Meeting Report on
"Exchange Meeting on Safeguarding Future Rural Drinking Water Supply in Odisha"

Bhubaneswar April 29 and 30th 2010

A better understanding of hydrology & ground water flow is crucial for identification of water source; reducing contamination, efficient sitting of wells & sanitation service points keeping the erratic geographical positioning of the habitations. This understanding is particularly relevant when striving for more up scaling sustainability of rural water supply & sanitation in Odisha. The workshop was a result of cooperation between Gram Vikas, UNICEF, Deltares and ICCO involved in water supply and sanitation and evolved out of a felt need to engage people from diverse fields to provide inputs for designing future courses of action. . The two day workshop on: *Safe guard Future drinking water supply in Odisha*" at the New Marrion, Bhubaneshwar was rolled out with the following objectives:.

- ✓ Current situational analysis of water quality in Odisha from monitoring to date;
- ✓ Increase awareness of the importance of groundwater monitoring (quality and quantity);
- ✓ Discussion and exchange of experience on Odisha's rural drinking water issues in terms of water resources;
- ✓ Improve cooperation in the water sector and exchange

Opening remarks were given by Joe Madiath, Gram Vikas, Job Zachariah and Aidan Cronin, UNICEF, Marijn Kuiper of Delatares and Mr. N. K. Shukla. The format of the meeting was 13 technical discussions and discussion followed by Group work and summarizing next steps.

Presenters

1. J. Perrin, Indo-French Centre for Ground Water Research (IFCGR)
2. Dr. D.V. Reddy, National Geophysical Research Institute, Hyderabad
3. P. K. Naik, Scientist, Central Ground Water Board
4. Dileep K. Panda, Directorate of Water Management
5. Aidan Cronin, UNICEF Odisha
6. Dr R.P. Misra, Technical Advisor, WQ,RWSS
7. Pradeep Ku. Sahu, RWSS, Koraput
8. Chiralekha Chowdhury, Manager, Gram Vikas
9. Marijn Kuijper, Deltares
10. S.C. Jaiswal, Water Aid
11. Roelof Stuurman, Deltares
12. Nitya Jacob, UN Solution Exchange
13: Vijaylakshmi, Development Alternatives

Presentation 1: Dr. J. Perrin, Indo-French Centre for Ground Water Research (IFCGR)

Mr. Perrin focused on hard rock hydrogeology, aquifer structure & ground water flow. Joint collaboration between National Geophysical Research Institute (NGRI), India & BRGM, France is involved in the research work that focuses on Hard rock aquifers of southern India.

Some highlights of his presentation:

→*Structure of hard rock aquifers*: Granite, gnesis, schist constitute a large part of southern India

→*Weathering profile*: {Sandy Regolith 0-3m, Laminated Layer 10-15m} Saprolite, Fissured Layer15-20m, Fresh basement

→*Mapping of aquifer thickness* using geological observations (dug wells) & geophysics (resistivity logging) Ref: Gajwel watershed

→HR aquifers are developed by weathering process, they are extensive but highly heterogeneous locally, they are shallow (<50m depth)

→*Risk for RWS in hard rock*: Development of agriculture: Agriculture contaminants (Nitrates, Pesticides), Sewage, mining & poultry farms are other risk factors.

→*Mitigation of risk*: Adequate sitting of wells (*Recommendations on well sitting in low layer areas, near tanks for dilution of potential contaminants, drilling deeper than 50m is avoidable as most transmisive fractures are within weathering profile)* ground water management policy (Budgeting, stimulation tools, decision support tools)

→Recommendation on aquifer monitoring: Long term monitoring (Ground water measurements twice a year i.e. end of dry season & end of monsoon)

The question was raised that if going deeper in hard rock areas is futile then is it better to dig three wells of less depth than a single well of over 300 ft deep with the same money. Some viewed that in Odisha desired quantity water is not possible in 50m. The solution of digging two wells of 50mtr deep instead of digging one well of 100m deep may be make sense economically but not socially with examples where very close wells were causing fluctuations in the water table. Thus people were divided on the view whether a single well or multiple shallow wells. It must be noted that well location is important and one has to maximize the weathered profile with deeper fractures extracting water from top zones.

Presentation 2: Dr. D.V. Reddy, National Geophysical Research Institute, Hyderabad

Groundwater contamination is found when micro-organisms are present or when ions are more than the specified limit. Anthropogenic contamination is induced by human activity and may include Nitrates and/or several other organic compounds. Most of the fluoride found in groundwater is due weathering of rock and dissolution, e.g. Nalgonda District of AP, India, has a very high content of Fluoride and has been linked to political parties claims on safe drinking water. Higher amounts of Fluoride can cause dental, skeletal fluorosis, joint pain, restriction of mobility, and bone fractures.

Nitrate pollution is generally from anthropogenic sources with human encroachment most often the cause of elevated levels in groundwater. Sources include septic tanks, sites used for disposal of human and animal sewage, food processing and industrial chemical fertilizers. The biggest health risk is the conversion of hemoglobin to met hemoglobin which depletes oxygen in blood and enlargement of thyroid, cancer, birth defects and hypertension

A key question was how can we manage the nitrate pollution in rural environment?

- Managing the proper sewerage/ waste water drainage system
- Suitable solid waste dump yards for the cattle and kitchen waste
- Community drinking water supply from the wells situated away from the villages

A conceptual model of the mechanism and processes that control these concentrations in the aquifer will be beneficial. Decontamination is not an easy task, however, we have to explore the new technologies to reduce / minimize the contamination.

Presentation 3: P. K. Naik, Scientist, Central Ground Water Board

The average annual rainfall in Odisha is 1502 mm. But rainfall is erratic and as we go westward it gradually decreases. The stage of ground water development is now at 18%. Ground water quality problems are linked mainly to Fluoride (Occurrence of high fluoride in bore wells of Orissa as drilled by Central Ground Water Board in hard rock terrain). Problem of High Fe is also widespread. In the mining areas of Joda-Barbil-Koira it is unfit for drinking purposes especially in summer season due to deeper water level in discharge areas and base flow. The uneven distribution of GW in hard rock area is a main problem - Deeper fracture zones lead to variability in water level.

Determining the best well sites in remote rural villages can be done by the collection of historical data of the area and vicinity with an extensive study of Toposheet / Remote sensing /Geology of the area and then conduct VES as per site specific problem. Studies reflect there is enough GW for drinking water purpose, but conservation is required.

Bacteriological contamination, especially faecal coliform comes from leaching of solid (human and animal excreta) and liquid wastes. Often the drinking water source (hand pump) is close to household toilets and accumulation of human excreta near a drinking water source. Need to look at combating measures such as the integration of traditional knowledge & modern technology.

Traditional structures like open wells and sanitized dug wells tackle the problems related to iron and to some extent in the case of arsenic and fluoride. Household ceramic filters through village entrepreneurship can prevent water borne diseases.

Presentation 4: Dileep K. Panda, Water technology Centre

Mr.Panda related the hydrological variability along with climatic stresses.

→Climatic and anthropogenic stresses like changes in mean and extremes in rainfall and temperature, Changes in evaporation & transpiration, Sea level rise, Anthropogenic groundwater extraction influence the recharge to and discharge from the aquifer

→Critical issues of Drought: 56% of the geographical areas were affected. In Odisha, groundwater levels range of 0-3 m shifted to the range of 3 to < 7.5 m categories in the drought year

→Trend variation: Pre-monsoon experienced a depletion of 0.23 m in 10 years. Rain fall trend is changing. Total rain fall is the same but distribution pattern is varying.

Presentation 5: Dr. Aidan Cronin, UNICEF Odisha

The presentation reflected UNICEF's involvement supporting GoO at State level and in Koraput District of Odisha in the context of infrastructure O&M and water quality monitoring. Social, technical & political issues are also considered during the intervention. UNICEF's mandate is children and 20% of under 5 mortality is due to diarrhea. Orissa's Diarrhoea burden is 20% higher than the Indian average and the significance of water and sanitation is appreciated when one realizes that 80% of diarrhea is due to water & sanitation. Findings of water quality monitoring by RWSS (in 1,570 GPs of the state covered in 2009 via 5 focus GPs of each block, The remaining 4664 GPs of the State to be covered in 2010):

- The percentage of samples above permissible limit tested by DLL is 25% higher than by FTK
- FTK: Iron is detected as the most common contaminant, and Fluoride follows as the next.
- DLL: Most common contaminant is Iron, with Turbidity and Fluoride following next.
- Widespread microbiological contamination of groundwater was detected b additional testing supported by UNICEF (20% positive detects with faecal coliforms).

→O&M: 40% of tube wells are over 10 years of age, 25% are 5 to 10 years old and 35% are less than 5 years old while the ratio of point source to SEM has increased from 29 to 36 in the period 2002-2009.

→Sanitary Surveillance about the environment/surrounds of the water source in the operational villages can make a huge impact on identifying and addressing risks of point source pollution.

→Bottlenecks: At Village/GP level there is a need for systematic information sharing (with the local village water, sanitation and health committee / GKS) by the SEM and verified by the District Level Laboratory (DLL). At block level there must be handholding and monitoring overview of SEMs to support their work. At the District level a minimum 10% of the sources tested by FTK are required to be analyzed in the DLL. Sources showing positive results of Faecal Coliforms contamination should then be analyzed also in DLL; also Fluoride samples testing positive with the FTK should be quantified at DLL level. A systematic procedure for follow-up on risks identified by the sanitary risk survey should be initiated via remedial works / stronger O&M for positive impact on water quality. Bacteriological contamination is seen consistently and urgently needs addressing.

Presentation 6: Dr R.P. Mishra, Technical Advisor, WQ, RWSS

He emphasized on the aspects of Govt. Policies & guidelines to strengthen the implementation part. Dr. Mishra reflected the national level guidelines relation to the state level

→National Goal:
-Paradigm shift from "*just providing Water Supply System in the village to ensuring Water Supply Security at the House Hold Level*"
- Establishment of Water Security Plan "*Adequate quantity of highest quality water for drinking and domestic purposes on a sustainable basis at all times*"
- Water quality testing and sanitary inspection as Water safety Plan

→State plans:
- Establishment of 26 Sub Divisional Laboratories during this financial year. Balance laboratories in the next year
- Provision of FTK to all Gram Panchayats of the state and provision of refill chemicals for the existing FTKs
- 100 % water quality monitoring by using FTK (engaging VWSC/GKS member or outsourcing)
- Preliminary bacteriological analysis using H_2S Strip Test Vials
- Subsequently 100 % testing for MPN/ FC/ TTC at Sub Division / District laboratory 10% of samples to be tested by District Level laboratory which include positively tested samples
-Random testing of water samples by SRI
-Identification/ registration of all water supply sources
-Sanitary Survey by ASHA/VWSC/NGO
- GPS survey of all water sources by NGO
- Sanitary inspection by sample testing is in progress, maintenance, cleaning & rehabilitation is essential.

Presentation 7: Pradeep K. Sahu, RWSS, Koraput

Koraput Laboratory under the intervention of RWSS with some support from UNICEF is well equipped with Instruments/reagents for testing of
- Physical analysis: Conductivity, pH, TDS, Colour, Odour
- Chemical analysis: Iron, Calcium, Magnesium, Nitrate, Fluoride, Chloride, Sulphate, Hardness, Alkalinity
- Microbiological analysis: TTC (Thermo Tolerant Coli form) and FS (Faecal Streptococci)

Study procedure: Bottom- up approach based on a water safety plan identified by Sanitary surveillance supported by microbiological testing. Challenges to address include reaching 100% coverage of all sources in Sanitary surveillance, chemical and microbiological testing and mitigation of water quality related problems with the consumer, PRI.

It was discussed that faulty design of the borewells, lack of cement packing are the main reasons for the contamination from surface pollutants as well as increase of iron content in the water. Questions were raised as to how would the government would scale up the activities as demonstrated by the Koraput laboratory. Dr. Misra responded saying that water quality surveillance is to be done and in the second phase more samples are to be collected. The feedback from the first phase will be used to strengthen the laboratory infrastructure and personnel for water quality surveillance. Presently contaminated borewells are marked as "not to be used for drinking" but in the absence of other sources in the vicinity people would resort to using unsafe water.

Presentation 8: Chitralekha Chowdhury, Manager, Gram Vikas

The Gram Vikas experience in the field of water & sanitation & the challenges faced in providing Safe water supply in Rural Odisha was shared. These touch the core values of the organization as *Inclusion, Gender Equity, Social Equity, Cost Sharing, Sustainability.*

The Indian context means that 80% of morbidity in rural India due to lack of protected and safe drinking water and sanitation. 94% populations in rural Orissa have no access to protected water, less than 1% has access to sanitation facilities. The daily drudgery of water collection and poor sanitation does not even spare children. A key vehicle for social inclusion can be water and sanitation.

Gram Vikas' approach is that the aim must be 100% coverage of all households in a village with institutional mechanisms developed for O&M. ON this there must be equal representation of men and women and each household must contributes an average of Rs. 1000 ($22) towards corpus fund as People can and will pay for quality but there are social costs. To ensuring sustainability the institutional mechanisms to enforce and maintain hygienic practices can have group monitoring by children, women. There must also be clear identification of maintenance mechanisms, e.g. contribution from harvests; community pisciculture; monthly payments

Physical Capital Gram Vikas has supported includes Toilets and bathing rooms, Piped water supply with three taps and Development of community assets while key challenges include insufficient yields, water quality and the failure to strike water.

There is a strong need for collaboration for understanding ground water movement and interaction in different Hydrogelogical contexts, including training in water quality monitoring and expanding knowledge to understand pollution and well vulnerability

Key future challenges include how to continue to balance up-scaling this MANTRA and tackle issues of water quantity and quality while ensuring sustainability. Gram Vikas way of involving community in planning to implementation level is an example for all the participants; the challenges reflected in the presentation put forth the issue of the need for various stakeholders to play a proactive and complimentary role.

Presentation 9: Marijn Kuijper, Deltares emphasized on the issues of recharge & importance of clean location. The focus point was to demystify monitoring and facilitate non experts to play a significant role at the grass root level with respect to water quantity and quality monitoring. The Bare foot hydrologist is a member of a rural habitation who has sufficient knowledge (after training) to make appropriate decisions about siting for new well locations The concepts of barefoot hydrologists are to ensure sustainable safe drinking water by improving the knowledge of ground water management in approachable manner to the community.

Deltares and Gram Vikas trained 40 barefoot hydrologist trainers on monitoring water quality and protecting wells development. A key objective was to find sustainable well locations (clean and sufficient in yield). To this end an easy-to-use toolkit was developed.

Findings from the bare foot project included that some two thirds of the sampled well were of good quality though microbiological contamination was found in 8% of wells and nitrate and bacteria found in another 8% of wells. Shallow wells in fresh water lens were deemed as preferable to one deep well in the salt water body, Practical difficulties were encountered in covering bigger diameter wells; Cover makes no difference in recharge and they summised that often a clean location is more important than a deep well! Another finding was that gravity flow wells, although shallow wells provide the cleanest water because they are located in a clean, natural environment. Key challenges for the future include:

> Choice between abstracting shallow groundwater or deep groundwater

> How can barefoot hydrologist can assist in selection of clean wells locations?

> What affordable filtering and purification solutions can work on village level?

The term "barefoot hydrologist" led to some debate as there was apprehension that if specialized work is to be done by the "barefoot " approach then we are at risk of loosing technical integrity. This view was opposed by others present saying that the "barefoot approach" has proved to be successful in other sectors, especially health care. Many participants were also of the opinion that with certain literacy levels local people can be trained to carry out simple monitoring protocols and fill the gap where the government is not able to reach out to and Government may play a facilitative role in this process. The challenge however remains regarding sustainability of the monitoring systems.

Presentation 10: S. C. Jaiswal, *Water Aid*

This dealt with the water quality problems encountered in coastal areas and Water Aid presented its experience of Sustainable technical Solutions in Puri.

→Magnitude of problem: severe water quality problems mostly Iron and Salinity. Microbiological contamination was also found – even in deep wells – mirroring the experiencing of all of the other sampling results. Adverse impacts on health are not known to the community and use of non potable sources are quite common, No community participation in mitigation activities

→Steps in Project Implementation: Baseline study, Hardware Activities, Water Quality Analysis from different sources, area specific solution

→Project outcome: to create models of safe drinking water facilities in quality affected areas through proper water quality mitigation and management strategies, to identify alternate water sources in Iron/ Salinity and other quality affected areas, Liaise with government to replicate the low cost and community managed mitigation measures in other areas.

→Some Solutions: Adopted terra-filter developed by IMMT, Bhubaneswar reduce the iron, suspended materials and be appropriate for installation in areas where people are poor, have no regular electricity and the public tube well is the only source of drinking water.

There were some questions regarding the intervention was mostly on the iron removal filters promoted by Water Aid in Puri district and its efficacy in removing iron contents from water and there was agreement that there need to be more research as to how much iron is being removed as a result of the use of the terra filters, the life of the filter and how often it needs to be replaced.

Presentation 11: Roelof Stuurman, Deltares

This was an overview of the evolution of water supply system in the Netherlands and in the European context and highlighted the various developments in the sector that had led to improved access, research and monitoring of drinking water in the Netherlands. Groundwater protection is done at 4 levels identified around the abstraction area with strict control on activities allowed at the different levels.

When comparing drinking water in Odisha context here it is obvious that groundwater storage in Odisha very low and also that recharge differs enormously (Orissa is in the range of 1500 to100 mm/yr. while Holland is in the range of 800 to 300mm/yr. Orissa also has low natural groundwater protection given the hard rock aquifers. Hence, future challenges in Orissa include planning for groundwater protection as well as robust Monitoring & groundwater management. As one cannot manage what is unknown then much better understanding is needed on Travel times, pesticide threats, purification capacity of soil, effect of fertilizers, acid soil, safe groundwater use etc., control of drinking water quality, to monitor and follow-up appropriately and how to handle the resulting information generated.

Presentation 12: Nitya Jacob, Resource person and moderator, Water Community, UN Solution Exchange

→Water Community, UN Solution Exchange

- National level platform for sharing views, experiences and research
- Inputs for policy, programmes, research, raising awareness, networking
- Membership: 40.8% NGOs, Multi/Bilateral 26.2%, 11.4% Govt.
- Discussion themes water & access, quality, service delivery, management, Drinking water, Sanitation, Governance, Water and agriculture, Socio-economic & cultural barriers to access, Water resources management, Conflicts over water, Water and climate change
- Advantages: Sharing knowledge, organizing information, helps in making informed decisions, wider consultations in real time, brings out innovations, eliminates duplication of efforts; saves time and money, helps to build on what is already there.
- Bring together experts from academia, NGOs, the government, international agencies and donors to pool resources and tackle the menace of contamination
- PGWM - Participatory Ground Water Management – to evaluate shortcomings in existing regulatory framework & ground water governance structure and involve communities in ground

water management and governance, Actors include gram sabhas, farmers, donors, international agencies and government.

Presentation 13: Vijaylakshmi, Development Alternatives

Dr. Vijayalaksmi briefed the audience on the work of Development alternatives and its involvement in technology promotion with respect to water quality monitoring and purification technology. The Goal is linked primarily to Sustainable livelihoods (Social equity, Environmental quality, Economic efficiency) and Sustainable Enterprises Based on Appropriate Technology. They have worked on water quality monitoring (using Jal-TARA testing Kit which can test 14 Physical, Chemical & Biological Parameters). They also work on bio-sand filtration techniques that provide continuous gravity feed with output of 2500 -3000 litres per day and removes Bacteria (99.9%) and Turbidity.

She also demonstrated the IWRM model Bundelkhand looking at a holistic Water Management approach including Demand Management, Supply Management, Sanitation Management, Institution Development via Capacity Building Modules and Community Mobilisation for Water Management.

They have found that the strategies for a successful approach must have key elements:

- Periodic water resources/quality data collection & maintenance (NGOs, Local schools)
- Design & Implementation of problem based treatment & management systems
- Training of local NGOs, CBOs on monitoring and management
- Institutionalizing all the activities

Group Work:

The Group work aimed at addressing the two key questions:

- What do you see as the biggest challenges in safeguarding rural water and sanitation?
- What are the first steps we can commit to together to improve cooperation in addressing these challenges?

The outcome discussions are summarized below:

1. **Biggest challenges:**

Management

- Water resource management poor - from source siting to development and managements

- Need for a strong push for sanitation and hygiene and SLWM to complement advances in water supply – only then will have an integrated sectoral approach
- Poor infrastructure development and maintenance – there is a lack of a sense of ownership of the community of natural resources & their management
- Too little priority on water quality issues
- Too little inter-departmental convergence / little integration of all good initiatives
- Difficulty in implementing laws, policies and guidelines – need good monitoring for this
- Transparency in program implementation & pricing

Knowledge

- Poor understanding of the resources / Need for more research on Hard Rock Aquifers
- Water security and sustainability issues need strengthening
- Need to see how traditional methods of water management can be used in conjunction with modern challenges and also improved technical solutions
- Need to understand now how over extraction and over pollution of GW are impacting on the future

2. To address these challenges we have to follow the following steps:

- Prepare a clear plan of action on water & sanitation with all key stakeholders involved on the protection and maintenance of the water source system
- Information from all stakeholders to be registered and access through public domain
- Proper training to community on water, sanitation and hygiene practices, through Media TV, Radio, campaigns, advertising, wall painting display on water quality information etc.
- Supporting Panchayat and CHWS/GKS to be given Training and provided with Financial, Technical and Administrative support
- Demonstrations needs to be done on a large scale collaboration – research institution, community, government, all stake holders to pick this model up.
- Strong Convergence of line departments like Health, PRI, Water resources, Sanitation, Education, NGOs and CBOs.

- Regular monitoring of programs by and with Govt, and developing an alliance on improved water and sanitation provision - Further such meetings will help this.

Wrap-up

The concluding session had the presence of Ms. Shairose Mawji, Chief of Odisha, UNICEF. She appreciated the gathering and the energy of the participants to involve on the subject of the workshop. She said that the presentations rightly reflected the issue and the next steps would be crucial considering the risks involved with respect to availability of ground water. Water quality is an important factor for ecology as well as economy. Addressing water and sanitation can combat diarrhea incidences among children and increase school days up to 1.9 billion.

Dr. Shukla appreciated the enthusiasm of participants. Safe Water supply has been always a subject of concern. Sustainability with respect to water entails quality, durability & safety. To make it available to the community is an onerous task hence joint action is needed to find solutions. Acceptance of "water diviner" or "barefoot hydrologists" may be a long debate but the moot point is that people want water. Therefore setting up knowledge schools can be instrumental.

Ms. Chitra thanked all the members or their enthusiastic participation and hoped that the take home would be to be more open to joining hands with one another in the light of the complexity of the subject and appealed that the energy generated should not end up as workshop but come out as collaboration.