

A Report on National Water Seminar

Challenges of Providing Potable Water to the Islands

January 29 - 30, 2009, CARI, Port Blair, Andaman & Nicobar Islands, India

Jointly Organised by -



Mennonite Central Committee
mcc.org



Emmanuel Hospital Association
eha-health.org



Central Agricultural Research Institute
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Proceedings

[Emmanuel Hospital Association](#) (EHA) in collaboration with the [Central Agricultural Research Institute](#) (CARI) and [Mennonite Central Committee](#) (MCC) organized a [National Water Seminar](#). The Seminar was held on the Andaman Islands in Port Blair at the CARI campus on January 29 - 30, 2009. The theme of the seminar was, "*Challenges of Providing Potable Water to the Islands.*"

The National Water Seminar was designed to bring together those concerned to examine the complexities of providing potable water to an island environment. The seminar was held over two days with 104 registered attendees. Eighty-six were local participants and 18 came from various parts of India and abroad. Participants included representatives of various government departments, NGOs, *Panchayat* members, academia and news media. Three sessions were held in which 17 papers were presented. The session topics were;

- Water resource development under island conditions
- Water quality concern for island conditions and
- Community-managed water resources and supply systems.

Inaugural Session

The Chief Guest Dr. Alok Saxena, Managing Director A& N Islands Forest & Plantation Development Corporation inaugurated the seminar. The function began with a welcome note by Mr. Abraham Dennyson, Project Manager, Andaman Water Project, EHA. After the lighting of the traditional oil lamp and the presentation of bouquets Mr. Dennyson presented EHA's Water Experience as a background to the seminar. Following this Dr. R. C. Srivastava gave the Presidential Address and Dr. Alok Saxena gave the Inaugural Address. Both emphasized the need for safe drinking water in these Islands. The inaugural function concluded with the vote of thanks proposed by Dr. Ambast, Head (SRM) CARI.

<h3>National seminar on potable water begins</h3> <p>Staff Correspondent Port Blair, Jan 29</p> <p>The two day National Water Seminar on 'challenges of providing potable water to the islands' got underway in the conference hall of Central Agriculture Research Institute (CARI), here today. The Managing Director, A&N Islands Forest & Plantation Development Corporation Ltd, Dr. Alok Saxena inaugurated the seminar as the chief guest. The Director CARI, Dr. R C Srivastava presided over the function.</p> <p>The seminar is being sponsored and organized by Emmanuel Hospital Association (EHA), with the coordination of CARI.</p> <p>Addressing the inaugural function, the chief guest informed that majority of the</p>  <p>people in the country are facing safe drinking water problems. These islands have the same problem wherein the people, especially in the rural areas do not have safe drinking water. He said that water is the essence of life and wherever there is more forest, there is more water. Though these islands have unpolluted water resources, still water borne diseases are prevalent, he said and called upon the stakeholders, to think serious about the initiatives in bringing about an affective management of safe drinking water. He expressed hope that the seminar will come out with positive results and recommendations for better management of safe drinking water in these islands.</p> <p><i>(Contd. on last page)</i></p>	<h3>The Daily Telegrams</h3> <p>January 30, 2009 Port Blair</p> <h3>National seminar on potable</h3> <p><i>(Contd. from first page)</i></p> <p>Earlier, the chief guest lit a ritual oil lamp to inaugurate the seminar.</p> <p>In his presidential address, Dr. Srivastava underlined the need for transfer of technological methods in finding suitable location for developing ground water resources such as wells etc. to the stakeholders and to entrust the management of the existing resources to them as also to ensure both quality and quantity as well as proper management. This will change the mindset of the stakeholders and also lead to self dependent, self sufficing and safe drinking water, he said.</p> <p>The seminar is being attended by eminent personality and experts in water resource development from different parts of the country.</p> <p>Earlier, Shri Abraham Dennyson, Programme Manager, (Andaman Water Project) EHA welcome the gathering and the inaugural function concluded with the vote of thanks, proposed by Dr. Ambast, Head (SRM) CARI.</p>
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Session 1 - Water resource development under island conditions

Paper 1 – Water Resource Development through Rainwater Management by Dr. Srivastava, Director CARI, Port Blair

This paper gave an overview of the water scenario in both India at large and the Andaman Islands in particular. Water supply and Sanitation must go hand in hand since Sanitation is not possible to promote when water is scarce. Various strategies of rainwater harvesting were given depending on the location of the collection point

- Most of the Islands in Andaman Nicobar archipelago have small land area hence does not promise any good water resources. Only South, Middle, North Andaman and Car Nicobar having more than 1000 sq km area with width being between 15 to 40 km .
- In valley areas the paddy fields should be properly bunded and open dug wells can be used to extract water, tank cum well system can be adopted in mid hill areas and Lined tanks can be constructed on hill tops.
- Irrigation systems can be linked to drinking water and sanitation programmes.
- Rain water management is the only promising solution to enhance the water availability in these islands.
- Satellite villages can supply water upto 50000 m3 annually to a township and earn considerable revenue by it.

Paper 2 – ‘Rainwater Catchments in a Systems Perspective’ by Dr. Richard J. Heggen, Professor Emeritus, Oregon State University, New Mexico

Dr. Heggen presented 10 challenges of Rainwater Catchments System (RWCS).

- RWCS are a conjunctive water source, complementary with surface or groundwater utilization.
- On one side modern technologists are those who equate smallness with unimportance and a hindrance to pursuing a mega-solution on the other hand, large-scale solutions can also be achieved by dispersed, less obtrusive measures of RWCS when measured in terms of impact.
- Even rudimentary analysis of the water's economic value, in most cases will favour development of RWCS
- Realistic simulation is feasible for RWCS through computer modelling. Modelling reveals the influences of rainfall pattern, catchments area, storage capacity and demand on system performance. The value of such knowledge outweighs the costs of the modelling effort.

- RWCS development should be worked out in terms of optimal investment, determining the system sizes that most efficiently balance the results.
- RWCS will not satisfy its demand at all times. By considering the consequences of uncertain behaviours, RWCS can be realistically understood and appropriately relied upon.
- RWCS design can incorporate water demand into analytic consideration not just as a target, but as a function that itself changes with the situation. So doing, the RWCS is better understood in its human dimension.
- Good RWCS design respects, and should take advantage of cultural, ecological and economic systems. RWCS can be sensitive to such constraints. Very often conflicts between such constraints and RWCS stems from the narrow imposition of engineering.

RWCS work is satisfying because it makes a difference. It is vital and engaging. The challenge makes it worth it. Systems challenges cannot be resolved in isolation. Investigators must draw upon ongoing developments in engineering, the natural sciences and the social sciences. Not only engineers, but also community organizers, health workers, builders, farmers, financiers educators ad women in particular have roles in defining both the needs and possible solutions

Paper 3 – ‘Possible Alternatives for Sustainable Sanitation and Safe drinking water supply in Islands with specific reference to Andaman & Nicobar Islands’ by Santha Sheela Nair, Secretary, Drinking Water Supply, New Delhi

The secretary (DWS), Government of India (GOI) was unable to attend due to some unforeseen reasons. However she had sent her paper and it was read during the seminar in her absentia. The Paper specified government guidelines while planning water systems on the Andaman Islands. A few key points from the paper are as follows:

- Generate awareness and capacity of community towards creating healthy living conditions by promoting eco-sanitation.
- Sustainability should be evaluated from source, technology, financial and social aspects. Technology like RO should be the last of options as it can be detrimental to the fragile eco system.
- The current water supply system needs to be decentralized for augmentation taking into consideration of the seismic risks, scattered - increasing population and climate change.
- Close to 90% of area under forest cover, Integrated water resource management is possible through active involvement of Forest Department
- Individual and community roof-water harvesting is an ideal decentralised system of providing safe drinking water.

- Renewable energy sources should be tapped to reduce the dependence on the diesel generators used for pumping

She concluded by saying that, "for this noble cause Drinking Water Department, (GOI) will extend all possible co-operation in this regard."

Paper 4 – ‘Geo-informatics for Planning and Development of Water Resources at Macro Scale in A&N Islands’ by Dr. Ambast, Head, Division of Natural Resource Management, CARI, Port Blair

Dr. Ambast introduced Geographic Information Systems (GIS) and how they can be used in water resource development. He showed how CARI is using this technology on its own campus and how it will be extended to the rest of the Islands. The GIS can be used to understand, evaluate, simulate and manage the impact of various development projects.

Marine sedimentary rocks are predominating in Islands and do not form well developed potential aquifer system both in shallow and deeper horizons. Bore wells are not feasible in these formations whereas dug wells of 4-5 m diameter and 6 m depth may yield from 3000 - 5000 lpd water.

Remote sensing could be used to define the representative sites, guide the field work and generate thematic layers such as surface hydrology, geomorphology, geology, vegetation, rainfall and human impact.

Paper 5 – ‘Water resource Development and Conservation Action plan for Theni Allinagaram Municipality of Theni district, Tamil nadu using Remote sensing and GIS Technology’ by Mr. Kaliraj, GIS Faculty Gandhigram University, Tamil Nadu

Mr. Kaliraj presented a case study from Theni municipality in Tamil Nadu in which GIS was used in water resource development and planning. Through this model it was possible to suggest appropriate site for construction of farm ponds loose rock check dams, water absorption trench and recharge beds in and around the study area.

Paper 6 – ‘Low Temperature Thermal Desalination (LTTD) Model’ by Jon Kurien, Titanium Tantalum Products Limited, Chennai

This presentation was on Low Temperature Thermal Desalination (LTTD). 0.1 Million Litres per day pilot plant on L TTD process has already been commissioned and is in operation since May 2005 which was designed, fabricated & installed at Kavaratti in Lakshadweep. The plant has been working since then, generating fresh water from the sea water to meet the drinking water needs of people of Kavaritti Island, part of Lakshadweep.

In LTTD method the energy requirement for the evaporation of water are taken from sea which makes the process eco- friendly and uses renewable source of energy. LTTD uses the temp difference which exists between the surface layer water (28 -30 C) & deep sea layer water (7 -10 C) in an ocean to produce potable water.

Session 2: Water quality concern for island conditions

Paper 7 – Bringing Safe Drinking Water to Rural India – SWAJAL KRANTI - Ms. Renu, NAANDI, Hyderabad

Ms. Renu presented a case study from the NAANDI foundation. This is a tripartite model involving Gram Panchayat, Naandi and a Technical Partner. The Technical partner was responsible for technology and annual maintenance. The community participates and owns the safe water project through the contribution of capital, land and labour for its construction. Water is supplied at 10 paisa per litre and aimed at recovery of capital and running cost. Water treated by Reverse Osmosis and UV method for delivery of safe drinking water. More than 500 units are functioning by end of Dec 2008 in the states of Andhra Pradesh, Haryana, Rajasthan and Punjab.

Paper 8 – Water Quality and Health Hazards – The Andaman Perspective – Dr. Subarna Roy, Indian Council for Medical Research (ICMR), Port Blair

This presentation highlighted the water born disease common in the Andaman Islands their causes and ways to prevent them. Water tested by RMRC between 1999 to Nov 2006 on various sources show considerable amount of coliform contamination while treated sources were satisfactory. It is therefore believed that unless properly treated the common water sources of Andaman & Nicobar Islands are contaminated with common microbial pathogens.

He attributes the decrease in cases of diarrhoea to

- the revamped sanitation measures taken by the local administration after the tsunami destruction,
- stepped up surveillance,
- proactive chlorination of water sources by the authorities and NGOs, and
- increased awareness among people.

During discussion a PWD representative raised the issue of encroachment of forest land and the difficulties in storage, treatment and supply of water to these scattered villages. He also added that the population has increased but sources and storage have not. Mr. Roy noted that there is no effective quality monitoring done by PWD

and that the whole system needs to be revamped. Not only should safe water supply be ensured, betterment of environmental sanitation, proper disposal of human excreta and practice of personal hygiene should also be encouraged.

***Paper 9 – Microbes in desalinated drinking water - Dr. Mrinal K Bhattacharya,
Department of Botany and Biotechnology, Karimganj College, Assam***

This presentation focused on the microbes that can pass through the desalinisation process. He emphasized the need for pre and post treatment of the desalinated water. It needs to be experimented whether use of two different disinfectants during post and pre treatment lower microbial risks and byproduct production of disinfection.

***Paper 10 – Water Supply in a Disaster Situation – Water Quality Concern -
Arumugam Kalimuthu, PLAN India, New Delhi***

Mr. Kalimuthu presented on the various standards that are used for testing water, both international and Indian standards. He covered both the microbial and chemical contamination in water post disaster situation with help of examples of study form

1. Andhra Pradesh – Post Tsunami,
2. Mazaffarpur District, Bihar – Post Flood,
3. Maharajganj, Uttar Pradesh – Post Flood

He recommended not promoting leach pit toilets in water logging / shallow water table areas. He also suggests that Panchayat should be equipped to do water testing and NGOs should supply the same test kits as UNICEF and the Government so that replacement chemicals are available. He also gave recommendations on the distance between sewage leach pits and bore wells.

***Paper 11 – Importance of Point of Use (POU) devices in water treatment in rural
India - Mazhar Rashidi, Pratinidhi***

Mr. Rashidi shared a case study of the Point of Use (POU) model that Pratinidhi is promoting in Uttar Pradesh. The model promotes boiling of water, use of chlorine tablets and water filters. This model is not for the poorest of the poor because there is a cost involved. Water filters were made available through SHG and micro finance institutions. Pratinidhi works through Self Help Groups (SHGs) to work against false perceptions about water hygiene.

Paper 12 – Onsite Chlorine Production - Jon Kurien, Titanium Tantalum Products Limited, Chennai

Mr. Jon Kurien represented Noble Eco Systems Pvt. Ltd. (www.noblechlor.com) He introduced a product called NOBLE CHLOR™, these are electro-chlorinators manufactured by same company. These electro-chlorinators are able to produce liquid chlorine on demand. Currently bleaching powder is used on the Andamans to treat water, this can prove hazardous if handled incorrectly and is often expired before usage. Salient Features of this product are

- Eco friendly system
- Self chlorine generation
- Safe & simple system for operation
- No chemicals need other than common salt
- No handling or storage of hazardous chemical
- Since liquid chlorine can be made on site and is safer to handle

Session 3: Community-managed water resources and supply systems

Paper 13 – Case Study of Chouldari Panchayat - Mr. Indrajeet Mistri, Pradhan, Chouldari, South Andaman.

This presentation was a case Chouldari Village, South Andaman. After the tsunami many water source dried up. Ponds and ring wells have been done by Panchayat this allowed the seasonal rain to be trapped and seep into the soil to recharge the water table. Chouldari Panchayat has one checkdam from where PWD supplies drinking water during summer the water supply is curtailed up to once a week. People depend on dug wells it possible to augment water by some more checkdams and borewells.

Paper 14 – Case Study of EHA initiatives - Mr. Ngampam A Satsang, Programme Officer, EHA

This paper presented two case studies. Milangram is a village in North Andaman. During the dry months little water is available. EHA helped forming a Village Water Committee (VWC). Through this VWC one ring well and two shallow bore well were constructed. By this effort the target villages have increased water supply and reduce the time and distance in fetching water. VWC is providing household filters to its members to treat the water.

Narayan Tikery is a remote jungle village in North Andaman. EHA helped forming VWC and provided materials to construct one ring well

and repair another. The VWC also uses monthly contribution (user fee) to repair and maintain these structures.

Paper 15 –Periyatheru quenches its thirst – Case Study - Dr. Vijaykumar, AFPRO

This presentation was a case study of Periyatheru, in Nagapattinam District, Tamil Nadu. After the tsunami the freshwater aquifers had become saline. Recharge structures were put in place, which slowly replaced the salt water. The villagers were also made aware of the negative affect that prawn cultivation in the vicinity had on their drinking water sources. They were then able to stop the prawn cultivation and see drastic improvements in the quality of water. The project also promoted ECO-SAN toilets, which are composting toilets, ideal for areas like this with shallow aquifers.

Paper 16 – Case Study on Manjery – Water Users Association - Dr. Ravi Shankar, CARI & Mrs. Applanarasamma, Pradhan, Guptapara, South Andaman

Dr. Shankar along with Mrs. Applanarasamma presented a case study of Manjery Village in South Andaman. After the tsunami the villager went to CARI with their water problem. A water user association (WUA) was formed with 17 member in 2006 now there are 35 members in it. The WUA also filed tender application with CARI for construction of ring well and gabion structures. Ultimately the WUA did the work while CARI gave the technical inputs. Check dams were made in the streams. The livestock were able to drink from these while they also recharged the groundwater table. The wells now provide water and the cultivable land have increased and new vegetable cultivation is possible where it wasn't before. This also a model of how agriculture and drinking water can be promoted together.

Paper 17 – Case Study of Public Private Partnership in Nicobar - Mr. Rajesh Kumar Kashyap, ADRA, Port Blair

Mr. Kashyap presented the ADRA model of Public Private Partnership (PPP). ADRA worked in conjunction with the Andaman Public Works Department (APWD) to build two tanks of one lakh litre capacity for rainwater harvesting on Car Nicobar Island with a piped distribution system. The tanks come from Australia and 3 more will be implemented soon.

Video Release – Thirsty Paradise

Andaman Water Project, EHA released a video documentary about the water issues of the Andaman Islands.

Valedictory Session

The Valedictory Session began with an introductory note by Dr. R. C. Srivastava. The Chairman of each session; Mr. Arumugam Kalimuthu, Mr. David Chandran and Dr. Ambast reported on the session they had chaired. The valedictory address was given by Shri Vivek Rae the Chief Secretary of the Andaman and Nicobar Administration and the vote of thanks was given by Mr. Dennyson.

The Daily Telegrams

January 31, 2009

Port Blair

National seminar addresses isles potable water issues

Staff Reporter
Port Blair, Jan 30

Promotion of appropriate decentralized alternative system to move away from single source dependency and integrated watershed projects, encouraging public-private-partnership, ensuring that water quality meets the BIS standards at delivery points and availability of de-salination plants to meet the extreme event of non-availability of water were some notable recommendations, made at the two day National Water Seminar on 'challenges of providing potable water to the islands' which concluded in the conference hall of Central Agriculture Research Institute here today. The Chief Secretary, Shri Vivek Rae graced the function as



the chief guest.

Addressing the concluding function, the chief secretary said that analyzing the problems prevailing in these islands is very important while preparing recommendations for solving the drinking water problems. There is need to address the drinking water problem at the micro, village and panchayat level, the Chief Secretary said adding that the PRIs have a greater role to play in mitigating the drinking water problem as enough grants have been provided to them to take up rural water supply and sanitation schemes.

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National semi....

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The Chief Secretary further said that there is need for fixing responsibility and accountability of those engaged in the water management starting from the source till its distribution to the general public. He said that a bottom level approach is needed to tackle the potable water problem and address it completely. The Chief Secretary also released a video documentary brought out by the EHA on A&N water crisis and its solution.

S/Shri Arumugam kalimuthu, David Chandran and Dr. Ambast presented sessions findings and recommendations came out in the seminar participated by more than 80 participants.

Earlier, Dr. RC Srivastava welcomed the gathering while Shri Abraham Dennyson, Programme Manager, (Andaman Water Project) EHA proposed the vote of thanks. The seminar is being sponsored and organized by Emmanuel Hospital Association (EHA), with the coordination of CARI.

Challenges

Land Area: Geophysical Aspect

Since islands are surrounded by sea water the interaction between salt and fresh water aquifers are of constant concern. Furthermore the smaller an island, the less area is available for precipitation to collect and form freshwater streams and surface water sources. Only very few have more than 1000 sq km area and most of the Islands have narrow land mass of 15 – 45 Km width. Since islands are unique in their geographic, geologic, and political identity a specific knowledge of any one island needs to be known in order to address the water issues.

Subsoil: Geophysical Aspect

Although the Andaman Islands receive about 3000mm of rainfall annually, almost double that of the mainland, there is a severe shortage of portable drinking water. Very little of this over abundant precipitation is able to seep into the earth and form aquifers. This is due to the sedimentary subsurface clay content which is not very permeable. Four months every year virtually no rain falls, so during the summer months fresh water is scarce in the sky and under the earth. In past years, even in the capital city Port Blair, resident's received only 20mins of piped water each week during the dry months.

Tsunami Effect:

To further add to the problems the 2004 earthquake that caused the tsunami tilted the islands. The northern extents of the islands were thrust up by few meters and the southern extent sank by few. This changed the subterranean flow of water, so that some places that had fresh drinking water were now dry and other places the sea water ingresses thus formerly freshwater wells now produce saline water.

Centralised Approach

Over the years the Public Works Department (PWD) has the huge task of providing water throughout the many islands to its very scattered population. The PWD's approach has been to create centralized water systems. A centralized system is prone to failure during emergencies. For example the source for South Andaman's Port Blair area is the Dhanikhari Dam. The water from the dam is collected, treated and then distributed through the municipal pipeline. The water stored in the dam, however, is not sufficient to meet the demand. With the growing population this source will become even more inadequate. The PWD proposes to raise the height of the dam by 5 meters. This is an expensive project in a earthquake prone Island. During the 2004 tsunami the earthquake broke the PWD pipelines leaving the population it served without water for more than 10 days

Tectonic Activity

The PWD is also planning a scheme to build submarine pipeline which would bring water from the relatively water rich Rutland island to Port Blair where it would be fed into the existing system. Critics, however, questions the longevity of this plan considering the tectonic activity and earthquakes that frequent the region.

Inadequate Treatment Plants

The water treatment systems that are in place are also not adequate to treat the quantity of water that must pass through them. This is particularly evident from the murky water that we receive for most part of the year (the rainy season) at our tap. The particulate matter in the water also decreases the effectiveness of the bleaching powder that is used to sterilize the water. There are also reports that the bleaching powder that is used is often expired and thus not as effective.

Forest Dwellers

Furthermore many villages in the jungle do not have piped water at all.¹ Even though the Government has provided schools and primary health services for these forest dwellers refused to do anything about drinking water supply. It is difficult to believe but there are humpty number of schools without any drinking water facility in these forest settlement. This leaves the isolated villagers to find water where they can. Many collect water from small springs or seasonal streams that dry up during the summer since the Andaman has only one perennial freshwater river. When the streams run dry they make what are called *diggies*, which are wells dug in the dry stream beds that hopefully provide enough water to make it through the dry months.

False Perception on Rainwater Harvesting

The PWD has also tried its hand at Rainwater Harvesting. Under this scheme rainwater harvesting tanks were built at all schools and government buildings. However this proved to be a failure because the dry period and size of storage has not been taken into consideration. Following this it a general notion that that rainwater harvesting is a failure. This is despite a report by the Central Groundwater Board that concludes that rainwater harvesting and artificial groundwater recharge structures are still the best options for the islands.

The water issues facing the Andaman Islands are unique but not insurmountable. An emphasis should be placed on providing clean water to the poorest and most marginalized. If all those who are working with water on the islands come together to solve the problems they will overcome.

¹ It is reported by the PWD that 30% of the water the PWD supplies is raw untreated water.

Recommendations

Finding solutions to water problems require a specific knowledge of the location. Therefore these recommendations are specific to the Andaman Islands. However, these recommendations can be easily adapted to other island situations if a local knowledge is available.

Water resource development under island conditions

- 1) Access to water is a basic human right² so the Administration should focus its efforts on providing potable water equitably to the most vulnerable in society including those living in remote or jungle villages.
- 2) Stereotype approach will not solve all the water problems faced therefore conjunctive development of rainwater catchments, groundwater and surface water and complimentary use of same should be the approach.
- 3) The development of drinking water sources should be linked with that of irrigation water to make it more economically viable. Therefore the Agriculture Department and Drinking Water Department should work together closely.
- 4) Computer modelling can reveal the influences of rainfall pattern, catchments area, storage capacity and demand on system performance. Rainwater Catchments Development should take advantage of such modelling without ignoring cultural, ecological and economic aspect of the design.
- 5) Develop a database of geo-information system of Andaman about surface, surface and groundwater details.
- 6) The PWD proposal to build decentralised rainwater reservoir that will supply raw water for 100 days at all villages is a welcome move. This project should be expedited with priority.
- 7) Bore wells in North and Middle Andaman have not been very successful dug wells with big diameter will serve good purpose of augmenting water supply.

² - The Right to Life is also guaranteed by Article 21 of the Indian Constitution, which the Supreme Court of India has read as protecting the right to health and a safe environment: "environmental, ecological, air, water, pollution, etc., should be regarded as amounting to a violation of Article 21." (Virendra Gaur vs. State of Haryana, 1995 2 SCC 577).

- India - National Water Policy 2002 recognises water 'a basic human need'
- "Access to safe water is a fundamental human need and, therefore, a basic human right. Contaminated water jeopardizes both the physical and social health of all people. It is an affront to human dignity." Kofi Annan, United Nations Secretary-General.

Water quality concern for island conditions

- 8) Appropriate investment need to be made in treatment plants as very often existing treatment plants fail to handle the supply demand.
- 9) As of date Andaman does not have an effective water quality monitoring system in place. PWD should put a robust water quality and monitoring system in place.
- 10) Bleaching powder in Andaman is imported from mainland and it loses its strength (quality) before used in the inter Islands. PWD should consider manufacture and use of chlorine locally.
- 11) Proper sanitation is not possible without adequate water and improper sanitation runs risk of contaminating water sources. Therefore the government and NGOs should work to promote both aspects.
- 12) The administration should separate considerable resources in raising awareness on sanitation among the rural folks. 'Public Health and Sanitation' should be included in school curriculum.
- 13) Composting toilets (Eco-San) should be promoted in places where water table is high.
- 14) Many primary schools in rural remote parts of Andaman are without proper water and sanitation facilities, government should address the issue in priority basis.

Community-managed water resources and supply systems

- 15) The Water supply should be decentralised so that large portions of the population are not left without drinking water in the case of a natural disaster.
- 16) Formation of 'Water User Association' should be promoted to manage and maintain water resources.
- 17) Panchayats should be given more of a stake in planning and implementing water supply systems in their respective areas.
- 18) Use Point of Use (POU) devices for water treatment can be promoted through Water User Association or SHGs or Micro Credit channels.

Conclusion

Andaman Islands are God given paradise to us. It our responsibility to pass it on to the future generation not a *paradise lost*. There are some subtle and obvious issues which need to be given attention while addressing the Challenges Providing Potable Water to these Islands. Key stakeholders specially the administration and Panchayat Raj Institutions need take note of such issues seriously and address it before it is too late. **Jai Hind!**