agriculture extension scientists', besides 'agriculture research scientists' - thanks to visionary leaders in agriculture science who have recognized and envisioned the 'agriculture extension' as an integral part of agriculture science. Similarly, the basic education and literacy campaigns, with some hiccups, have been successful and have contributed tremendously in bringing illiteracy rate down; it also became possible because of the visionary leaders in the field, who recognized the worth of 'education experts' who led an army of qualified teachers and educators equipped with necessary knowledge and skills in education. Shall we learn lessons from our own such success stories and make our 'science communication' establishments more meaningful!

When the idea of publication of the Indian Journal of Science Communication (IJSC) was floated, not only 'commoners' but many 'specialists' also started presuming that it was going to be yet another science journal or science magazine that will carry hardcore 'science research papers' or 'popular science articles'. Even some contributors have started submitting such materials to the journal. There were hardly a few who knew that the journal in fact was expecting contributions on 'science communication'. Similarly, when annual Indian Science Communication Congress (ISCC) was conceptualized in 2001 as a forum for exchanging newer ideas, reporting research and discussing issues emanating to 'science communication', a great deviation from main subject was observed. More than 50% papers and presentations were on telecommunication, information communication technology (ICT), library science and/or communication apparatuses, instruments or gadgets, etc. Some scholars had submitted their research papers on hardcore science and technology fields, i.e. nanotechnology, biotechnology, virology, new building materials, or crystallography, etc., while popular science writers started sending articles on galaxies, sun flairs, environment and other similar subjects of popular nature. Only a few papers, a bit closer to our subject, were on science education, agricultural extension, technology transfer, and alike. Then slowly, with tremendous efforts, motivation, orientation, training and mentoring, the situation started improving. The data was drawn, analyzed and interpreted from submissions by participants of these congresses subsequently, though depressing, a pattern of slight positive change in understanding of the field of 'science communication' amongst participants was observed, with same results for overseas delegates. However, an assessment has revealed that still there is a great apathy amongst people, and they hardly realize what exactly means from this phrase. They are excited with big stories in nanotechnology, launch of satellite, breakthroughs in biomedical sciences, nuclear plant, and bionics, etc., but least interested in the 'process of communication' of these developments and discoveries to public.

So the struggle begins from addressing the challenge of 'people's mis-understanding of science-communication'. 'Science communication' being an important area in today's scenario, needs an appreciation by its peers in 'sciences' and 'communications', otherwise it will not come out of its 'prolonged state of infancy' and will not attain status of 'well accomplished field' at right point of time. Declining interest in basic sciences, inadequate science coverage in media, lower level of science literacy, misunderstanding between scientists and journalists, and least preference to 'public understanding of science' by 'scientists and communicators' lead to cause severe inhibition for the inclusive growth of the society and 'science communication' may not emerge as a well flourished field to its fullest grandeur. S&T being one of the important driving forces in today's world has been well perceived by one and all, but the need of connecting it to society has yet to be adequately emphasized to minimize the ever widening science-society gap. There is an urgent need of developing understanding of 'science communication' especially amongst scientists, communicators, and policymakers, so that the immense potential that 'science communication' has to offer can eventually be translated for promoting 'public understanding of science'.

Dr. Manoj Kumar Patairiya

How the Indian English-language press covers environment?

Bharvi Dutt

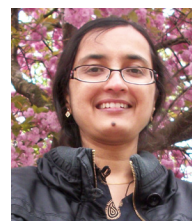
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The paper examines the coverage of environmental related issues published in 31 prominent English-language Indian newspapers in terms of their quantification and thematic representation. The issue of environment has assumed a prominent position during the last decade. Among all the topics discussed under environment, climate change and global warming got the highest priority with 75% items which constituted more than two third (77%) of the total space occupied by environmental issues. Of these, highest were on adverse impacts of global warming/ climate change followed by those on mitigation. Among all the newspapers, The Times of India devoted the maximum space to the issues related to environment.

Keywords: Environment, Global warming, Climate change, English-language press

Introduction

The notion of environment in the present study refers to all of the biotic and abiotic factors that act on an organism, population, or ecological community and influence its survival, development and wellbeing. Biotic factors include the organisms themselves, their food, and their interactions. Abiotic factors include such items as sunlight, soil, air, water, climate, global warming and pollution, etc. (The American Heritage Science Dictionary,

Houghton Mifflin Company, 2005). Also, the terms ‘global warming’ and ‘climate change’ have been used interchangeably due to their trans-possible use in popular and policy discourse. However, the two terms are scientifically distinct (Boykoff and Boykoff 2007).

Background

India is one of the largest democracies of the world, where people elect the governments every five years

Table 1: Space allocation to environmental news items in newspapers

No.	Newspaper	No. of items	Percentage	Space Occupied (cm ²)	Percentage
1	<i>Times of India</i>	166	26.1	26,911	17.8
2	<i>Financial Express</i>	59	9.3	19,231	12.7
3	<i>Economic Times</i>	47	7.4	12,118	8.0
4	<i>Statesman</i>	37	5.8	11,249	7.5
5	<i>Hindu</i>	35	5.5	7,775	5.2
6	<i>Hindustan Times</i>	32	5.0	7,608	5.0
7	<i>DNA</i>	29	4.6	8,902	5.9
8	<i>Hindu Business Line</i>	29	4.6	6,987	4.6
9	<i>Mail Today</i>	22	3.5	7,309	4.8
10	<i>Asian Age</i>	22	3.5	3,743	2.5
11	<i>Pioneer</i>	20	3.1	4,461	3.0
12	<i>Business Standard</i>	20	3.1	6,055	4.0
13	<i>Free Press Journal</i>	19	3.0	3,601	2.4
14	<i>Tribune</i>	18	2.8	4,501	3.0
15	<i>Political and Business Daily</i>	18	2.8	3,740	2.5
16	<i>Indian Express</i>	15	2.4	3,279	2.2
17	<i>Other 15 Newspapers</i>	48	7.5	13,229	8.8
	Total	636	100	150,699	99.9

by the method of universal adult franchise. Geographically, it accounts for a meager 2.4% of the world's total surface area of 135.79 million sq. km. Yet, India supports and sustains a whopping 16.7% of the world population, being the world's second highest populated country with a population of more than 121 billion (Ministry of Environment & Forests (MoEF), 2009). More than two thirds of the population still lives in rural areas, mainly practicing agriculture, artisan or working as farm labour. Being a fast growing economy in the world, India's energy consumption has increased by ~4% over the period 2001 and 2006 (MoEF 2007). This has resulted in the rise of green house gas emissions – rising from 682 Mt. carbon dioxide (CO₂) in 1990 to 1342 Mt. CO₂ in 2004 (Watkins 2007). Also, a citizen from the highest income groups in India-comprising just 1% of the population – emits four and a half times more CO₂ than a citizen within the poorest 38% of the population (Billet 2009). The richest 14% of Indian citizens emit 24% of India's CO₂ emissions (Ananthapadmanabhan *et al* 2007). At the same time, in global context, India's share of ~16% of the world population accounts for only 4.6% of the global CO₂ emissions (MoEF 2009).

Newspapers in India

Science and technology communication among people has assumed increasingly greater importance in all societies across the globe. Newspapers constitute primary source of communication for general public on issues related to S&T. India publishes newspapers in as many as 100 languages and dialects; with Hindi and English being the most prominent. Predominantly, these are published from the four metropolitan centers (Delhi, Mumbai, Kolkatta and Chennai) and other state capitals. English newspapers published from these four metropolitan centers account for a major proportion of circulation. Total circulation of registered newspapers/ periodicals in India during 2008–2009 was 257,953,373 copies per publishing day. Unlike in many other emerging economies, the press is free in India and the state does not exercise any control over its free and fearless functioning, except the provisions incorporated in Press and Books Registration Act. However, a few national dailies like *The Hindustan Times*, *The Times of India*, *The Economic Times*, *The Indian Express*, *The Financial Express* and *The Statesman* belong to the big business and industry houses that might have their own ideologies.

The main focus of the newspapers remain po-

litical developments, economy, business, education, development, entertainment, art, culture, sports and crime including economic crime, these also disseminate information on science, technology, health and environment (Dutt and Garg 2000; Dutt and Garg 2012). The coverage, however, differs depending upon the status and place of publication of newspapers. Newspapers are also potential medium for shaping peoples' opinion on debatable issues like climate change/ global warming (Burgess 1990; Wilson 1995; Boykoff and Boykoff 2004; Billet 2009; Das *et al* 2009). The coverage of climate change/ global warming issues in Indian newspapers has witnessed significant increase during the last decade (Boykoff 2010; Billet 2009). The approach of the coverage has also undergone a change having found its way into financial papers (Boykoff 2010).

The issues related to environment especially of climate change/ global warming have assumed global significance encompassing a range of factors including social, political, economic, and scientific, etc. The present paper attempts to portray how English-language newspapers in India have treated the coverage of these issues.

Objectives

The objectives of the study are as follows:

- To quantify the number of items pertaining to environmental issues and to identify newspapers that gave emphasis to these issues;
- To analyze the prominence of the reported items; and space devoted to them.
- Codification of the identified items into global warming, climate change and other environmental related issues.
- Identification of themes, issues, and concerns reflected in items pertaining to climate change and global warming.

Data and methodology

The study is based on the quantification of issues on environment that appeared in 31 prominent and popular national English dailies published from metropolitan cities and state capitals during April 01, 2008 to September 30, 2008. However, there was no specific reason to choose this period. The advantage

of selecting prominent and popular dailies has also been pointed out by Moyer *et al* 1995. The selected newspapers make up a large proportion of the total circulation. Authors identified the relevant stories and articles (hereafter called "Items") on various issues concerned with environment published in these selected newspapers. These relevant marked items were cut from the main newspapers and pasted on separate sheets for further analysis. The name of the newspaper, date of publication of the item and page number on which it was published was noted. Each item was codified into an appropriate sub-discipline based on the headline and/ or the content. The content of the item was studied wherever the headline was ambiguous. Also, on each clipping the type of item (story or article), visual(s), if any, number of column spread and quantum of space measured in square centimeters (cm²) was recorded. Wherever available name of the journal(s) and the country of the workplace where the research was carried out were also recorded. The data was fed into Fox-Pro for analysis.

Review of literature

In the past, several studies dealing with the coverage of climate change in the media have been published in the literature. However, most of these studies mainly focused on the media coverage of the environmental and climate change issues of the industrially advanced countries of the west like the USA (Mazur and Lee 1993; Trombo 1996; Boykoff and Boykoff 2004; Boykoff and Boykoff 2007; Antilla 2005; Liu *et al* 2008), UK (Wilson 1995; Taylor and Nathan 2002; Carvalho and Burgess 2005; Boykoff and Mansfield 2008), Germany (Dunwoody and Peters 1992; Weingart *et al* 2000), Australia (McManus 2000) and New Zealand (Bell 1994). The US has been the focus of several studies, probably, because it is the top emitter of greenhouse gases (GHGs) globally, producing approximately 25% of GHGs worldwide with 5% of world's population (McCarthy and Canziani 2001). Few other important studies on media coverage of climate change and global warming are by Bell 1994; Stamm *et al* 2000; Wilkins 1993; Nissani 1999; Bord *et al* 2000; Musukuma 2002; Hansen 1991; Doston *et al* 2012.

The reporting of environmental issues in media has exhibited differences among different west-

ern economies despite the fact that these are global scientific occurrences. For instance, cross-cultural comparison of global warming coverage in France and the US found that France’s coverage was more events based, focused more on international relations and offered a more restricted range of perspectives than the US coverage, which tends to emphasize on conflicts between scientists and politicians (Brossard *et al* 2004). Billet has also expressed similar views and points out that climate change is represented in highly weird manners at the national level (Billet 2009). However, the two fast growing economies of the world like China and India have been left out from the studies of media coverage of environmental issues including climate change/global warming by western scholars except Billet 2009 and Boykoff and Boykoff 2010. This gap is of considerable concern given the global nature of sustainability problems (Joseph 2005) and the critical role of communication in the environment politics. Keeping this in view, Bacon and Nash (2006) analyzed environmental stories in five South-East Asian English-language newspapers (*Vietnam News, South China Morning Post, Jakarta Post, Bangkok Post, New Straits Times*) and compared them with the coverage in the *Sydney Morning Herald*. Das *et al* 2009 explored the coverage of environmental issues in three daily newspapers published from Bangladesh for June 2007 (two Bangla and one English-language). Srivastava (2003) examined the coverage of environmental issues in regional Indian newspapers. The present study is, however, different from Billet 2009 and Boykoff 2010, as it covers more number of newspapers (hardcopy) published from different parts of India.

Results

Items and space allocated: A total of 636 items were published on different aspects of environmental issues during the period of study. These items occupied a total space of 150,699 cm². The space occupied by issues related to environment was second highest, preceded by health issues among the entire S&T coverage in the Indian newspapers (Dutt and Garg 2012). The average space occupied by each item was 237 cm², much higher than the average space (183.3 cm²) occupied by S&T news in Indian English-language dailies.

Topics covered: Among all the topics discussed under environment, climate change and global warming got the highest priority. There were 477 (75%) items which occupied a space of 116,382 cm², constituting more than two third (77%) of the total space occupied by environmental issues. The remaining (159) items were scattered in different sub-topics related to environment and could not be grouped into meaningful homogenous categories, and hence have been grouped as “others”.

Prominence and placement: About 71% of the items were allocated a column spread of up to four columns; the remaining 29% had a column spread of more than four columns. The proportion of items having a column spread of one to four was almost equal. Of the entire coverage only a minuscule portion (8%) items appeared on the first four pages of the newspapers and the rest 92% appeared on later pages. The subject that had the highest number of items on the front pages dealt with impact and mitigation.

Newspapers: The total items appeared in 31 newspapers published from different parts of India. Of these, the national daily *The Times of India* published from the national capital devoted the maximum space to environmental issues (~18%). This was followed by *The Financial Express* and *The Economic Times*, the two business newspapers (Table 1). These three newspapers together accounted for more than one-third of the space allocated by all the newspapers and about 42% of the total items. Certain regional newspapers like *Assam Tribune, Deccan Chronicle, Deccan Herald, Metro Now, Mid*

Table 2: Coverage of various environmental issues

Global Warming/ Climate Change themes	Number of items (%)
Adverse Impacts	179 (28.1)
Mitigation	130 (20.4)
Diplomacy	53 (8.3)
Politics and Policy	36 (5.6)
Global Warming Research	32 (5.0)
Global Warming Cause	28 (4.4)
Global Warming Awareness	12 (1.8)
Adaptation	7 (1.1)
Total	477 (~75)

Day, Mint, Mumbai Mirror, New Indian Express, Sentinel, and the Telegraph accorded little priority to environmental issues.

Sources of items: Of all the reported items about half (47%) did not mention their sources. The remaining 53% items used indigenous as well as foreign sources. Of these about 39% were indigenous sources and the rest 61% were foreign sources. Among the foreign sources, 30% were from the UK, 16% from France, 7% from the US and the rest 8% were from other countries. The indigenous news sources were dominated by Press Trust of India (PTI), Times News Network (TNN), Indo-Asian News Service (IANS) and Asian News International (ANI). Foreign news sources were dominated by Reuters (UK), AFP (France), Associated Press (AP) from USA, *The Guardian* and *The Independent* both from the UK.

Workplace of research: About 87% of the items originating from 25 countries mentioned the workplace of research reported in the newspapers. The most dominating countries were India (~32%), USA (~28%), UK (~6%), Japan (~4%), Australia (~3%), Germany (~2.5%) and Thailand (~2%). These seven countries accounted for 77% of those items that had referred to the place of research. Other major performing countries included Canada and France. There is a striking departure in the workplace of research when compared to overall S&T where the US was the dominating country accounting for 41% of the items followed by India (16%) (Dutt and Garg 2012). Also, in the overall S&T coverage research performed in 70 countries found place in the newspapers whereas in the environment it was restricted to 25 countries.

Visual representations: About 56% of the items were supported by visuals, the majority of which were photographs. Of the visuals with photographs 46% were single photographs and the rest 3% had multiple photographs. Other forms of visuals included sketches, satellite images, diagrams, graphs and tables. A small proportion of items had multiple visuals. Impact related items had the maximum number of illustrations.

Journal citation: Of all the items published in dif-

ferent newspapers 86% did not incorporate journal citations. Only 14% items included journal(s), conference paper(s), reports and book citations. Highest number of citations was from journals. Twenty six different journal titles dealing with environment related issues were cited in these items. Few dominant of these included *Nature, Science, and Proceedings of the National Academy of Sciences of USA.*

Thematic representation: The items were scattered on several issues with a significant percentage (75%) on climate change/ global warming, the rest 159 were grouped as “others” as they could not be homogeneously categorized (Figure 1). Hence, the thematic presentation will reflect on sub-topics discussed under climate change/ global warming (Table 2).

Adverse impacts: Of the 477 items on climate change/ global warming, the highest (179) dealt with adverse impacts of climate change/ global warming. These items occupied a space of 35,267 cm², constituting about one-quarter of the total space occupied by items on environment and more than one third (36%) of the space on climate change/ global warming. Several types of adverse impacts that might result due to climate change/ global warming were discussed in these items. The highest number of items was on ecological impacts on forests and different species of plants, insects, microbes and animals like penguins, dolphins, dinosaurs, orangutan, tuatara reptile, seals, fishes, elephants and their habitats, birds and their migration patterns, impact on coral reefs and mangroves. Several items dealt with already visible impact of global warming on weather and those that were projected to take place in the coming years like rise in temperature, change in rainfall patterns, fiercer tropical cyclones and increase in the occurrence of hurricanes.

Effects of global warming on human health were also discussed in some articles. These items were on increase in vector borne diseases like malaria, cataract blindness, psychiatric diseases, allergies and increase in HIV positive cases.

A large number of items dealt with melting of Arctic, Antarctic and Himalayan glaciers “the Gangotri” and other glaciers like North Pole and their resultant impact on rise in sea level and sinking of islands and vulnerability of coastal areas to storms.

How the Indian English-language press covers environment?

Some of the items discussed about how rapidly the arctic ice were melting and projected how fast they would melt in the coming years. Acidification of ocean water was also focused in one item.

Items on agricultural impacts dwelt upon decrease in crop production of wheat, rice, cardamom and their result on food security. Impact of the melting of Himalayan glaciers on India's overall agriculture and food production were also discussed in some items. Some other items discussed the effect of global warming on bee pollination and loss of fragrance in the flowers, wine and beer production. The economic impact of global warming on economies of different countries including India was discussed.

Mitigation: These items (130) discussed about mitigation policy, development of new technologies and alternative energy sources for mitigation of climate change/ global warming. Some items discussed about developed country versus developing country stand on mitigation, domestic mitigation policy, India-China mitigation policy and issues related to carbon credits.

Diplomacy: The central theme dealt with international politics of climate change (53) and India's role in it (11). These involved mainly developed and developing countries' debate on carbon emission rights and stand taken by various countries on this issue, specially the US and Japan, changes in their attitude towards climate change and steps taken in that direction. Global conferences like the global meet on climate change, the Copenhagen conference and the G8 summit (Japan) on global warming were also discussed in some items.

There were 8 items on India-China inclusion in the mandatory emission caps. The topics included stand of the US on the issue of carbon emissions in the emerging economies. There were 6 reports on Kyoto emission caps. Other articles dealt with the stands taken by poor nations' on the issue and the diplomacy of the science of climate change and cap over emissions.

Politics and policies: Thirty six items dealt with politics and policies of climate change. Most of the items on domestic policies focused on the various aspects of the national action plan on climate change, national solar mission and the various state

action plans. International politics like comparison between carbon emissions by India and China, G8 summit on climate change and India's position on banning of coal were also dealt with.

Global warming research: These items (32) discussed topics of global warming research. Highest number of items under this category was on the mathematical modeling of climate phenomenon. Other subjects covered included the effect of aerosols on climate change, items against and in support of the warming theory and those linking global warming with ozone hole depletion.

Global warming cause: These items (28) included the effect of increasing nitrogen based gases besides the rise in carbon dioxide, and also items on other causes such as solar activity, obesity and non-vegetarianism contributing to warming, the effect of black carbon and the contribution of methane gas in global warming.

Global warming awareness: These items (12) comprised methods of combating global warming, spreading awareness through comedies, children's awareness programs, UN messages to generate awareness, opinion survey, life style and warming.

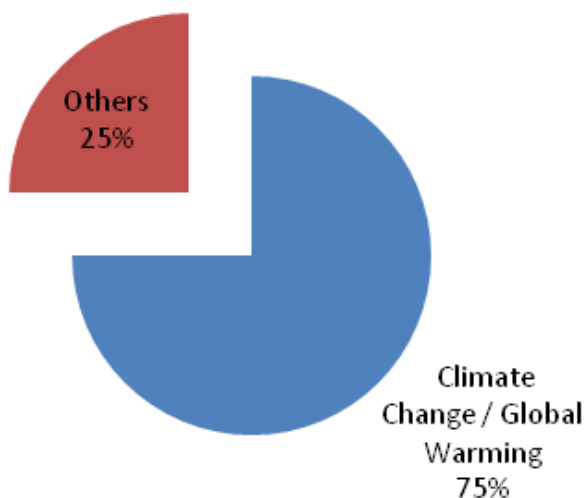
Adaptation: These seven items included domestic agricultural adaptation, relocating species to save them, protection for riverside cities and necessity of adaptation and technology to test climate tolerance.

Others: The items grouped in this category discussed topics like alternative fuels, biodegradable plastics, biodiversity, carbon emissions, deforestation, eco-friendly buildings, emission control in aviation and ships, and pollution of water and air, etc.

Discussion and conclusion

India is attracting increasing attention within the climate debate due to its physical and political situation. Also climate change is attracting increasing attention within India, (Billet, 2009) as the coverage of environmental and climate change / global warming issues have increased significantly. The topic of environment in Indian English-language press has come to acquire a centre stage by gaining 2nd posi-

Coverage of Environmental Issues



tion at ~15% coverage (the 1st position occupied by health/ biomedical research at 36% coverage) as revealed by the predominant position of this topic in the entire gamut of science and technology coverage (Dutt and Garg, 2012). And within the environmental coverage it is the sub-topic of climate change/global warming that occupies the leading position, Figure 1. In an earlier study (Dutt and Garg, 2000), the proportion of environmental issues was negligible and ranked at 10th position as percentage (~3%) of S&T coverage in Indian English-language dailies. This increase in coverage on environment in the English-language press from 3% in 1996 to 15% in 2008 is a remarkable change, which needs to be put in proper perspective. This predominance of environmental issues in the English-language press may be comprehended by the fact that environment is no longer a relegated domain as its impact is all-pervading which touches the quotidian life of the populace in India, both in rural as well in urban areas. Changing weather pattern, various kinds of pollution, issues of a variety of waste management, various kinds of environmental campaigns, like planting trees, ban of plastics, etc., in addition, big full page awareness advertisements by MoEF in print as well as electronic media on environment day and other occasions, celebrations of environment day in schools by organizing lectures, painting competitions, essay writing, some schools organizing students' march on the streets with placards as a part of sensitizing people about environmental issues and

concerns. Further, the pro-active role of government agencies in enforcing various environmental regulatory measures, have put the issue of "environment" in cognitive structure of the people. All these issues keep on getting reflected in the press.

The state of environment in India has stirred the conscience of the nation which is evident in various policy initiatives and programs undertaken by the Ministry of Environment and Forests (MoEF), Government of India, as well the public concern and awareness on the issue during the last decade or so. Various regulatory measures have come into force and their implementation has gradually become more and more stringent as was evident by the meticulous stand taken by the MoEF on several issues. For example, in the recent past the Green Tribunal suspended the environmental clearance granted to the POSCO India Private Limited for setting up a steel plant in the state of Odisha and the issue has been in the press as the controversy evolved and unfolded itself (*Times of India, Green Tribunal Suspends Environmental Clearance to POSCO, 30 March 2012*). Various other measures like revoking environmental clearances under Environment (Protection) Act 1986, granted earlier to Cement Plant, Coke Oven Plant and Captive Power Plant, in District Bhavnagar, Gujarat (MoEF), in December 2011.

Among the sixteen newspapers listed in Table 1, about one third of the coverage was captured by the newspapers whose focus was business/ finance/ economics. It may be surmised that their interest in the environmental issues might be governed by the business and commercial interest of their clients/ readers who might be looking for various kinds of business opportunities, devising and reformulating strategies in view of the entire gamut of evolving environmental scenario. Also, environmental policy and regulatory issues are germane and crucial to the interests of the business and industrial community.

In the entire gamut of environmental coverage, the predominance of global warming/ climate change may also be attributed to the global political activity spearheaded under the aegis of United Nations Environmental Program (UNEP) which witnessed various international meets of top ranking political leaders, officials, scientists and environmental specialists. International diplomacy on the reduction of CO₂ emission and the articulation

of India's position on these issues has attracted the attention of the media. Also in the Indian media the award of Nobel Peace Prize to the Intergovernmental Panel on Climate Change (IPCC) (received by Dr. R.K. Pachauri as Chair IPCC) jointly with Al Gore the former Vice-President of the United States triggered trickling stories and articles on environment, mainly climate change/ global warming in the English-press. Although, the prize was awarded in December 2007 but this mere event that an Indian heading IPCC and bagging a Nobel on the subject of environment brought the topic of environment into focus in the Indian English-press.

References

1. Ananthapadmanabhan, G., Srinivas, K., & Gopal, V. (2007). *Hiding Behind the poor: a Report by Greenpeace on Climate Injustice in India*, Greenpeace, New Delhi.
2. Antilla, L. (2005). Climate of Skepticism: US Newspaper Coverage of the Science of Climate Change. *Global Environmental Change, Part A: Human and Policy Dimension*, 15 (4), 338-352.
3. Bacon, W. & Nash, C. (2006). Reporting Sustainability in the English-Language Press in South East Asia. *Pacific Journalism Review*, 12(2), 106-134.
4. Bell, A. (1994). Climate of Opinion: Public and Media Discourse on Global Environment. *Discourse and Society*, 5(1), 33-64.
5. Bell, A. (1994). Media (Mis)communication on the Science of Climate Change. *Public Understanding of Science*, 3:259-275.
6. Billet, S. (2009). Dividing Climate Change: Global Warming in the Indian Mass Media. *Climate Change*, DOI 10.1007/s10584-009.9605-3
7. Bord, R.J., O'Connor, et al. (2000). In What Sense Does the Public Need to Understand Global Climate Change? *Public Understanding of Science*, 9, 205-218
8. Boykoff, M.T., & Boykoff, J.M. (2004). Bias as Balance: Global Warming and the US Prestige Press. *Global Environmental Change*, 14(2), 125-136.
9. Boykoff, M.T., & Boykoff, J.M. (2007). Climate Change and Journalistic Norms: A Case-study of US Mass-Media Coverage. *Geoforum*, 38, 1190-1204.
10. Boykoff, M.T., & Mansfield, M. (2008). 'Se Olde Hot Aire': Reporting on Human Contributions to Climate change in the UK Tabloid Press. *Environmental Research Letters*, 3:024002 (8pp) doi:10.1088/1748-9326/3/2/024002
11. Boykoff, M. (2010). Indian Media Representations of Climate Change in a Threatened Journalistic Ecosystem. *Climate Change*, 99: 17-25, doi10.1007/s10584-9807-8
12. Brossard, D., Shanahan, J., & McComas, K. (2004). Is Mass Media Coverage of Global Warming Culturally Bound? A Comparison of French and American Coverage of Global Climate Change. (in) *Proceedings of Climate Change Communication Conference*, Volume 132, University of Waterloo, Ontario, p.9-10.
13. Burgess, J. (1990). The Production and Consumption of Environmental Meanings in the Mass Media: A Research Agenda for the 1990s. *Transactions of the Institute for British Geography*, 15, 139-161.
14. Carvalho, A., & Burgess, J. (2005). Cultural Circuits of Climate Change in the UK Broadsheet Newspapers, 1985-2003. *Risk Analysis*, 25 (6), 1457-1469.
15. Das, J., Bacon, W., Zaman, A. (2009). Covering the Environmental Issues and Global Warming in Delta Land: A study of Three Newspapers. *Pacific Journalism Review*, 15(2), 10-33
16. Doston, D.M., Jacobson, S.K., Kaid, L.L. & Carlton, J.S. Media Coverage of Climate Change in Chile: A Content Analysis of Conservative and Liberal Newspapers. *Environmental Communication: A Journal of Nature and Culture*, 6(1), 2012, DOI:10.1080/17524032.2011.642078.
17. Dunwoody, S., & Peters, H.P. (1992). Mass Media Coverage of Technological and Environmental Risks: A Survey of Research in the United States and Germany. *Public Understanding of Science*, 1(2), 199-230.
18. Dutt, B., & Garg, K.C. (2000). An Overview of Science and Technology Coverage in Indian English-language Dailies. *Public Understanding of Science*, 9, 123-140.
19. Dutt, B., & Garg, K.C. (2012). S&T Coverage in English-language Indian Dailies. *Current Science*, 102(9), 1244-1245
20. Dutt, B., & Garg, K.C. (2012). S&T Coverage in English-language Indian Dailies. *Journal of Science Communication (JCOM)*, 11(3), 2012, A01, 1-9
21. Hansen, A. (1991). The Media and the Social Construction of the Environment. *Media, Culture and Society*. 13, 443-58
22. Josephi, B. (2005). Journalism in the Global Age: Between Normative and Empirical. *Gazette*, 67(6), 575-590.
23. Liu, X., Vedlitz, A., & Alston, L. (2008). Regional News Portrayals of Global Warming and Climate Change. *Environmental Science Policy*, 11(5), 79-393
24. Mazur, A., & Lee, J. (1993). Sounding the Global Alarm: Environmental Issues in the US National News. *Social Studies of Science*, 23, 681-720.
25. McCarthy, J.J., & Canziani, O.F. (2001). Climate Change 2001: *Impacts, Adaptation and Vulnerability*,

- Geneva, Switzerland, IPCC: 89.
25. McManus, P.A. (2000). Beyond Kyoto? Media Representation of Environmental Issue. *Australian Geographical Studies*, 38(3), 306-319.
 26. Ministry of Environment & Forests, Government of India. *Annual Report 2007-08*. New Delhi.
 27. Ministry of Environment & Forests, Government of India. *State of Environment Report 2009*. New Delhi.
 28. Moyer, A., Greener, S., Beauvais, J., & Salovey, P. (1995). Accuracy of Health Research Reported in the Popular Press: Breast Cancer and Mammography. *Health Communication*, 7, 149
 29. Musukuma, S. (2002). Putting Environmental Reporting on the News Agenda. *Intermedia*, 30,16-17.
 30. Nissani, M. (1999). Media Coverage of the Greenhouse Effect, Population and Environment. *Journal of Interdisciplinary Studies*, 21(1), 27-43
 31. Srivastava, M. (2003). Role of Regional Newspapers in Dissemination of Scientific Knowledge on Environment and Development. *Indian Journal of Science Communication*, 2(1), 15-22
 32. Stamm, K.R., Clark, F., & Eblacas, P.R. (2000). Mass Communication and Public Understanding of Environmental Problems: The Case of Global Warming. *Public Understanding of Science*, 9, 219-237.
 33. Taylor, N., & Nathan, S. (2002). How Science Contributes to Environmental Reporting in British Newspapers: A Case Study of the Reporting of Global Warming and Climate Change. *the Environmentalist*, 22, 325-331.
 34. Trumbo, C. (1996). Constructing Climate Change: Claims and Frames in US News Coverage of an Environmental Issue. *Public Understanding of Science*, 5(3), 269-283.
 35. Watkins, R., Palmer, J., & Kolokotroni, M. (2007). Increased Temperature and Intensification of the Urban Heat Island: Implications for Human Comfort and Urban Design. *Built Environment*, 33(1), 85-96
 36. Weingart, P. A., Engels, A., & Pensegrau, P. (2000). Risks of Communication: Discourse on Climate Change in Science, Politics and Mass Media. *Public Understanding of Science*, 9, 261-283.
 37. Wilkins, L. (1993). Between the Facts and Values: Print Media Coverage of the Green House Effect, 1987-1990. *Public Understanding of Science*, 2, 71-84.
 38. Wilson, K. M. (1995). Mass Media as Source of Global Warming Knowledge. *Mass Communication Review*, 22 (1-2), 75-89.



Communication strategy for new amoebae diseases

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Information and effective communication strategies are critical to the successful management of any disease and its future transmission. Obtaining early information about risk factors and symptoms most effectively enhance the rate of strategically escaping or curing disease at an early stage. The paper discusses the prevalence of amoebae and the disease potential of the genus Acanthamoeba and Naegleria, causing Granulomatous Amoebic Encephalitis (GAE), Amoebic Keratitis (AK), and Primary Amoebic Meningoencephalitis (PAM). The work involves awareness meant for the welfare of rural as well as urban populace, farmers and health workers. Recently, the authors have reported several amoebic species associated with fresh and raw vegetables, especially consumed as salad, such as, mushroom, capsicum, onion, radish, betel leaves and sugarcane juice, just to name a few, and some fast food items as well. Therefore, the role of these amoebae as disease causing organisms should be seriously analyzed and evaluated. General public should be educated and made aware of the means of disease propagation and transmission. Much information is needed about amoebic meningitis and keratitis in India as these have been tagged as rare diseases by medical and health professionals. Lack of attention, information and knowledge up-gradation among health professionals about new amoebic diseases have led to ignorance among general public. No specific books are available in the market regarding disease. There are very few cases reported in India than abroad, not because of low incidence rate but due to lack of health reporting. Limited research, lack of scientific talks and no effective medicine is available for these diseases. Gradually, increase in number of cases are also observed because possible routes of infections are getting more due to changing lifestyles of people. Some new possible means that are responsible of these new amoebic diseases were discovered. The paper thus emphasizes on the need of information and communication strategies, amoebic meningitis and keratitis.

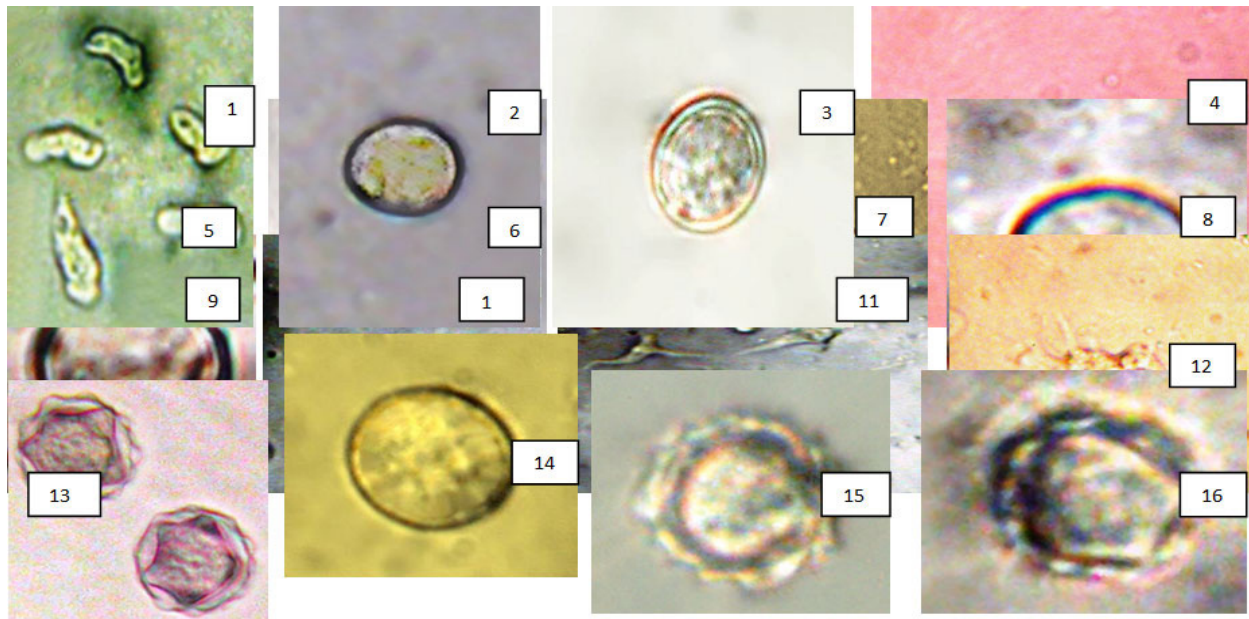
Keywords: Amoebae diseases, Communication strategy, Clinical and veterinary aspects, Cleanliness.

Introduction

Amoebae are regarded as the most primitive among animals. The disease causing amoeba known to medical sciences was mainly *Entamoeba histolytica*, but amphizoic amoebae belonging to two genera (*Naegleria* and *Acanthamoeba*) are now established as opportunist parasite of human being and domestic animals (see Plate-1), (Morales *et al*, 2006, Daft *et al*, 2005). These small-free living aerobic amoebae were regarded as, opportunistic and pathogenic in nature, producing fatal human diseases affecting central nervous system and eye. *Naegleri fowleri* is the causative organism of acute infection of healthy persons having recent history of swimming and the disease is termed as Primary Amoebic Meningocephalitis (PAM), whereas, *Acanthamoeba culbertsoni* is the aetiological agent of chronic illness of immunologically weak individuals having no history of swimming and disease is termed as Granulomatous Amoebic Encephalitis (GAE). *A. polyphaga* and *A. castellani* are known to cause eye infections and the disease caused by them is referred as Amoebic keratitis (Culbertson, 1971). These amphizoic amoebae are ubiquitous in nature and have been

isolated from a variety of habitats such as water, soil, and from various edible agricultural products, including vegetables such as carrot, turnip, radish, etc., consumed mostly in raw conditions and aquatic edible organisms like prawn, crayfish, fishes, etc. (Sharma *et al.*, 2004; Veverkova *et.al.*, 2002; Dykova *et.al.*, 2005; Ahmad *et al*, 2009; Rezaeian *et al*, 2008; Kilvington *et al.*, 2004; Pandey and Sharma, 2004, 2006; Dykova and Jiri, 2004). The observations and findings of this study provides a significant data to understand the ecology of amphizoic amoebae, their relationship with their host and to provide useful information about the prevalence of pathogenic *amphizoic amoebae* strains in order to develop a better understanding of such opportunistically parasitic amoebae prevalent on various environmental substrates. A proper study of amphizoic amoebae from their natural habitats, which risk humans and animals for infection, is helpful in suggesting suitable preventive measures besides enriching knowledge of general public by educating people about healthcare and hygiene.

Objectives



Various species of amphizoic amoebae. Fig.1- Trophozoites of *Naegleria* sp.; 2- Cyst of *N. fowleri*; 3- Cyst of *N. gruberi*; 4- Amoebaoflagellate stage of *Naegleria* sp.; 5- Trophozoites of *Schizopyrenus* sp.; 6- Cyst of *Schizopyrenus* sp.; 7- Trophozoites of *Hartmanella* sp.; 8- Cyst of *Hartmanella crumpae*; 9- Cyst of *Hartmanella vermiformes*; 10- Trophozoites of *Vanella* sp.; 11- Floating forms of *Vanella* sp.; 12- Trophozoite of *Acanthamoeba* sp.; 13- Cyst of *A. polyphaga*; 14- Cyst of *A. glebae*; 15- Cyst of *A. culbertsoni*; 16- Cyst of *A. rhyssodes*. All magnifications = $10\times 40x$.

1. To develop strategies regarding dissemination of information and effective communication, which are critical to successful management of these new amoebic diseases and their future transmission.
2. Obtaining early information about risk factors and symptoms that will most effectively enhance the rate of strategically escaping or curing disease at early stage.
3. To discuss the prevalence of opportunistically pathogenic amoebae and their disease potential of the genus *Acanthamoeba* and *Naegleria*, causing GAE, AK, and PAM.
4. To analyze and evaluate the role of these amoebae as disease causing organisms.
5. To draw attention of health professionals and provide useful information amongst masses for their education and awareness, leading to knowledge up-gradation about various means of disease propagation and transmission.
6. To emphasize and encourage the need of eminent research work in this field considering the present scenario of limited research contributions from Indian perspective.
7. To discuss about the possible routes of infections, which are getting more due to changing lifestyles of people, including food borne transmission of the disease.

Materials and methods

In order to evaluate and analyze the information and communication strategies for these new amoebic diseases, amoebic keratitis and amoebic meningitis, the data was collected from various sources, and then analyzed to draw conclusions. Scientific literature was thoroughly read from various scientific institutes and internet (journals, books, etc.), and scientific experiments performed by the authors in laboratory conditions. Isolation of amoebae was performed by following the standard methods of Singh and Hanumaiah (1959). Amoebae were studied and identified on the morphological basis of trophozoites, cysts and flagellates following Singh (1981) and the latest classification of protozoa (Levine *et al.*, 1980). The pathogenicity test of amphizoic amoebae was performed in laboratory *Albino* mice weighing upto 12 to 15 g. choosing the strains of *Naegleria fowleri* which is regarded as the causal

organism of the disease PAM.

Discussion

We need to focus on following aspects that need immediate attention:

Clinical aspects: Presence of amphizoic amoebae may cause danger of PAM, GAE, and AK for people meddling with contaminated pond water and especially immune-compromised persons.

Veterinary aspects: The domestic animals or the cattle might also remain affected by these pathogenic amoebae. There is a high likelihood of cattle and other livestock to catch infection of PAM, GAE, AK or both as they remain in constant contact with the contaminated pond water most of the time, especially at the time of bathing and drinking, where the infective stages (trophozoite) of *N. fowleri*, may make its way through the nasal passage of the victim and cause PAM or the trophozoite of *Acanthamoeba culbertsoni* or *A. rhysodes* could infect the animal via haematogenous route. The same threats remain viable for human beings also. Ironically, in a country like India, where the cause of human deaths goes undiagnosed due to lack of facilities, funding and awareness, how much and to what extent is it possible to diagnose the cause of deaths among cattle or other livestock?

Soil is regarded as a suitable medium for growth of aerobic amoebae as it contains various organic and inorganic compounds (Singh 1975). The microbial activities are mediated in the rhizosphere so it may be assumed that the protozoon population would be distributed in this microhabitat as well (Rodriguez-Zaragoza *et. al.*, 2005) and as *Agaricus bisporus* and *Plerotus sajorcaju* (mushrooms) are grown on compost made up of highly rich organic matter therefore the probability of rich amoebic fauna in compost as well as on mushroom surfaces is very high (Shukla and Sharma 2010; Shukla 2011). On similar lines, we can say that the presence of pathogenic *Acanthamoeba* strains in poorly washed sugarcanes (*Saccharum officinarum*) that grow in close vicinity of soil and its extracted unpasteurized juice should be a matter of concern for the consumers as well as juice vendors. It is a warning for all the fruit juice consumers, as these deadly amoebae may

Various environmental substrates from which pathogenic and lethal stains have been isolated

S.No.	Substrates	Reason for choosing as a substrate	No. of pathogenic strains isolated/ total samples	No. of lethal strains when tested on <i>Albino mice</i> / pathogenic strains	Publications and paper presented
1.	<i>Pleurotus sajorcaju</i> (oyster mushroom)	Grows in compost rich in organic matter, supports amoebic growth	5/180	3/5	<i>Journal of Applied and Natural Science</i> . ISSN-0974-9411. Vol. 3 (2): 247-252
2	<i>Agaricus bisporus</i> (button mushroom)		Not investigated/ 240	Not investigated	<i>Journal of Advanced Zoology</i> .ISSN-0253-7214. Vol 32 (1),19-23.
3	<i>Trapa bispinosa</i> (singhaha)	Grows in water rich in organic matter, supports amoebic growth	11/100	11/11	<i>Lucknow Journal of Science</i> ., ISSN 0974-8121 Vol. 7(2), 9-18.
4	<i>Nymphaea nouchali</i> (kamalkakri)				
5	<i>Piper betel</i> (paan)	Grows in soil	21/200	14/21	Paper presented at Annual Conference of AEB, Lucknow, 2012
6	Unpasteurized Sugar-cane juice	Extracted from unwashed/not properly washed sugarcane under non- hygienic conditions	14/90	11/14	Paper presented at XXII Annual Conference of National Environmental Science Academy held at Jamia Hamdard, NewDelhi, 27- 29 th December, 2009.
7	<i>Heteopneustes fossilis</i> (singhi)	Edible fishes cultivated in water often contaminated with amphizoic amoebae	4/36	Not investigated	<i>AQUACULT</i> ISSN-0972-2262. Vol.12 (1), 125-132
8	<i>Channa punctatus</i> (girai)				
9	Various environmental sources (air, soil, water, other edible products)	Here strains were studied with emphasis on certain physico-chemical factors influencing their pathogenicity. For detailed reading consult the paper.			<i>Flora and fauna</i> . Vol. 17 (1): 129-133
10		The role of pathogenic and lethal strains of amphizoic amoebae have been discussed in detail with respect to their relation to edible biological products For detailed reading consult the book.			Protozoa and food: amphizoic amoebae and other protozoa in relation to edible biological products VDM, Germany ISBN 978-3-639-36381-4
11	Domestic water supply	Pathogenic strains were detected			<i>Perspectives in Animal Ecology and Reproduction</i> , VOL 7, Chapter-1, pg 3-14, Daya publications, New Delhi.

pose a major threat by causing diseases like GAE through hematogenous route, especially if there is any wound in the vocal cavity of the consumers (Shukla and Sharma 2009). Besides GAE, the risk of another disease such as Cutaneous Acanthamebiasis (CA) might also occur among farmers. Therefore, it is advisable that certain sectors or industries in which unpasteurized fruit juices or raw vegetables appear in ready-to-eat products that are not further heat-processed or pasteurized should be avoided by the consumers (Shukla and Sharma 2010; Shukla 2011). Pathogenic *Acanthamoeba* strains may even pose threat of GAE among consumers, farmers and vendors of betel leaves. Therefore, apart from causing cancer there is yet another reason for the consumers that its consumption should be avoided (Shukla and Sharma 2012). Presence of amphizoic amoebae may cause danger of GAE or AK for immune-compromised as well as immune-competent persons respectively. The amphizoic amoebae found on vegetables used for human consumption are transmitted from different sources during the chain of production, transportation, market and cuisine which could be through waste water used in aquatic food production or contact to other contaminated products or splashing and refreshing of vegetables with contaminated water (Shukla and Sharma 2010; Shukla 2011). Thus, consumers should wash their vegetables thoroughly, especially those eaten raw or in poorly cooked forms, proper cooking of vegetables is recommended and a good hygiene is urgent for everybody dealing with food. There is a need of awareness especially among farmers and vendors about the occurrence of these protozoan parasites and their proper sanitation.

The results are in conformity with the findings of earlier researchers. Besides these substrates, there were some more food items, from where these amoebae were isolated. This is noteworthy that due to changing lifestyles in recent Indian context, we are switching to fast food fashion that comprises of these raw or poorly cooked vegetables. If not cooked properly these may be a cause of the serious amoebic diseases as the route of GAE causing acanthamoebae is haematogenous. Any wound in mouth may result the active trophozoite to cause the disease. The small free-living amoebae have been isolated from agricultural soils (Ekelund and Ronn 1994). These free living amphizoic amoebae

are ubiquitous in nature and grow in close proximity to vegetables cultivated underground or in aquatic environments. Irrigation with poor quality water is one way that fruits and vegetables can become contaminated by disease causing protozoa (Steele and Odumeru 2004). So these findings are in support and give logical expansion of the work on small free-living amoebae from edible sources like vegetables such as turnip (Srivastava *et al.*, 1996), carrot (Sharma *et al.*, 2004), cucumbers, cabbage, lettuce, celery, carrots, radishes, tomatoes, cauliflowers and spinach (Rude *et al.*, 1984), various species of mushrooms like *Laccaria trullisata* (Napolitano and Flanagan 1980) and another common edible species *Agaricus bisporus* (Napolitano 1982). Recently they have been isolated and cultured from store-bought spinach and lettuce (Gourabathini 2008). We are aware that soil amoebae are recognized as pathogens (Duma 1972) and because virulent and nonvirulent amoebae have been obtained from lettuce, radishes, and onions (Clurea-Varl Saanen 1981), the role of vegetables in transmitting amoebae to humans must be evaluated.

The present study is a preliminary effort of applied significance covering the areas of food microbiology, protozoology, healthcare, hygiene, agricultural significance and may also serve the purpose to understand ecological relationships among amoebae and edible biological products. Extensive studies and futuristic approach are required to investigate the role of amoebae in edible mushrooms and other vegetables. These findings are in conformation and extension with the experimental works of other researchers who have previously worked on amoebae in relation to mushrooms (Napolitano, 1982 and Napolitano, and Flanagan, 1980) or other vegetables (Srivastava *et al.*, 1996). The findings are based on the experiments performed by authors under strict laboratory conditions during the period of November 2009 - November 2012. Some interim data have already been published in journals and presented in conferences.

The small, aerobic, free-living amoebae are the causal organisms of amoebic meningitis and keratitis. *N. fowleri* is the causative organism of acute infection of healthy persons having recent history of swimming and the disease is known as PAM (Visvesvara *et al.*, 2007), whereas *A. culbertsoni* is the aetiological agent of chronic illness of immu-

nologically weak individuals having no history of swimming and disease is termed as GAE (Martinez, 1980). *A. polyphaga* is known to cause eye infections and the disease caused is amoebic keratitis. Contaminated soil, water and air are considered as the main cause of disease propagation. *Naegleria fowleri*, the causal organism of PAM, penetrates the nasal cavity and subsequently invade cranium via nasal mucosa and cribriform plate, travel along the olfactory nerves and finally reaches the brain. In the brain they cause extensive destruction of tissue and patients usually develop cranial nerve palsies. Involving III, IV and V as well as cerebellar ataxia and reduced deep tendon reflexes, have also been reported (Carter 1970; Martinez 1985). Symptoms of the disease are severe headache, fever with body temperature above 39°C, meningismus, nausea, vomiting, meningeal irritation and neck stiffness (Carter 1970 and Jamil *et.al.*, 2008). Occurrence of amoebic meningitis has also been reported from India. A total of ten cases have been reported between 1971 and 2008 from India. This indicates how unaware are the health professionals, medical bodies and general public regarding these amoebic diseases that are tagged as rare by medical and health professionals.

Limited research, lack of scientific discourse, and non availability of effective medicines make these diseases more serious. There have been only the case reports of such diseases; no treatment and no follow up after death is reported in India, probably due to lack of research and funding (Shukla 2011). Conventional drugs such as Amphotericin-B and Rifampicin have been used to cure these diseases in early stages but they are losing momentum because of the resistant strains of amoebae coming into being. A survival case of a 26 year old female was presented by Jain *et.al.*, (2002) where *Naegleria* meningitis was diagnosed by wet mount cytology of cerebrospinal fluid (CSF) and treated with Amphotericin-B, Rifampicin and Ornidazole. Here the patient survived because of the early diagnosis of the disease. Therefore, awareness and information regarding disease is essential. Early treatment with Amphotericin B and Rifampicin may help and improve survival. Amphotericin-B at a dose of 1-1.5 mg/kg/day alone or in combination with Micronazole, Rifampicin and sulpha drugs may be used (Loschiavo *et.al.*, 1993) under prescription by a qualified medical doctor. The mortality rate of *N.*

fowleri infection is extremely high, of about 97% (Kaushal 2008).

Granulomatous amoebic encephalitis due to *Acanthamoeba sp.* causes chronic, sub acute encephalitis with CNS infection often with granuloma formation (Martinez *et.al.*, 1980). The route of infection is haematogenous and occurs through the lower respiratory tract ulceration of skin or mucosa, or other open wounds. The symptoms are headache, seizures, nausea, vomiting and neck stiffness (Carter 1970; Hamide *et.al.*, 2002). Besides, GAE *Acanthamoeba sp.* also causes Keratitis. It is the most common human infection of the cornea caused by *A. polyphaga*, *A. castellanii*, *A. palestenensis*, *A. rhyssodes* and *A. hatchetti* (John 1993). AK is severe, progressive and sight threatening infection of cornea. Even after improved diagnostic techniques and applying novel treatment modalities AK accounts for profound morbidity and significant loss in visual acuity in about 16% of infected corneal ulcer patients (Duguid *et.al.*, 1997). Though various risk factors are being quoted, none of them received due attention except “contact lens wearers” (Jeanette *et.al.*, 1989) in developing countries, as there is no widespread use of contact lenses in these countries. Now, since it has been identified that even non-contact lens wearers are prone to this infection (Sharma *et.al.*, 2000; Srinivasan *et.al.*, 2003; Davamani *et.al.*, 1998), this disease is gaining momentum like other common microbial eye infections fall of dust particles, trauma due to vegetable matter, contact with contaminated water, etc., have been found to be the predominant risk factors of AK (Radford *et.al.*, 2002; Kunimoto *et.al.*, 2000). The first case was diagnosed by Jones *et.al.*, (1975) from South Texas, with a history of eye trauma and exposure to contaminated water in the United States, but the disease remained very rare until the 1980’s when an increase in incidence mainly associated with contact lens wear was reported (Bacon *et.al.*, 1993). Visvesvara *et.al.*, (1983) studied the effect of Ketoconazole, Amphotericin-B and Sulphadiazine on *Acanthamoeba sp.* Ofori-kwakye *et.al.*, (1986) have stated that complete surgical excision of the mass lesion combined with chemotherapy offers the best prognosis, in addition to offering tissue for a definitive diagnosis. The disease is characterized by severe ocular pain, inflammation (Mannis *et.al.*, 1986) affected vision and ring shaped stromal infiltrate,

composed of neutrophils (Ma 1981), if not managed properly can lead to blindness and even loss of eye (Sharma *et. al.*, 2004).

Conclusions and recommendations

Though some of these diseases could be life threatening but there is no need to panic, as the incidence of these diseases is rare and simple measures can be more effective for protection. Following measures are recommended to safeguard from these diseases:

- **Improve public health and food safety:** Improved information and education to farmers on cleaner and more sustainable production techniques would help them match and satisfy consumer preferences, while maintaining environmental and health standards. There is a need of awareness especially among farmers, vendors and consumers about the occurrence of these protozoan parasites and their proper sanitation (Shukla 2011).
- **Ensure environmental quality:** Use of contaminated wastewater for irrigation and transportation purposes is the main cause for contaminating edible biological products with amphizoic amoebae. Strengthening environmental legislation would help alleviate this problem. Health risk minimization strategies should be developed and disseminated.
- **Filling in the knowledge gap by community participation:** An inclusive approach is required in order to fill the gap of agricultural knowledge among the farmer, consumer and the research communities that will lead to more effective health safety strategies.
- **Packaging, labeling and certification:** Packaging and labeling are becoming more important to consumers, as they provide some measure of food safety standards. Educating farmers on (hygienic) processing, along with a labeling system (or certification) would help gain better prices.
- **Devising new methods for improved farming techniques:** Research and development of adequate technologies may improve sustainable health and hygiene.
- **Ensure aquatic environmental quality:** Wastewater which is used in urban consumption or aquaculture increasingly polluted and serves

a main cause for contaminating aquatic vegetables (trapa, nymphaea, amaranthus, etc.) with amphizoic amoebae. Discharge into public water bodies must be better monitored and regulated. Health risk minimization strategies (like avoid meddling with such contaminated water without adequate care and hygiene) should be developed and implemented.

- **Inspection of ponds at regular intervals for its water quality:** Investigating and inspecting microbiological aspects of the ponds where these vegetables are grown should be continuously will be helpful and save people from microbiological contamination.
- **Maintenance of proper hygiene:** While extracting juice, cleaning and sterilization of fruits, squeezing rollers, juice extraction machine, etc. would be an advantage.
- **Formulation and application of international standards:** Such standards for food premises and public health infrastructure would be of great value.

This study comes out as a cautious effort to protect humans and animals from these deadly diseases transmitted through edible biological products and other environmental sources. These findings serve as additional evidence for food borne transmission of pathogenic free-living amoebae that may cause human disease under natural condition either directly or indirectly. Therefore, this work highlights the current epidemiological significance of pathogenic amphizoic amoebic strains and that must not be underestimated.

References

1. Ahmad, T., Paul, N, Shukla, K., and Sharma, A. K. (2011). Occurrence of amphizoic amoebae in domestic water supply from Lucknow city. *Perspectives in Animal Ecology and Reproduction*, 7, Chapter-1, pg 3-14, Daya publications, New Delhi.
2. Ahmad, T., Paul, N. and Sharma, A. K. (2009). Occurrence of small freeliving amoebae from natural water resources. *Environ. Conser. Jour.* 10 (1&2): 1-5.
3. Bacon, A. S., Frazer, D. G. and Dart, J. K. (1993). A review of 72 consecutive cases of *Acanthamoeba* keratitis, 1984-1992. *Eye.* 7:719- 725.
4. Carter, R. F. (1970). Description of a *Naegleria* sp. isolated from two cases of PAM and of the experi-

- mental pathological changes induced by it. *J. Pathol.* **100**: 217-244.
5. Clurea-Varl Saanen, M. 1981. L'isolement d'amibes libres dans le sol et les legumes; etude morphologique et pathogenique des souches isolees. *Rev. Med. Suisse Romande.* 101:229-238.
 6. Culbertson, C. G. (1971). The pathogenicity of soil amoebae. *Ann. Rev. Microbiol.* **25** : 231-254.
 7. Daft, B. M., Visvesvara, G. S., Read, D. H., Kinde, H., Uzal, F. A., and Manzer, M. D. (2005). Seasonal meningoencephalitis in Holstein cattle caused by *Naegleria fowleri*. *Journal of Veterinary Diagnostic Investigation* **17**, (6): 605-609.
 8. Davamani, F., Gnanaselvan, J., Anadakannan, K., Sridhar, N. and Sundararaj, T. (1998). Studies on the prevalence of *Acanthamoeba* keratitis in and around Chennai. *Indian J Med Microbiol* **16**(4):152- 153.
 9. Duguid, I. G., Dart, J. K., Morlet, N., Allan, B. D., Matheson, M., Ficker, L. and Tuft, S. (1997). Outcome of *Acanthamoeba* keratitis treated with polyhexamethyl biguanide and propamidine. *Ophthalmology* **104**:1587- 1592.
 10. Duma, R. J. 1972. Primary amoebic meningoencephalitis. *Crit. Rev. Clin. Lab. Sci.* 3:163-192.
 11. Dyková, I. and Lom, J. (2004). Advances in the knowledge of amphizoic amoebae infecting fish. *Folia Parasitologica* **51** : 81-97.
 12. Dyková, I., Pindová, Z., Fiala, I., Dvořáková, H., and Macháková, B. (2005). Fish-isolated strains of *Hartmannella vermiformis* Page, 1967: morphology, phylogeny and molecular diagnosis of the species in tissue lesions. *Folia Parasitologica* **52** : 295-303.
 13. Ekelund, F. and Rønn R. (1994). Notes on protozoa in agricultural soil with emphasis on heterotrophic flagellates and naked amoebae and their ecology. *FEMS Microbiology Reviews* **15** : 321-353.
 14. G. and Matheson, M. (2004). *Acanthamoeba* keratitis. The role of domestic tap water contamination in the United Kingdom. *Invest. Ophthalmol. Vis. Sci.* **45**: 165-169.
 15. Gourabathini, P., Brandl M. T., Redding K.S., Gunderson J.H., and Berk, S.G. (2008). Interactions Between Foodborne Pathogens and Protozoa Isolated from Lettuce and Spinach. *Appl. Environ. Microbiol.* **74**:2518-2525.
 16. Hamide, A., Sarkar, K., Kumar, N., Das, A. K., Narayan, S. K. and Parija, S. C. (2002). *Acanthamoeba* encephalitis : a case report. *Neural India.* **50**: 484-486.
 17. Jain, R., Prabhakar, S., Modi, M., Bhatia, R. and Sehgal, R. (2002). *Naegleria* meningitis : a rare survival. *Neurology India.* **50** (4): 470-2.
 18. Jamil, B., Ilyas, A. and Zaman, V. (2008). Primary amoebic meningoencephalitis. *Infectious Diseases Journal of Pakistan.* **17** (2): 66-68.
 19. Jeanette, J. S., Theodore, M. B. and Visvesvara, G. S. (1989). The epidemiology of *Acanthamoeba* keratitis in the United States. *Am. J. Ophthalmol.* **107** : 331- 336.
 20. John, D.T. (1993). Opportunistically pathogenic free-living amoebae. Parasitic Protozoa, 2nd edition, Volume 3, Edited by Julius P. Kreier and John R. Baker Academic Press, Inc. San Diego.
 21. Jones, D. B., Visvesvara, G. S. and Robinson, N.M. (1975). *Acanthamoeba polyphaga* keratitis and *Acanthamoeba* Uveitis associated with fatal Meningoencephalitis. *Trans. Ophthalmol. Soc. U. K.* **95**: 221-32.
 22. Kaushal, V., China, D. K., Ram, S., Singh, G., Kaushal, R. K. and Kumar, R. (2008). Primary amoebic meningoencephalitis due to *Naegleria fowleri*. *J. A. P. I.* **56**.
 23. Kilvington, S., Gray, T., Dart, J., Morlwt, N., Beeching, J. R., Frazer, D.
 24. Levine, N. D., Corliss, J. O., Cox. F. E. G., Deroux, G., Grain, J., Honigberg, B. M., Leedale, G. F., Loebllick, A. R., Lom, J., Lynn, D., Merinfeld, E. G., Page, F. C., Polijansky, G., Sprague, V., Vavra, J. and Wallance, F. C. (1980). The newly revised classification of Protozoa. *J. Protozool.* **27**: 37-58.
 25. Lorenzo-Morales, J., Coronado-Alvarez, N., Martinez-Carretero, E., Maciver, S. K. and Valladares, B. (2007). Detection of four adenovirus serotypes within water-isolated strains of *Acanthamoeba* in the Canary Islands, Spain.
 26. Loschiavo, F., Ventura Spagnolo, T. and Sessa, E. (1993). Acute primary amoebic meningoencephalitis from *Naegleria fowleri*, report of a clinical case with a favourable outcome. *Acta. Neurol. Nepoli.* **15** : 330-340.
 27. Ma, P., Willaert, E., Juechter, K. B. and Stevens, A. R. (1981). A case of keratitis due to *Acanthamoeba* in New York and features of 10 cases. *J. Infect. Dis.* **143**: 622-667.
 28. Mannis, M. J., Tamaru, R., Roth, A. M., Burns, M. and Thirkill, C. (1986). *Acanthamoeba* sclerokeratitis arch. *Ophthalmol.* **104** :1313-1317.
 29. Martinez, A. J. (1985). Free-living amoebas: natural history, prevention, diagnosis, pathology and treatment of disease. *CRC Press*, Boca Raton, Florida.
 30. Morales, J. A., Chaves, A. J., Visvesvara, G. S., and Dubey, J. P., (2006). *Naegleria fowleri*-associated encephalitis in a cow from Costa Rica. *Veterinary Parasitology.* **139** (1-3): 221-223.
 31. Napolitano, J. J. (1982). Isolation of Amoebae from Edible Mushrooms. *Applied and Environmental Microbiology.* **44** (1): 255-257.
 32. Napolitano, J. J. and Colletti-Eggolt C. (2007). Occurrence of Amoebae on Oak Leaf Lettuce (*Lactuca*

- sativa* var. *crispa*) and Boston Lettuce (*L. sativa* var. *capitata*). Journal of Eukaryotic Microbiology. **31 (3)**: 454 – 455.
33. Napolitano, J. J., and Flanagan, V. D. (1980). Occurrence of amoebae in and around the mushroom *Laccaria trullisata*. J. Protozool. **28**: 494- 497.
 34. Ofori-kwakye, S. K., Sidebottom, D. G., and Herbert, J., (1986). Granulomatous brain tumour caused by *Acanthamoeba*. Case report. *J. Neurosurg.* **64**: 505-509.
 35. Pandey, R. and Sharma, A. K. (2004). Studies on water with special reference to amphizoic amoebae. Ph.d., Thesis, University of Lucknow, Lucknow.
 36. Pandey, R. and Sharma, A. K. (2006). Isolation of a pathogenic *Naegleria fowleri* and non-cyst forming free-living amoebae *Vanella mira* and *Flabellula calkinsi* from domestic water supply U.P., India. *Lucknow Journal of Science.* **3 (1)** : 27-32.
 37. Radford, C. F., Minassion, D. C., Dart, J. K. G. (2002). *Acanthamoeba* keratitis in England and Wales: Incidence, outcome, and risk factors. *Br. J. Ophthalmol.* **86** : 536-542.
 38. Razaiean, M., Niyiyati, M., Farina, S. N. and Hagh Motevalli, A. (2008). Isolation of *Acanthamoeba spp.* From different environmental sources. *Iranian J. Parasitol.* **3 (1)**: 44-47
 39. Rodriguez-Zaragoza, S., Mayzlish, E., and Steinberger, Y. 2005. Vertical distribution of the free-living amoeba population in soil under desert shrubs in the Negev desert, Israel. *Appl. Environ. Microbiol* : 2053-2060.
 40. Rude, R. A., Jackson, G. J., Bier, J. W., Sawyer, T. K. and Risty, N. G. (1984). Survey of fresh vegetables for nematodes, amoebae, and *Salmonella*. *Journal-Association of Official Analytical Chemists*, **67**: 613-615.
 41. Sharma, A. K. Pandey, R. and Pandey, K. (2004). A report on the occurrence of amphizoic amoebae from carrot. *Flora and Fauna*, **10 (2)**: 141-143.
 42. Sharma, A. K. Sharma, U. D. and Singh. S. (2000). First case of *Acanthamoeba* Keratitis in a contact lens wearer from India. *Biol. Memoirs.* **26 (2)**: 44-47.
 43. Shukla, K. (2011). PROTOZOA AND FOOD: amphizoic amoebae and other protozoa in relation to edible biological products ISBN 978-3-639-36381-4. VDM , Germany.
 44. Shukla, K. and Sharma, A. K (2010). First report of free living pathogenic and Non pathogenic amoebae in an aquatic Vegetable, *Trapa bispinosa* (Singhada), ISSN 0974-8121 *Lucknow Journal of Science*: **7(2)**, 9-18.
 45. Shukla, K. and Sharma, A. K (2011). First report of amphizoic amoebae isolated from edible Oyster mushroom-*Pleurotus sajor-caju* (Singer, 1949). *Journal of Applied and Natural Science*: **3 (2)**: 247-252.
 46. Shukla, K. and Sharma, A. K (2012). Prevalence of pathogenic *Acanthamoeba* strains in *Piper betle* (L.) commonly consumed by people of India. Paper presented at annual conference of Academy of environmental biology, IITR, Lucknow.
 47. Shukla, K. and Sharma, A. K. (2009). Isolation of pathogenic *Acanthamoeba* strains from unpasteurized juice of sugarcane (*Saccharum officinarum*). Paper presented at annual conference of National Environmental Science Academy, Jamia Hamdard, New Delhi.
 48. Shukla, K. and Sharma, A. K. 2010. Studies on protozoans with special reference to amphizoic amoebae being isolated from edible biological products. Ph.D. Thesis. Department of Zoology, University of Lucknow, Lucknow. India.
 49. Shukla, K., Ahmad, T., and Sharma, A. K (2011). Occurrence of amphizoic amoebae in *Channa punctatus* and *Heteropneustes fossilis*. ISSN-0972-2262. *AQUACULT* : **12 (1)**, 125-132.
 50. Shukla, K., Ahmad, T., and Sharma, A. K (2011). Prevalence of amphizoic amoebae in edible mushroom – *Agaricus bisporous*. *Journal of Advanced Zoology* : **32 (1)**, 19-23.
 51. Shukla, K., Ahmad, T., and Sharma, A. K (2011). Temperature Tolerance of Small Aerobic Free-Living Amoebae. *Flora and fauna*. **Vol. 17 (1)**: 129-133.
 52. Singh, B. N. (1981). Nuclear division as the basis for possible phylogenetic classification of the order Amoebida Kent, 1880, *Ind. J. Parasitol.* **5**: 133-153.
 53. Singh, B. N. and Hanumaiah, V. (1979). Studies on pathogenic and nonpathogenic amoebae and the bearing of nuclear division and locomotion form and behavior on the classification of the order amoebida. Monograph no.1 of the Association of Microbiologists of India. *Indian J. Microbial.* 1-80.
 54. Singh. B. N. 1975. Pathogenic and non-pathogenic amoebae. *Wiley & Sons, New York*.
 55. Srinivasan, M., Sanghamitra, B., Celine, G., Praveen, K.N. (2003). Non contact lens related *Acanthamoeba* keratitis at a tertiary eye care center in south India: Implications for eye care programs in the region. *Med. Sci. Monit.* **9 (4)** :177-181.
 56. Srivastava, A., Sharma, A. K., and Jaiswal, K. (1996). Isolation of pathogenic *Acanthamoeba rhyodes* from Turnip. *Biol. Memoirs.* **22 (2)**: 87-89.
 57. Steele, M. and Odumeru J., (2004). Irrigation Water as Source of Foodborne Pathogens on Fruit and Vegetable. *Journal of Food Protection.* **67 (12)**: 2839-2849
 58. Veverková M, Dyková I and Pecková H. (2002). Experimental study on pathogenic potential of six *Acanthamoeba* strains isolated from fish. *Folia Parasitol (Praha).* **49 (3)**: 243-5. ■

Bio-economy: Strategic communication for sustainable development in Himachal Pradesh

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Introduction

The bio-economy strategy aims for a more innovative, resource efficient and competitive society that brings together food security and good health with sustainable use of renewable resources for industrial purposes, while ensuring environmental protection. It will lead to research and innovation through global bio-economy policies and a more engaged public dialogue. The bio-economy encompasses the production and conversion of renewable biological resources into value added products, such as food, feed, bio-based products and bio-energy. Its sectors and industries have strong innovation potential linking wide range of sciences, industrial technologies involving local tacit knowledge¹. The bio-economy strategy emphasizes the knowledge base and cultivates innovation to achieve increased productivity and improved focus on environment. Potential communication interventions in this regard are to raise awareness, recommend a solution, identify perceived barriers and benefits to behavior change, provide logistical information, use community groups to counsel and motivate, provide information on correct use, encourage continued use by emphasizing benefits, reduce barriers through problem solving, build skills through behavior trials, social support, recall benefits of new behavior, assure ability to sustain behavior and social support. The present study suggests sustainable use and conservation of communication practices for *Taxus* in Pangli valley, Himachal Pradesh for societal benefits.

To cope with a worldwide rising population, fast reduction of numerous resources, growing ecological pressures and climate change, it is required

to drastically modify the approach to production, utilization, processing, and storage, recovering and discarding of biological resources. Bio-economy holds a great potential in maintaining and creating economic growth and jobs in rural, coastal and industrial areas, decrease fossil fuel dependence and progress the environmental sustainability of primary production.

Global population growth by 2050 is estimated to lead to a 70% increase in food demand. Bio-economy answers massively increasing demand for biomass on land and turn attention towards oceans and aquatic ecosystems as new sources of sugars and oils. The Bio-economy strategy will comprise the conclusion of the direct market programme on Bio-based products and maintain the blue growth initiative, renewable energy and fuel quality targets and energy technology plan by enhancing the knowledge base and nurturing novelty for generating quality biomass at a competitive cost. Bio-economy leads us to understand present and future biomass accessibility, demand and competition amid biomass applications, estimating their climate change mitigation potential. This takes an account of building alternative sources of carbon and energy more reachable (e.g. farming and forestry remains, wastes) and motivating research into renewable resources, such as microalgae. The European Commission defines a “post-petroleum” bio-economy as “an economy that uses biological resources” from land and sea, as well as waste, as inputs to food and feed, industrial and energy production which also cover the use of bio-based processes for sustainable industries. Bio-waste for example, has considerable potential as an alternative to chemical fertilizers or for conversion

into bio-energy. The partial replacement of non-renewable products by more sustainable bio-based ones should be pursued¹⁻³. The bio-economy approach seeks to control private business and special means will generate earnings that will subsequently flow back to prosperous financier⁴.

Managing natural resources sustainably

Agriculture, forestry, fisheries and aquaculture necessitate a lot of crucial and partial resources to construct biomass. These not only include land, sea space, fertile and functioning soils, water and healthy ecosystems, but also minerals and energy for the production of fertilizers. Their use also incorporates major opportunity expenses associated to the exhaustion or failure of ecosystem services. Declining biodiversity can considerably debase the excellence of resources while limiting the yields of primary production, chiefly in forestry and fisheries. The Strategy will thus sustain the accomplishment of an ecosystem based management. It will hunt for synergies with green policies on resource competence, sustainable use of natural resources, security of biodiversity and environment, as well as terms of ecosystem services. The bio-economy strategy will hold up a universal approach to more sustainable resource use. This will develop an internationally shared indulgence of biomass sustainability and finest practices to open new promotion, diversify production and deal with extensive food security issues^{1,3-4}.

Climate variability causes further pressure on fitness of our ecosystems and escalates threat of permanent harm to natural resources. Land is directed to avoid dreadful conditions and the loss of critical environmental ecosystem services. Threats like erosion, acidification and wind erosion, are being aggravated under extreme climate conditions. Shielding our resources and recuperating their elasticity is a challenge requiring active planning, adaptive management and timely intervention. Land health precedence is required to achieve lasting asset defence and the condition of key environmental ecosystem services at the landscape scale with landholders, society, governments and industry functioning jointly through integrated solutions⁵.

Answering societal challenges: The *Taxus* tree strategy

The bio-economy's cross-cutting nature offers a unique opportunity to comprehensively address inter-connected societal challenges, such as food security, natural resource scarcity, fossil resource dependence and climate change, while achieving sustainable economic growth. *Taxus baccata*, a small to medium size (10-20 m. tall), evergreen tree, is one of the most valuable medicinal tree species of Himalayan region. Leaf and bark of the species yield an alkaloid taxol, which is used for treatment of a variety of cancer. It is also used for treatment of bronchitis, asthma, epilepsy, snake bites, scorpion stings, internal injuries, lung diseases, diabetes, as aphrodisiac and its colorful wood to veneer furniture, to make bowls, tankards, combs, tool handles, pegs, and various art objects⁶. There is a serious threat to the existence of this species due to over exploitation and slow regeneration in its native habitat. In the present initiative an approach has been developed to prioritize species at local level for societal benefits. Mass scale propagation of *Taxus* and its conservation in Pangi valley (Chamba District, Himachal Pradesh) has been initiated and yew nursery is established.

The *Taxus* tree is probably the most "humanized" of all Indian/ European forest trees; it was managed and planted for Taxol production in Himachal Pradesh and further domesticated in Himachal Pradesh and Uttarakhand. *Taxus baccata* is used in topiary in making of formal gardens, foliage (Taxotere), and landscape material, commercially important at a regional or international level. The anthropocentric inquiry of value includes not only the yew's medicinal benefits to society but respect from bowmen for its medieval role in warfare, from craftsmen for its extraordinary wood. The yew is also attractive to the earth first point of view of biodiversity whereby this organism over thousands years has managed to have not only a longevity known to merely a few species, but has internally created chemical constituents that protect it against various pests and browsers. Its evergreen nature, winter fruit, wood quality, and general aesthetics elevated it to the Celtic status of a 'noble' tree. It is strongly associated with ancient rituals and Christian churchyards. The yew has provided tools and weapons for ancient and medieval cultures and has been manipulated into religious objects and home furnishings. By providing a unique compound called taxol, it stands today not as a symbol of death, but a symbol of life⁷. Effective communication skills are employed for raising

awareness towards sustainable development and conservation of *Taxus* populations in Pangi valley area containing local tribes of pangwalas (Fig. 1).

The community based programmes of sustainable use of Himalayan yew together with ex-situ cultivation should guarantee the income earned from medicinal plants in such harsh life area and help conserve a particular genotype and assure its survival in the nature. This will surely be a source of green economy in Himachal Pradesh.

Green economy and green growth

‘Green economy’ refers to an economic system which produces goods and services at significantly reduced levels of resource and energy use and general environmental impact, while simultaneously respecting aspects of social welfare and justice. One of the principles of the ‘green economy’ is that the exogenous costs of environmental damage should be reflected in product prices, thus creating incentives for clean production. The United Nations Environment Programme (UNEP) has been pursuing this approach since 2008 via its green economy initiative⁸. The initiative concentrates on public and private investments in less environmentally harmful production methods. The Organization for Economic Cooperation and Development (OECD), meanwhile, has developed the principle of ‘green growth’ as a part of its green growth strategy⁹. To progress on such thoughts we should also follow some possible recommendations and strategies for sustainable development.

Recommendations and strategies

Development strategy processes for sustainable development put people right at the center of attention. Examination, discussion, illustrations, capabilities, preparation, funds and events are to describe a society’s cooperative profitable, community and natural

goals. Strategic communication is a possible mechanism for effective policy generation and societal contribution from inventing an idea, conclusion build up, budding and employing plans to monitoring impact. Message supply- information exchange, estab-

“Green economy refers to an economic system which produces goods and services at significantly reduced levels of resource and energy use and general environmental impact, while simultaneously respecting aspects of social welfare and justice.”

lishing agreement between contrary judgment and interests; smoothen the progress of the structure of know-how and action aptitude of the delicate collaboration between government, civil society cluster and the private segment. OECD and

UNDP consider communication and alertness rising as one of nine central mechanisms for sustainable development¹⁰. Environmental communication has been a missing connection between the theme of environmental issues and the allied socio-political procedure of policy making and civil participation. It bridges ‘hard’ industrial know-how and ‘soft’ deed oriented behavior modifications. Models, technologies and talent interconnected to the environment need are surely to be communicated to policymakers, opinion leaders, strategic groups or the public at huge scale. Simple and understandable elements and putting these on the agenda could be a prerequisite for harmony and change in any civil society¹¹.

Strategies for sustainable development are a synchronized set of participatory and endlessly improving processes of investigation, question, aptitude growth, scheduling and savings, which put together the profitable, social and environmental objectives of society¹². Strategic communication can:

- Convince a Nation’s judgment creators to approve unique policies and at the same time support community.
- Reinforce the aptitude of urban leaders, NGO representatives, and community based organizations to administer their economic, ecological and social resources sustainably.
- Develop partnerships among governments, local communities, and NGOs to encourage people for active collaboration for change.
- Motivate natives to adopt cleaner and greener

- production technologies.
- Raise awareness and support for sustainable development problem solving.
- Accelerate and improve farmers' adoption of technologies and behaviors.
- Enhance friendly behaviors such as conserving water, changing harmful techniques, and preventing forest fires.
- Generate excitement in a community
- Empower local people to speak and to continue their efforts for future benefits¹³.

Environmental education and communication is too critical for achieving environmental and right awareness, principles, skills and behavior constant with sustainable development and for successful input in decision making. Environment and development education should deal with the dynamics of physical/ biological and socio-economic environment and human development and should be applied in all disciplines to employ effective means of communication¹⁴.

Principles of effective communication strategies

Effective communication is a process of public and private dialogue through which people define who they are, what they want and how they can get it? This initiative is informed by principles of tolerance, self-determination, equity, social justice and active participation for all¹⁵. Ecological facet of corporate sustainability made up of both environmental issues of the product and those due to corporate activities¹⁶. Product and production related environmental impacts of a company may form a foundation for defining the environmental profile and for identifying environmental leaders¹⁷. Recognizing areas of environmental initiatives answers the call for studies with a focus on specific environmental information¹⁸. Production and product related envi-

ronmental issues should be implemented, especially in sectors such as environmental technology and clean-technology, which have prominent product related profiles. The proposed model of environmental profile can be used to increase awareness of environ-

“Environment and development education should deal with the dynamics of physical/ biological and socio-economic environment and human development and should be applied in all disciplines to employ effective means of communication.”

mental engagement among public policymakers and corporate leaders in these and other sectors, as well as among SMEs (small and medium-size companies)¹⁹. At Rio+20, least developed countries emphasized ICT networks as es-

sential infrastructure for development. A more critical discussion is needed around the ways in which technology changes our understanding of sustainable development and how it impacts social equity, economic prosperity and environmental protection²⁰. Monitoring Sustainable Development (MONET) scheme also serves as an information platform. All elements of the indicator system (indicators, postulates, definitions and methods) are published on the internet. The monitoring indicators relate to the different key challenges and not specifically to individual measures. An overall picture of the progress that has been observed on the key challenges can be gained from the sustainable development strategy²¹.

Conclusion

To conclude potential communication interventions in progressing our work are:

- Awareness raising
- Solution to problem
- Barriers and benefits to behavior change
- Logistic information
- Community groups to motivate
- Information for correct use
- Emphasizing benefits
- Building skills
- Social support
- Benefits of new behavior
- Ability to sustain social support

References

1. European Commission, Communication to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, Safeguarding Privacy in a Connected World. A European Data Protection Framework for the 21st Century, COM (2012) 9 final, at p. 9, <http://eurlex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2012:0009:FIN:EN:PDF>, 25 January 2012.
2. Jim Lane, Whatever happened to algae and biofuels? *Biofuels Digest*, 23 April, 2012.
3. EC, Commission proposes strategy for sustainable bio-economy in Europe, European Commission, <http://ec.europa.eu/research/bio-economy/news>, 13 February 2012.
4. CBD Alliance, Civil society views on Scaling Up Biodiversity Finance, Resource Mobilization and Innovative Financial Mechanisms, compiled by Simone Lovera (Global Forest Coalition) and Rashed Al Mahmud Titimur (Unnayan Onneshan) for the CBD Alliance, <http://www.cbdalliance.org/innovative-financial-mechanism/2012/3/14/civil-society-views-on-scaling-upbiodiversity-finance-resou.html>, March 2012.
5. Victorian Investment Framework for Natural Resource Management Statement of Priorities 2012/2013, Victorian Government Department of Sustainability and Environment, 2012.
6. Amin Shah, De-Zhu Li, Lian-Ming Gao, Hong-Tao Li, Michael Möller, Genetic diversity within and among populations of the endangered species *Taxus fauna* (Taxaceae) from Pakistan and implication of its conservation, *Biochemical Systematics and Ecology*, 36 pp 183-193, 2008.
7. J L Delahunty, Thesis *Religion war and changing landscapes: An historical and ecological account of the Yew tree (Taxus baccata L.) in Ireland*, University of Florida, 2002.
8. <http://www.unep.org/greeneconomy>
9. <http://www.oecd.org/greengrowth>
10. James Deane, Why the media matters, Communication for Social Change Consortium for the Global Forum for Media Development, 2005.
11. GTZ, Environmental Communication for Sustainable Development, A Practical Orientation, Eschborn, 2000.
12. OECD, Sustainable Development Strategies, Chapter 7, Communications, Paris, 2002.
13. GreenCOM, Heating Up Society to Take Environmental Action, Washington DC: AED, 2002.
14. UNCED, Agenda 21, Chapter 36, Promoting education, public awareness and training, 1992.
15. Rockefeller, Communication for social change: A position paper and conference report, New York: Rockefeller Foundation, 1999.
16. Rupert J. Baumgartner and Daniela Ebner, Corporate Sustainability Strategies: Sustainability Profiles and Maturity Levels, *Sustainable Development*, 18, pp 76–89, 2010.
17. Bozena Guziana, Is the Swedish environmental technology sector 'green'? *Journal of Cleaner Production*, 19, pp 827–835, 2011.
18. Bozena Guziana and Peter Dobers, How Sustainability Leaders Communicate Corporate Activities of Sustainable Development, *Corporate Social Responsibility and Environmental Management*, DOI: 10.1002/csr.1292, 2012.
19. Abeer Hassan and Essam Ibrahim, Corporate environmental information disclosure: Factors influencing companies' success in attaining environmental awards. *Corporate Social Responsibility and Environmental Management*, 19, pp 32–46, 2012.
20. ITU News, Least developed countries: A decade of growth, but challenges remain, *ITU News*, <http://www.itu.int/net/itunews/issues>, 2012.
21. www.monet.admin.ch

Commissioned Studies/ Papers

Indian Journal of Science Communication encourages potential scholars to undertake short term studies/ research/ surveys on specific area/ topic/ sector concerning S&T communication. It is expected that such studies will also lead to writing of a paper/ article and can subsequently be published in IJSC, if found suitable. A committee of experts will evaluate and recommend carrying out of such studies. A nominal amount towards honorarium may be granted for undertaking such studies.

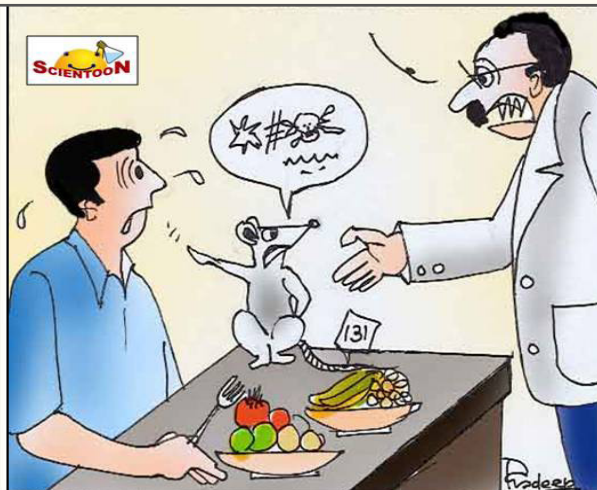
Proposals, including information pertaining to title of the study, scope and objectives, methodology, expected outcome, budget estimates and time schedule, etc., may be sent to the Editor, IJSC.



Carotenoids

Beta carotene is one of 50 carotenoids in foods that convert to vitamin A in the body. It is usually found in red and orange colored fruits and vegetables and in some dark green ones where the color is hidden by chlorophyll.

Foods high in carotenoids include: Red, orange, deep-yellow and some dark-green leafy vegetables, carrots, sweet potatoes, broccoli, apricots, mangoes, red and yellow peppers.



“His complaint is genuine. As per the protocol, these fruits containing antioxidants have to be tested for safety studies on him only”

SAFETY IN LABS

In the laboratory certain precautions are necessary so as to avoid any accident.

Please ensure that no loose wires are around specially which are from any instruments which is on.



“Hello Angela! Welcome to India, When did you arrive from Brazil?”

Inclusive development through science and technology intervention: Role of dissemination of appropriate knowledge

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Introduction

Uttarakhand being a hill stat, the development of the remotest place is expected from the government and therefore the council has carried multiple programmes with science and technology interventions for inclusive development of the state. Since 60% population of the state depends on agriculture, a variety of entrepreneurship programmes related to food processing, canning and technology development for farmers, were organized and 6 Training Research Centers (TRCs) were established. These centers act as source for technology dissemination and training of local people to start small enterprises related to processing of fruits juices, vegetables, pickles, and fish rearing, etc. Some 12,000 beneficiaries have been given training and are working successfully in the small scale enterprises. The article deals with various initiatives taken by the council for inclusive development of the state through science and technology interventions and role of dissemination of scientific and technological knowledge for realizing the success.

Uttarakhand state was carved out of northern part of erstwhile Uttar Pradesh state on November 09, 2000 in the western part of Himalayas, with 93% hills and 64% forest. The main objective for a separate state is to accelerate development of difficult geographic terrain, and deliver benefits of development to remote areas. Expectations of people from the government are high. The state falls in agro-ecological zone 4 and 11. Agriculture is the major occupation of the population and majority of the population lives in rural areas. Like the trend everywhere

in the country, people from rural areas are migrating to big cities and cities have their own problems, where the new influx of people not only adds to the existing problems but also poised to face the problems. A simple solution lies in the development of rural areas and providing opportunities. Science and technology interventions, such as entrepreneurship development and S&T communication programmes put together by the council have been successful in retaining the migrating workforce in the villages of the state to some extent. The programmes could be helpful in stabilizing hill economy and generating awareness regarding appropriate technology and new avenues for entrepreneurship amongst farmers and youths.

Keeping these facts into consideration, the inclusive development of the state needs to be strategically planned. The government should prioritize the schemes for road, electricity (through non conventional resources as well) with science education in all the villages. This along with generating employment opportunities will pave path for happiness. This can be effectively done by initiating small scale enterprises at the village level and generating local human resources. This will not only provide local need based technological services but also provide employment to youth. Further, local enterprises relevant to the region should be identified and training for that should be delivered. This will generate new class of entrepreneurs and stability to the hill economy. This can be achieved by encouraging small scale enterprises and by motivation of youths with proper guidance and training. It will not only generate local employment to the youths but also help

Table 1: List of Entrepreneurship Development (EDP) programmes

S.No.	Name of the programme	Beneficiaries
1.	Awareness Workshop for Farmers on Pisciculture Development in Remote Area of Kumaun Hills of Uttarakhand	100
2.	Poor Women Entrepreneurship Development Training Programme for Chalk Manufacturing	60
3.	Emerging Trends in Separation Science and Technology (SESTEC-2008)	300
4.	Agriculture Technology Development Fair	358
5.	Educating Teachers in Science, Technology & IPR	
6.	Current Concepts in Productivity Management in Livestock & Poultry- environment, Nutrition & Stress	45
7.	Recent Trends in Immuno-Biotechnology based Biologicals and Their Commercialization	200
8.	Creativity and Innovation	60
9.	Science and Technology Entrepreneurship Park	
10.	IGNOU EDP program for jail mates	120
11.	Training of artisans from unorganized sector for capacity building (in 8 Districts)	
12.	Integrating Disaster Preparedness Training to State NSS Functionaries	31
13.	Natural Resource Conservation Uttarakhand Status, Challenges & Solutions	123
14.	Poor Unemployed Women Entrepreneurship Development Training Programme	43
15.	National Fish Farmers Day	50
16.	Ensuring Environmental Sustainability and Livelihood Generation through Productive Processing of Biomass Waste and Recycling of Paper	54

reduce wastage of perishable items by processing them at the source point itself, provide services to the locals in their villages and hence travel to the cities can be reduced.

Outreach programmes and the Council

Uttarakhand State Council for Science & Technology was established in the last quarter of 2005 as a nodal agency of the Department of Science & Technology, Govt. of India. The main objectives of the council is to advice the government for promotion of science and technology in the state, identify areas of science and technology interventions, technology demonstration/ extension and transfer, initiate, support, promote and co-ordinate research and development projects and programmes, promote popularization of science and spread scientific temper. These activities help disseminate scientific knowledge and accelerate the process of modernisation in Uttarkhand through the use of science and technology. The council encourages the innovators from the region and one best innovator is awarded every year.

The council reaches out to the widespread area of the state with science and technology knowledge through its 6 TRC's and 125 Vigyan Prasar Kendras (VPKs) established by the council throughout the state, which have strong association with local communities. The council provides popular science

books, magazines and equipments to the VPKs, so that they can update science knowledge and work for science outreach programmes for dissemination of scientific knowledge to common people. In addition, the District Coordinator in every district helps bring these programmes to different parts at grass root level. The council in its endeavor of playing catalytic role has developed linkages and networking with universities, institutions, colleges and NGO's. That apart, the council has Intellectual Property Facilitation Centers, Patent Information Centre, TePP (Technology Entrepreneurship Promotion Programme) Centre that are also supposed to disseminate necessary information, knowledge, and guidance to beneficiaries. With this infrastructure and support the council has been successfully reaching the grass roots and far flung areas. The establishment of Science Centre is proposed with its creation the role of council will be become more meaningful. Following are the TRC's established by the council:

- Kaleshwar, Chamoli
- Naugaon, Uttarkashi
- Jakholi, Rudraprayag
- Sahaspur, Dehradun
- Kanathal, Tehri Garhwal
- Ranikhet, Almora

Major initiatives and Almora example

The 13 districts of state mainly depend on agriculture, therefore entrepreneurship programmes related to food processing and canning are important small scale enterprise¹. However, these entrepreneurs and innovators constitute only 5% of population, even in developed countries^{2,3}. The TRCs act as source for technology dissemination and training of local people to start small enterprises related to processing of fruits juices, vegetables, pickles, and fish rearing, etc. Besides these, some region-specific flowers and herbs are also exploited for juices, which are in high demand due to medicinal value. Through District Coordinators, the science popularization programmes⁴, technology dissemination programmes, and EDP programmes reach far flung areas.

TRC, Almora in Letti village of Tadikhet block has set up an example for entrepreneurship development and addressing local problems. The centre has shown astonishing performance with many activities during 2009 onwards, which may be normal for other regions, but are extraordinary for a far way hilly region of Letti village:

1. **Fruit Processing Centre:** The region is known for production of orange, malt, lemon, pomegranate, and pear, but due to bad road connectivity and inaccessibility for the villagers to the market, the fruit produce rots before it reaches the market. In order to address this problem, TRC has developed a community centre for fruit processing facility, which in turn promoted self help groups for women and offered fruit processing training, such as: to look after raw material, judicious use of preservatives, packaging and marketing. A communication mechanism adopted by them enhanced fruit processing knowledge of the region. Now they are not in a hurry to take fruits to market, rather they are in a position to negotiate good price for their processed products.
2. **Floriculture training:** Under this programme, 60 women were trained for producing *Gladiolus* flower. They were taught about preparation of field for sowing, method of seed sowing, use of pesticide, use of manure and plant management, etc. 3 progressive trials in the region of *Sarana*, *Khatyadi* and *Letti* were most successful and encouraging. The beneficiaries further propagated the seeds provided by centre and benefited by the

sale of flowers in the market. With the encouraging results the TRC is planning programmes to diversify in other regions of Kumaon.

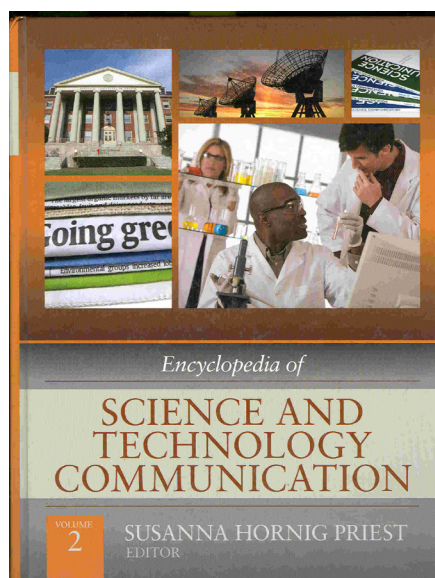
3. **Technology initiative for off-season vegetables:** *Naokhal* village is traditionally engaged in the vegetable production. The TRC utilized the expertise of them to train other vegetable producers. 9 progressive farmers out of them were benefited by 'low cost poly-houses'. In the future it is proposed to encourage the farmers to do trials of seeds, seed propagation and frontline exhibition to communicate the knowledge to fellow inhabitants.
4. **Children's Science Clubs:** In this programme, 5 Children's Science Clubs were established. With the help of these clubs various lectures and competitions were organized in order to generate awareness and interest among young students towards science. In addition, these clubs also arranged training for water and food testing.
5. **Innovative experiments:** Under NABARD Venture Capital Support, *Mahila Haats* are established in Ranikhat. The *Haat* will help in marketing of the women groups' products at competitive prices and ensure availability of these products in the market.
6. **Computer training:** TRC also provided free training to 10 villages' students.

All these initiatives have generated a momentum in the state and a lot of activities are in pipeline. In order to make the development sustainable, the present pace has to continue with leap towards multiplying these efforts in large scale.

References

1. Srinivas, K.; Singh, K. P.; Kumar, Ajay; Singh, H.R.K.; and Bisht, K.K.S., Agro-processing centre in Uttarakhand hills: a case study of enterprise development, *Journal of Agricultural Development and Policy* 19(1), 44-53, 2009.
2. Bolton, B and Thompson J, *Entrepreneurs: talent, temperament, technique*, 2nd ed. Oxford: Elsevier Butterworth-Heinemann, 2004.
3. Loportp, G., The Da Vinci Method <<http://DaVinci-Method.com>>, 2005.
4. Maikhuri, R.K.; Negi, V.S.; Rawat, L.S.; Dhyani, D.; Bahuguna, A.; and Phondani, P., Creating interest and curiosity among science students through learner centered and action oriented approaches, *Natl. Acad. Sci. Lett.*, 33 (5&6), pp. 123-131, 2010.

All-in-one on science and technology communication



Prof. Susana Hornig Priest, the editor of an 'Encyclopaedia of Science and Technology Communication' published by Sage, USA (2010) deserves kudos especially from the science communication fraternity for fulfilling a long felt need of those who wanted to see at one place a diversified knowledge treasure of comprehensive information about science and technology communication efforts all over the world. It is a gigantic effort of creating and collecting huge materials on the subject worldwide. The book in 2 volumes offers an excellent resource not just about S&T communication, but details about many historical and contemporary aspects of science and technological developments in simple language free from technical jargons. Besides communication, it serves as a mini encyclopaedia of science and technology too. The authorship is not confined around western or developed countries

only; it widely covers efforts in India, China, Japan and other states in the Middle East and Far East as well. The information is interesting, authentic and handy to any science and technology communicator who may not be a specialist. The coverage is wide and includes physical sciences, life sciences, as well as technology and applied sciences. The details are exhaustive, supported by necessary references, and give a complete picture of the subjects. The entries are classified in a systematic manner and authors are selected from amongst who's who of the subject areas they dealt with. The articles are written with a feel and are not just compilation of data. Definitely, it requires a creativity driven vision, courage and a lot of patience to conceive, plan, organize, edit and bring out such a mammoth work in the form of the encyclopaedia. An electronic version on a CD or DVD would be more convenient in today's digital age. The information on anything bracketed within the area 'science and technology communication' is fine and appropriately forms the core of the publication, but the information on 'science and technology' could have been kept aside. Though it seems that the editor and publisher may have a point of view to bringing both elements together possibly with a sense of 'completeness' of the subject, but it appears that combining the two interferes with the interest of the specific reader who is looking for specific material on the core subject, i.e. 'science and technology communication' not 'science and technology'! However, the encyclopaedia is a welcome effort and credited to be the only one of its kind in the world. It is equally beneficial to scientists, communicators, journalists, researchers and students, including anyone and everyone interested in science and technology in general and in its communication in particular.

[Mr. L.D. Kala, Centre for Energy Studies, Indian Institute of Technology Delhi, Hauz Khas, New Delhi-110016] ■

Science writing: A pre-requisite for science popularization

A Regional Training Workshop on Science Writing was jointly organized by the National Council for Science and Technology Communication, Department of Science and Technology, Government of India, New Delhi, M.T.S. Academy, Chennai, and Communication Department, Manonmaniam Sundaranar University at Tirunelveli (Tamil Nadu) during March 20-24, 2012. The Chief Guest Dr. B.P. Sanjay, Vice Chancellor, Tamil Nadu Central University, Thiruvarur, in his inaugural address, emphasized that science communication should be promoted at par with other communications, like development communication, sports communication, and mass communication. This will certainly bridge the gap between the scientists and the common with a passage of knowledge from lab to land. He also insisted that the science journalists and the science writers should owe prime responsibility of communicating the factual science with simple words to the common man, without exaggerating facts on imaginary basis. They must carefully follow ethics of journalism and press laws, he said.



Inaugural session in progress

In his presidential address, Dr. Manoj Kumar Patairiya, Scientist F/ Director, National Council for Science and Technology Communication, emphasized that science writing is a pre-requisite for many tasks of science popularization and elaborated vari-

ous steps taken by the NCSTC for popularizing science and technology among children, youth, women and general public. Programmes in different formats designed by NCSTC were broadcast and telecast in All India Radio and Doordarshan respectively over the years on various important occasions. Number of workshops, seminars, conferences at national and international levels are being organized for updating the latest developments in the field for scientists, academics, journalists, communicators, media experts, students and researchers. The workshop on science writing motivates the young graduates to promote scientific knowledge, scientific temper and science as a way of life. It is not only to know more about the latest developments in science and technology but to write the same in different formats of communication for the benefit of target audience for mass media is also important. He also requested media experts and media managers to give more space in dailies and more time in radio and television for science.

While delivering felicitation address, Member, Steering Committee of Manonmaniam Sundaranar University and Principal, S.T. Hindu College, Nagargoil, Prof. (Dr) S. Meenakshisundararajan said that the prime role of science communicators is to work in the field with people and educate them with common man's science. The workshop offers training for young science writers and journalists who are enthusiastic to learn. Keeping in view of the information revolution, science writers and journalists should update their knowledge and reach the public through various electronic media as well. Shri. A. Sarathy, Assistant General Manager, State Bank of India, Tirunelveli said that State Bank of India plays a significant role in popularization of science by sponsoring number of programmes of public interest. Head of the Department Prof. (Dr.) P. Govindaraju welcomed the gathering.

Dr. Cheyon, Honorary Secretary, M.T.S. Acad-

emy, Chennai detailed the prime aim of the workshop. Field visits to Tharangadara Chemicals Limited, Arumuganeri, and V.O.C. Port Trust, Tuticorin were interesting and informative to the participants, who have eventually prepared on the spot reports. Dr. S. Sambasivam, Associate Professor, Zoology Department, Presidency College, Chennai proposed a vote of thanks. Some 51 participants from the education institutions, media persons actively participated in the workshop. The following topics amongst others were covered:

1. Concept and Scope of Popular Science Writing by Dr. Manoj Kumar Patairiya, NCSTC/ DST, New Delhi.
2. Various Formats of Science Communication by Dr. Cheyon, All India Radio, Chennai
3. Space Technology and its impact on Society by Dr. Nellai Su.Mutthu, Scientist, ISRO, Sriharikota
4. Digitization of Broadcast module for Effective Science Communication by Shri. T. Sakthivel, Lecturer, Dept. of Communication, M.S.U.
5. Sciencetoon - An Innovative Format for Science Communication by Dr. Jeyanthi Kesavan, Head of the Dept., Information Technology, Periyar Maniammai Women's University, Tanjore.
6. Journalism and Press Laws by Smt. Radha Ravindran, Lecturer, Dept. of Communication, M.S.U.
7. Forensic Science Medicine & Psychology by Prof. Dr. Mohaideen, Associate Professor, Department of Criminology, M.S.U.
8. Marine Resources and its utility by Prof. Dr. A. Palavesam, Head of the Department, Centre for Marine Science & Technology, M.S.U., Tirunelveli
9. Nuclear Energy is the Need of the Hour by Dr. S. Venkatesh, Scientist G, Nuclear Power Plant, Nuclear Power Corporation of India, Kudankulam
10. Energy Economy by Dr. Samson Ravindran,

Principal, Mahendra Engineering College, Rasipuram

11. Preservation & Protection of Environment by Dr. Sambasivam, Associate Professor of Zoology Department, Presidency College, Chennai.

Out of 51 participants 29 were female and 22 were male. All the participants attended all the 8 technical sessions with enthusiasm, and earnestness.

Prof. S. Manickam, Registrar, Manonmaniam Sundaranar University said that many opportunities are available for science writing in corporate sector too. Chief Naval Commander, Shri. Sai. Venkatraman, INS Kattabomman Nagarcoil, said that latest advancements of science and technology are very well utilized by the defense service for not only updating their knowledge but also project the dignity of our country. Dr. Cheyon informed that the selected 5 best participants of the workshop will be invited for an Advanced Level Workshop on Science Writing in near future. He further added that the best scripts selected in the workshop will be recommended for publication in magazines and newspapers, broadcast on All India Radio, FM Radio, Community Radio, and telecast on TV networks.

Delivering the valedictory address, Dr. P. Iyamperumal, Executive Director, Tamil Nadu Science and Technology Centre, Chennai said that when the world is switching from information age to knowledge age, the young graduates of science disciplines must equip themselves with science communication techniques. The workshop has given a panoramic view of the science communication and its role in the modern society. He advised the students to spread science and technology in a simple method to the villages they belong and apply scientific temper in their day to day life.

Such basic courses especially designed for amateur science communicators at grass root level help prepare fertile land for development and orchestration of science communication programmes at national and international level.

[Mrs. Rajeswari Murugan, Former General Manager, BSNL, C-13, Nest Chaitanya Apartment, 9 Ratna Nagar Main Road, Teynamtet, Chennai - 600018]

Training science writers and science journalists in Nepal

A ‘Workshop cum Training on Science Journalism and Science Writing’ was organized by B.P. Koirala Memorial Planetarium, Observatory and Science Museum Development Board (BPKMPOASMDB), Ministry of Science and Technology, Govt. of Nepal, in Kathmandu, Nepal during June 14-20, 2012 with active support and participation of Indian science communicators’ community. The overwhelming response from participants, organizers and resource persons from both the countries suggests a tremendous potential and impact of such regional cooperation on cross border sharing of knowledge, skill, and experience in this field of scholarship to

encourage and develop a scientific culture.

Dr. Keshav Man Shakya, Minister of Science & Technology, Nepal said in his inaugural address that more science awareness is needed amongst Nepali population so that they can take advantage of the fruits that modern science and technology going to offer. Mr. Krishna Gyavali, Secretary, Ministry of Science & Technology, Nepal while highlighting the importance of public understanding of modern science and technology, in his presidential address, emphasized on science behind Nepali customs and rituals and suggested that these need to be scientifically examined for the public good.



Mr. Shriharsh Koirala, Executive Director, BPKMPOASMDB, Nepal; Mr. Krishna Gyavali, Secretary, Ministry of Science & Technology, Nepal; Dr. Keshav Man Shakya, Minister of Science & Technology, Nepal; Mr. Sanat Kumar Sharma, Co-Executive Director, BPKMPOASMDB, Nepal; Dr. Manoj Kumar Patairiya, Director/ Scientist ‘F’, NCSTC, India, at inaugural session

Dr. Manoj Kumar Patariya, Director/ Scientist 'F', National Council for Science & Technology Communication (NCSTC), Department of Science & Technology (DST), Govt. of India, who also served as the Chief Resource Person of the workshop, highlighted the need of carving science communication as an independent field of knowledge and there is much to learn from each other's experience for building upon the subject. Mr. Shriharsh Koirala, Executive Director BPKMPOASMDB, Nepal, while remembering his college days in Mumbai, shared an anecdote of his encounter with a music student, as his music at midnight was interfering with studies of Mr. Koirala. Both had a quarrel and shouted on each other, saying - 'you cannot succeed in your professional career'! But today, both are famous in their respective professions and are good friends. The message Mr. Koirala wanted to send across is their unbeatable dedication towards their goal that turned midnight quarrel into lifelong success! Mr. Sanat Kumar Sharma, Co-Executive Director BPKMPOASMDB, Nepal welcomed the guests and participants and elaborated the objectives of the workshop. A T.V. anchor Ms. Sneha Jha conducted the programme.



Curious participants attend workshop

Over 100 young participants belonging to various scientific, media, and academic institutions actively participated in the 7 days' workshop. Besides Indian resource persons, Prof. P. R. Pokhrel and Prof. Dr. U. Khanal from Tribhuvan University, Kathmandu, Nepal served as resource persons. The participants in their feedback have desired to enhance the duration of such workshops in future.



Participants at a technical session

The topics of various technical sessions and professional lectures included, amongst others, Science communication: concept, challenges and emerging paradigms; Disseminating scientific knowledge to the people: Role of visuals and scientoons – scientist's perspective; Techniques of science writing and science journalism: especially focusing on science news and feature writing – journalist's perspective; Improving accountability, ethical and professional standards on science journalism; Capacity building of media professionals in science journalism; Role of media on dissemination S&T and impact of dissemination in the society; How to bridge the gap between science and media in the public understanding of science: infrastructural systems; Policy approach for S&T information dissemination and inter-ministerial coordination on the promotion of science journalism; International scenario of science communication: careers and opportunities for young science writers/ journalists/ communicators; and Science journalism in Nepal: problems and prospects.

The programme also had as a major component of daily exercises by the participants conducted by resource persons, such as, How to develop science feature; Data mining, how to access sources for science information; T.V. and radio script writing, how to develop a science programme for radio and T.V.; Web-based science communication and networks; organising press meet, how to write a press release; Science popularization through folk arts: puppetry as a tool; Scientoon, how to plan and make a scientoon and a series of scientoons. A lively discussion followed each technical and exercise session.



Science periodicals published by BPKMPOASMDB



Mr. Sanat K. Sharma shows publications to Minister and Secretary

Prof. Dr. Heera Bahadur Maharjan, Vice Chancellor, Tribhuvan University, Kathmandu, Nepal was the chief guest at the valedictory function held on June 20, 2012. In his valedictory address, Prof. Maharjan, said that the Tribhuvan University would be interested to start a diploma course on science journalism in near future and highlighted the significance of such courses already available in several Indian and western universities. Mr. Shriharsh Koirala, Executive Director, BPKMPOASMDB, Nepal, chaired the valedictory session and realized the importance of training in science journalism to encourage and educate journalists so that they apply a scientific approach while reporting on science

issues. Mr. Sanat Kumar Sharma, Co-Executive Director, BPKMPOASMDB, Nepal presented an analysis and a report of the workshop and hoped that such programmes would be organized on a regular intervals to promote science awareness.

The major recommendations of the workshop included, i) creating a university course on science journalism or science communication in Nepal; ii) setting-up a science writers' association in Nepal; iii) organization of such training programmes on regular intervals; iv) involving resource persons from India for other science communication programmes in Nepal; and v) organization of special programmes on science communication using puppetry, sciencetoon, and other mass media. The workshop was able to create a wave of enthusiasm amongst participants and mass media as well as a positive atmosphere for the development of science communication activities in Nepal.



Participants prepare scripts and reports during workshop

[Prof. Dr. A.P. Singh, Head, Department of Anthropology, Lucknow University, Lucknow-226001]

12th Indian Science Communication Congress (ISCC-2012)

Risk Communication & Development
by
National Council for Science & Technology Communication
Vidya Deep Foundation
Indian Science Writers' Association
Jan Seva Ashram
at
Indian National Science Academy (INSA)
New Delhi-110002, India; December 17-21, 2012
<www.iscc.vidyadeep.org>

A fine blend of scientific knowledge and scientific bent of mind improves living and thinking standards of people and thereby help empower the society. Effective science communication is the most important tool for sustainable development. Most of the rural and urban communities are shadowed by superstitions and are poised to several risks of imbalanced developmental concerns. In the era of globalization, sustainable development is possible with use of latest technological applications affordable to the common man. Bridging the digital divide through ICT applications, social innovations, and creative solutions are the most important factors that can be achieved by means of sustained science and technology communication for a balanced development. Application of science and its utility are needed to be percolated deeper into the grass root level. Youths must be empowered through innovative technological skills to combat developmental risks. The increasing public concerns on emerging issues in genetically modified organisms, nuclear energy, climate change, clinical trials, industrial hazards, etc., need to be addressed with fair, honest, and factual scientific understanding; this entire concept opens up a yet another area of science communication, i.e. "Risk Communication & Development", which is the focal theme of ISCC-2012.

Sub Themes:

The deliberations may cover a wide range of sub themes, such as: Communication for Sustainable

Development; Awareness of Genetically Modified Organisms; Public Appreciation of Nuclear Energy; Public Understanding of Health Risks; Environmental Risks and Communication Strategies; Public Misunderstanding of Superstitions; Preparedness for Disasters - Natural and Human; Risk Communication and Mass Media; Scientific Temper and Risk Management, etc.

ISCC Format:

The technical sessions will have presentation of contributory research papers, review papers, survey analyses, case studies, posters, and invited talks. Discussions in split groups would offer close exchange of thoughts and ideas. Deliberations will be in English and/ or in Hindi. The prescribed time for paper presentation will be around 10 minutes (7 minute for presentation + 3 minute for discussion). Power Point presentation facility will be available. Best paper awards would be given in junior and senior categories. Selected papers can be published in *Indian Journal of Science Communication* <www.iscos.org>.

Who can participate?

Some 200 researchers and practitioners of science communication, i.e. scientists, technologists, academicians, writers, journalists, editors, scholars and faculty members, public relations and information officers of scientific organizations, representatives of media, science activists from NGOs, and senior government officials/ policy makers from India and abroad are likely to participate.

Special Features:

A display of science communication products, software materials, a special session for young researchers and students, face to face interaction with experts, open forums and debates on current issues

under the focal theme, cultural evenings, and field visit will be some of the attractions of ISCC-2012.

Weather:

Weather remains cold (5-15 Degree Celsius) in Delhi in December. Heavy woollens are recommended.

Abstract/ Paper/ Poster:

Last Date for Submission of Abstract (500 Words): November 20, 2012

Last Date for Application for Travel Fellowship: November 20, 2012

Intimation of Acceptance of Abstract/ Travel Fellowship: November 30, 2012

Last Date for Submission of Full Paper/ Poster: December 10, 2012

Registration:

Last Date for Registration: December 10, 2012

Registration Fee for Indian Delegate: ₹ 4000

Registration Fee for Indian Student Delegate: ₹ 2000

Registration Fee for Indian Accompanying Person: ₹ 2000

Registration Fee for Foreign Delegate: US\$ 400

Registration Fee for Foreign Student Delegate: US\$ 200

Registration Fee for Foreign Accompanying Person: US\$ 200

No Registration Fee for Members of Organizing Institutions

Spot Registration is possible depending upon space availability and presentation quality.

Travel Fellowship:

It is advisable to make your travel and hotel arrangement from your institution as per your entitlement. However, in some special cases, the travel expenses for authors of accepted papers except students could be reimbursed up to IIIAC Class train fare, while student participants/ other registered participants are reimbursed II Sleeper Class train fare subject to prior confirmation by organizers. Limited number of travels by II AC/ IAC Class train/ by air can be offered for invited experts/ speakers only in a few

special cases. Guest house can be arranged in some special cases for 17.12.2012 (AN) to 21.12.2012 (FN). International delegates will make own travel arrangement; the organizers could offer stay and meals.

Addresses for Communication:

Dr. Manoj Kumar Patairiya

Convener (ISCC-2012)

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Disasters - communicating in the crisis and aftermath

Disasters - communicating in the crisis and aftermath

Symposium being organized by International Public Communication of Science & Technology Network (PCST Network) and The Science Communicators' Association of New Zealand (SCANZ) February 21-23, 2013, Christchurch, New Zealand



A Symposium titled 'Disasters - communicating in the crisis and aftermath' in Christchurch on 21-22 February 2013 will focus on disasters communication, as a devastating earthquake rocked Christchurch, New Zealand on February 22nd two years back in 2011. Of course, the Canterbury quakes will be a thread running through the programme but many other sessions will be included to broaden the discussion. Symposium topics will include: Risk communication in relation to the threat of disasters, Case studies of effective science communication during disasters, The perception that we are faced with more natural disasters, extreme weather, earthquake swarms, pandemics, agricultural crisis - what does science say? The responsibility of scientists - where the law meets scientific evidence, Supporting scientists on the frontline when their expertise is needed, Communicating science as a disaster is

still unfolding, The changes in public understanding and expectations of science and communication, Science for a sustainable future - communicating to avert disaster. The Symposium will offer a variety of topics around the theme of disaster communication: Climate change, Bio-security, Natural disasters, and Trial by media, Public outreach and engagement, and best practice case studies.

This unique event will attract a wide range of scientists, communication practitioners, media, health and technology professionals, academics and researchers from New Zealand and around the world. Six international speakers are included on a high quality presenting line-up for the event, including internationally renowned members of the PCST Scientific Committee.

Between now and February 2013, SCANZ will hold a number of high quality regional events around the country. It will also announce and acknowledge science communication reporting, innovation and training before the end of the year. A variety of tour options to science facilities and other sites around the city would be available on February 24th. The Symposium will be held at the Chateau on the Park hotel, on the edge of Hagley Park to be delighted to provide high quality conference facilities. Hope you are encouraged by what's underway at SCANZ and what we can achieve together in the coming year. Your ideas, experience and networks are very welcome. See you in Christchurch in February next year.

The deadline for abstracts is Friday 14 September 2012. Registrations for the event will also open on this day. Further information at: www.scanz.co.nz

[Phil Johnstone, President, The Science Communicators Association of New Zealand (SCANZ), www.scanz.co.nz] ■

World Doctorates' Day to be observed on August 25th

A “Global Network of Doctorates” - an exclusive group of highly accomplished people having Ph.D. Degree in any field of study - has been created on March 7, 2012 in India. The main idea behind creation of this group is to offer a global platform to share experiences and to network as a powerful academic body. To be a doctored is a matter of pride being highest academic achievement to belong to an exclusive class of academicians holding the highest university degree.

One has to perform an exciting journey in order to earn a doctorate. It may be rough, bumpy, dark, lonely, but at times thrilling and rewarding. I feel that the Ph.D. is not merely a degree but it is a learning process that equips us with skills and aptitude to deal gainfully with difficult and challenging situations in life.

On an average about 40,000 scholars are awarded Ph.D. in USA every year. Doctorates share a major responsibility of generation and dissemination of knowledge and to steer the knowledge society towards prosperity and high quality of life with a commitment to ensure very high standards of Ph.D. Degrees across the disciplines.

Prof. Kamal Kant Dwivedi, Vice Chancellor, Apeejay Stya University, Sohna, Gurgaon, India – who has served as Head, National Council for Science and Technology Communication and worked with International Cooperation Division of the Department of Science and Technology, Govt. of India, and as Science Counsellor in the Indian Embassy, Washington D.C., USA - took initiative to put together this long felt network as a global platform. The group invites fellow doctorates to join in large number to make it the most powerful group of intellectuals worldwide.

So far nearly 1000 doctorates from 50 countries have joined the group and contributed signifi-

cantly by identifying several key issues to improve research and quality education. They are brainstorming on various challenges in the education sector and are ready to lead by example.

Prof. Dwivedi announced to observe the First “World Doctorates’ Day” on August 25, 2012. He urged all the members to observe this day by dedicating themselves to uphold the decorum of the highest university degree that they have earned. It was decided to take a pledge for sincerely applying their knowledge for: Upholding high ethical standards in all public activities and private endeavours, Promoting a spirit of understanding and good fellowship among people across the world, Demonstrating compassion and empathy for the disadvantaged and differently enabled, Advancing sustainable development and social progress, Transforming social perception towards ever increasing importance of scholarship in pursuit of excellence, and Encouraging adoption of good academic and research practices and professional conduct. The World Doctorates’ Day will be observed on August 25th every year with much more enthusiasm, Dr. Dwivedi said.

The group is accessible at <<http://www.linkedin.com/groups/Global-Network-Doctorates-4341924>>



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Welcome to ISCC - 2012

The 12th Indian Science Communication Congress (12th ISCC - 2012)

December 18-21, 2012,
Indian National Science Academy, New Delhi, India

Focal Theme:

Risk Communication and Development

Sub Themes:

- ❖ Understanding Risk Communication
- ❖ Media Coverage of Risks, Conflicts, Crises and Uncertainties
- ❖ Communicating Sustainable Development
- ❖ Bio-safety, Bt Crops, GMOs and Public Awareness
- ❖ Post Fukushima Scenario & Public Appreciation of Nuclear Energy
- ❖ Public Understanding of Health Risks and Clinical Trials
- ❖ Environmental Risks & Communication Strategies
- ❖ Public Mis-understanding of Superstitions
- ❖ Preparedness for Disasters, Terrorism, and Mass Destruction
- ❖ Role of Scientific & Technological Temper in Risk Management

Special Features:

- ❖ Exhibition on Science Communication Products and Software Materials
- ❖ Special Session on Risk Communication in Regional Languages
- ❖ Special Session for Young Researchers and Students on the Theme
- ❖ Face to Face with Top-notch Experts, Meetings, Networking Events
- ❖ Enriching Conference Events; Open Forums
- ❖ Live Debates on Conflicting Issues on the Theme
- ❖ Showcasing Cultural Heritage; Folk Performances, Field Visit

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