A Report on the **two-day** Workshop on Water Resources
In Kerala – Towards Conservation and Sustainable Management

The **Process**:
To initiate the ***SPFWiD (South Indian People's Forum For Water In Development) at South India,*** Oxfam India/Svaraj has undertaken water initiative programmes supported by SIDA for strengthening the food security and sustainability of the livelihoods of communities in South India. Initiatives are already underway in two of the South Indian States – Karnataka and Andhra Pradesh. And now Svaraj is seeking to work with CBOs in Kerala and TN.

Having identified individuals and watershed areas for exposure and discussion in Kerala, the Programme officers from Svaraj met and talked to various individuals and organizations with a view to putting together a workshop for a wider debate on water related issues in Kerala.

The **Preliminary Planning**:

Four Broad themes were visualized:

I. Participatory Approach to Integrated Water Resource Managament (IWRM)
II. Stakeholder's Responsibility towards IWRM
III. Technological Application in IWRM: GIS and Its application for the conservation and recharging of the Ground water resources in Kerala and Community Treatment Plants for recycling of waste water
IV. Governance Issues in IWRM (See Annexure - 2)

The **Workshop**:

Theme: **Water Resources in Kerala – Towards Conservation and Sustainable Management**

Date: 21st & 22nd of October 2005

Venue: Pearl Regency Hotel, Trissur, Kerala

More than fifty participants from different places of the state attended the workshop. The workshop started off with a welcome speech and outline of the purpose of the two-day workshop by Ms. Bharti Patel, the Director of Svaraj (Oxfam India). She drew participants' attention to the need for sustainability of the Livelihood systems of the communities through participatory approach to water resources and briefly outlined the efforts of Svaraj in Andhra and Karnataka. (See Annexure - 1)

The inaugural function was presided by Dr. S. Sankar, Senior Scientist at **Kerala Forest Research Institute Peechi, Thrissur, Kerala** who highlighted the fact how participatory approach can lead to privatization of natural resources. He cautioned the audience to be

careful on what they mean by participation. (Since there was no time for his elaborate presentation I have added his report as an Annexure in the end)

The inaugural address was delivered by Mr. P. S. Gopinathan Nair, President, All Kerala Rivers Protection Committee, Alwaye.

He drew our attention to the rapid degradation of water bodies caused by technological interventions and the need to change the modern lifestyle that is anthropocentric. He said that the mismanagement of resources for the past 30 years accounts for the water problems in Kerala. He suggested the following steps for the recovery of water resources:

1. Allowing as much rainwater to percolate into the soil.
2. Not to waste water
3. Recycling waste water through setting up of Treatment plants
4. Avoiding pollution of rivers
5. Importance of soil conservation and planting of trees
6. Switching to sustainable agricultural practices like organic farming and discouraging mono-cultural practices
7. Educating farmers about the present realities of water usage where waste is as high as 60%.
8. Prevent / slowing down of urbanization process in the state
9. Change of lifestyle

Session 1: Mr. Ajith Venniyoor moderated the session.

I. Dr.A. Latha spoke on "Participatory Approach to Integrated Water Resource Management".

Important issues:

- The right of the river to flow: negligence of river ecosystem & health of the river: Upstream-Downstream Linkages Missing
- Degradation of river catchments, Paddy land conversion that has damaged the recharge structures, unplanned tourism development, quarrying of granite & laterite, Sand mining, Midland hills deforestation etc.
- Interstate, Inter-Basin water diversions: problems relating to water allocation & sharing of resources, riparian rights, down stream impacts (Mullaperiyar, Bhavani, Siruvani & proposed projects)
- Change in Land use and Agricultural practices: Food crops to cash crops
- Pollution of water, land and air due to Industry (Eloor Toxic 'Hot Spot'), agriculture (Endosulfan), domestic waste, Urbanization etc.
- Conflicts between Drinking water vs. irrigation water use and allocation; for instance Malampuzha & Peechi Irrigation Projects, Hydro power vs. drinking water, Inter state diversions
- Lack of co-ordination between different development depts within a river basin; Irrigation Department, Kerala Water Authority, Electricity Board, Ground water Board etc.
- Mismanagement of water:

- Over dependence on public distribution systems that neglects own/local/regional sources
- Distribution vs. management of irrigation: water – head vs. tail end.
- Reuse – recycling/recharge of water that negligible
- Attitude – myth of plenty! And Wastage Increases!
- Rain water Harvesting is not the panacea

- Lack of River Basin Approach
  - Inadequate hydrological data base
  - Limits to extraction and utilization
  - Watershed development – though initiated not taken roots
  - Enabling legal / institutional / policy requirement
  - Participatory decision making regarding common resources: Involve users, planners, policy makers, researchers, women and children
  - Time for performance Analysis: Hydro Power projects, Irrigation projects and industries
  - Time for water auditing
  - Time for communication and cooperation
  - Water and food security should be seen together
- Recognition and responding towards increasing water scarcity

II. N. K Sukumaran Nair's Presentation:

His paper focused on "The holy River Pampa – Crying for help". This river called Pampa (also known as the "Dakshina Ganga") is fast moving towards degradation. The reasons for it are as follows:

- Deforestation in the catchment area
- Unscrupulous and unscientific mining of river sand
- The water pollution of the river due to human waste during Sabarimala Pilgrimage season and from waste materials flowing in from hospitals, rubber factories, Markets, houses… etc.
- Anti social and illegal fishing methods like use of poison, dynamites etc.
- Fall in the biotic status in the river.

He further drew the participants' attention towards the need to change our mindset. The Pampa Parirakshana Samithy, a voluntary Environmental Organization engaged in the preservation of this river was represented by the then Member of Parliament, Mr. Ramesh Chennithala. Due to various efforts in this direction, this is the only river that has been included in the National River Conservation Plan. The people's perception is that the engineers are not at all concerned with water. Their attention is only for constructions!

III. Mr. Manoj: Paper on 'A dalit perspective on water resources in Kerala"

Main issues:

- In the present era of globalization we have lost the hills, lands, resources and finally our own culture. The most affected are the dalits, Marginalised tribal people, the poor and the women.

- The state Govt. is playing a dual role. It has transferred the public sector into the hands of the private sector. It's policies are pro-MNCs.
- The urgent need of the hour is to have a different strategy/approach, towards the water rights of the marginalized groups.
- Gandhian approach is not sufficient for such issues. It is dangerous too. Ambedkar's perspective is necessary to address the livelihood issues.

Discussion on the above presentations:

- Solution has to start from home itself without blaming the other
- Inclusion of men, women and children is necessary to tackle the water issues in the state.
- Forests in the Upstream areas should be protected to maintain the flow of the rivers
- Protection of the natural reservoirs such as paddy fields, existing ponds etc.
- PRIs should be strengthened and equipped to address these issues
- Rainwater harvesting being a technological solution is anthropocentric. Human beings alone are not the heirs to water. But it is practical and economic
- Need change of life style and change in developmental policies
- Need to examine water-sharing issues between Kerala and Karnataka. We are only talking about Kerala-TN.
- Who owns water resources? – We have to define
- Why is that Pamba action plan is kept pending?
- There is no collective commitment. Exploitation continues because civil society is weak.

Final Conclusions by **Ajith Venniyur** (Moderator)

- We need to continue such dialogues in order to give shape for an action plan that helps to equip people to identify issues and find sustainable and workable solutions for these crucial issues.
- Gandhian approach could be a possible approach towards addressing water issues.

II Session:

- Prof. P.A. Vasudevan:
    1. Earlier the lack of technological resources was attributed to the growth of pollution. But now it is clear that the WB sponsored international neo-liberal agenda is dictating terms to the national policies. According to this, water is not a right but a commodity.
    2. The problem of the elected Govt. that encourages the entry of MNCs. As a result peoples struggle to get water fails. The struggle of Plachimada goes on. The coke company consumes 10-lakh l of water everyday. Water authority has no tooth. The system has broken down. Thus, misuse of water by MNCs is approved.

- Mr. R.Sreedhar: On Industrial Pollution:

1. Today there seems to be only one motto: "Industrialize or Perish". Pollution is not new in the state.
2. Eloor is one of the oldest Industrial sites that houses 247 chemical industries that produce Endosulfan, DDT etc that kills life. Grasim factory has itsshare in wiping out a number of villages. Periyar River is polluted due to industries. Local communities' struggle has not been the focus of our deliberations. Most of the time these "struggles" are purchased.
3. Constructing a house itself a polluting factor in Kerala. The need for changing the way we look at these issues!
4. Urban Pollution: Every CMC + Panchayath is affecting the water bodies. Huge landfills are seen. 6500MT of waste is produced daily in the state. Women are worst affected due to improper sanitation planning.
5. Rural pollution: due to Pesticides. The method of agriculture is the question.
6. KPCB and the politicians should be brought together to discuss pollution.
7. The need for multi disciplinary approach is a must to tackle the problem.

- **Discussion**:
  1. Need for the defining of the term " Stakeholder". Ordinary people do not figure in this terminology.
  2. Irrespective of power relations action should be taken and problems should be addressed.
  3. People are bound to cooperate with the World Bank funded programmes, as they have no other alternatives. Adversaries have to be brought to discussion so as to take the responsibility for pollution.
  4. Water as a gender issue has to be taken to focus.

III. Session:

- **Dr. Ajaykumar Varma**: Ground water Resource potential of Kerala and the scope for Application of GIS.

  - GROUNDWATER PROVINCES OF KERALA
    • Coastal alluvium
    • Riverine alluvium
    • Valley fills
    • Laterite
    • Intermontane valleys
    • Weathered & fractured rocks

  - **WATER LEVEL MONITORING - INFERENCES**
    •DTWT- mostly depend on topographical, hydro geological &rainfall
    •DTWT varies from few cm to 56m bgl, general range of 0-20m bgl
    •Deeper water levels in laterite hills of KNR, KSGD, KLM & TVM
    •Coastal plains of ALP, EKM,KLM- Shallow WT (0-6m bgl)
    •High ranges of IDK& PTA- Shallow WT (0-6m bgl)
    •WLF between PRM & PM restricted to 4m in alluvium& valley fills
    •In laterites, it ranges from few cm to 9m.

•In crystallines, it fluctuates in the range of few cm to 6 m.
•Trend analysis of WT from 1980 to 2000-
•Decline or rise between +0.05 to -0.05 m/year in 71% NHS
• Pre monsoon WL decline between 0.05 to 0.20 m/yr in 21% NHS
•Generally indicates negligible change in long-term WT trend.

- RESOURCE POTENTIAL OF DEEPER AQUIFERS

•Fractured aquifers upto 200m depth, Yield 3600 lph to 1,00,000 lph
•Alleppey beds- deep up to 600m at Katoor- brackish
•Vaikom beds- 43 MCM (10 MCM brackish)- tapped between Kollam and Kayamkulam
•Quilon beds- Thickness varies from 6 – 100m- Flow not clear (Marginally high hardness)
•Warkallai beds- Extensive- Thickness from 4m to 140 m- Flow 63 MCM (Present draft- 22 MCM) - Highly developed at Alleppey & Kuttanad
•Alluvium- Thickness up to 100m (Kattoor)- Sand, clay, Silt intercalatios

- <u>INFILTRATION</u>

A.COASTAL ALLUVIUM
- i) Soil in low land - 16 cm/hr to 76.8 cm/hr
- ii) Clayey soil - 0.025 cm/hr to 0.12 cm/hr
- iii) Silty soil - 25 cm/hr to 46 cm/hr
- iv) Silty Clayey soil - 11 cm/hr to 12 cm/hr

B. MID LAND
- i) Laterite - 4.8 cm/hr to 47 cm/hr
- ii) Red Clayey soil - 1.8 cm/hr to 8.4 cm/hr
- iii) Sandy Loam soil - 15.6 cm/hr to 31.8 cm/hr

C. HIGH LAND
- i) Fine Loamy soil - 15.6 cm/hr to 47 cm/hr

- Groundwater resource potential

Well density	-	10 to 250 per km^2
Well use – Domestic only	-	70%
Well use – Domestic & irrigation	-	24%
Well use – irrigation only	-	6%
Pumping wells	-	31%
Annual growth rate of wells	-	5/ km^2
Growth rate of GWdevelopment	-	0.34 to 5%
Ponds (with SC>48000 M^3)	-	995
Private ponds	-	57% (4% used for drinking water)
Local bodies owned	-	21%
Temple Owned	-	13%
Government owned	-	9%
Perennial Springs	-	236 (80% in highlands)
Yield (60 to 600 lph)	-	40%
Yield (600 to 6000 lph)	-	44%
Yield (6000 to 144000 lph) (0.6% people use this source for drinking)	-	16%

- Water stress

Type of resource	Water availability (Mm^3)	
	Annual	Summer
Surface water	24600	3690
Groundwater	5135	5135
Impounded water	5500	5500
Total	35235	14325

Sectoral water use	In Mm^3	
	Annual	Summer
Household	1226	809
Animals & birds	438	293
Industry	6400	3200
Wetland conservation	5000	3500
Irrigation	13665	13665
Total	26729	21467

Conflicts:

- Intrastate & Interstate
- Micro watershed based
- Groundwater development
- Periyar river- Sectoral conflicts

In Mm^3	Annual	Monsoon	Non-monsoon
Availability	6765	5617	1148
Utilization- 2001	2117	775	1342
Demand- 2025	5050	2348	2702
Surplus/Deficit- 2025	+1715	+3269	-1554

- Adverse aspects- GW availability
  - •Increasing water short areas- Lowering groundwater table, migration
  - •Increased Pumping stress
  - •Poor well siting & faulty drilling
  - •No monitoring/Difficulty of monitoring well field
  - •Groundwater illiteracy
  - •Poor community control

- GROUND WATER POLLUTION
  - •High degree of bacteriological pollution in dugwells
  - •Cross contamination of wells due to single leach-pit latrines

Projected number of dugwells = 40,00,000
No. of households = 55,00,000
Single leach-pit latrines = 30,00,000
Normal coliform content in raw sewage = 1 million ount/ml.

Daily per capita contribution of coliform bacteria = 300 billion
Reduction of bacterial count in FW due to natural self-purification process = 90% in 2 days

•96.8% sample show EC less than 1000 uS/cm at 25oC
•96.8 samples show total hardness less than 180 mg/l
•98% samples show chloride less than 250 mg/l
•97.7% show fluoride less than 1 mg/l
•92.6% samples show nitrate less than 45 mg/l

There is also ground water illiteracy among the people that needs to be addressed.

- Prof. Sudhakaran On "**Rain Water Harvesting The Best Technology Option For Water Security in Kerala"**

1. **Main issues:**
   - WATER & THE WORLD
     - The Elixir of Life
     - Basic Natural Resource for Economic Development
     - Most Abundant Material on Earth
     - 1400 Million cu.km (1400×10^{15} m^3)
     - Only 0.3% Available for Human Use
     - That too Polluted and Contaminated Seriously
       - Experiencing WATER STRESS
       - 80 countries & 40% of world population Plenty of water on earth,
       - Highly polluted and inaccessible portions omitted it is only 0.003%
       - Population explosion and environmental pollution worsen the situation
       - Nations around the world struggling to acquire water sources.
       - "WATER WARS" have begun in many parts of the world.

   - WATER CRISIS – STATUS OF KERALA
     KERALA – "GOD'S OWN LAND" BLESSED WITH:
     Heavy rainfall - 3070mm/ year
     Rain water availability - > 10,000 lpcd
     Abundant water resources - 44 Rivers

     Thousands of drains & streams, ponds & lakes; Nearly 50 lakhs wells.
     STILL ==> Floods + Drought + Water Scarcity WHY ?

   - WATER SCARCITY – REASONS AND SOLUTIONS
     NATURAL:

     * Short Duration of rainfall - 4 – 6months/12
       100-120days/365
     *High intensity of rainfall - >200mm/day
       80mm/hr(No Control)
     * Narrow land with steep topography - High runoff
       Low infiltration
       Losses-over ground
       -under ground

Human Activities

* Deforestation	-	Storing capacity of forests reduced
	-	Soil erosion, siltation - capacities of reservoirs, lakes, reduced. Floors of rivers raised - capacity reduction Flooding
* Filling of low-lying areas:		Leveling of areas-Storage eliminated Filling reduces storage capacity
* Drainage works	-	Speedy discharge, runoff losses, Low infiltration

- Rain Water Harvesting Refers to collection and storage of rainwater for later uses.
  In a broader perspective it includes activities aimed at :
  * Harvesting surface and ground water
  *Prevention of losses through evaporation and seepage.
  * Conservation, and
  * Efficient utilisation of AVAILABLE WATER RESOURCES

1) Roof Water Harvesting	2) Surface Water Harvesting
1. Storage for Direct Use	1. Storage for Conservation Reservoirs, Cross bars, Ponds
2. Recharge Ground Water	2. Ground Water Recharge Terracing, Contour Bunds/trenches Rain pits

- Roof Water Harvesting System two approaches:
  1) Design for available roof area:
  Rainwater from available roof area in collected
  Storage as per water demand
  Excess used for ground water recharge
  2) Design for required water demand/ statutory requirement
  Based an average annual rainfall, provide collection facilities over required area only. Excess water due to heavier rain for ground water recharge.

Session IV: Governance Issues in IWRM

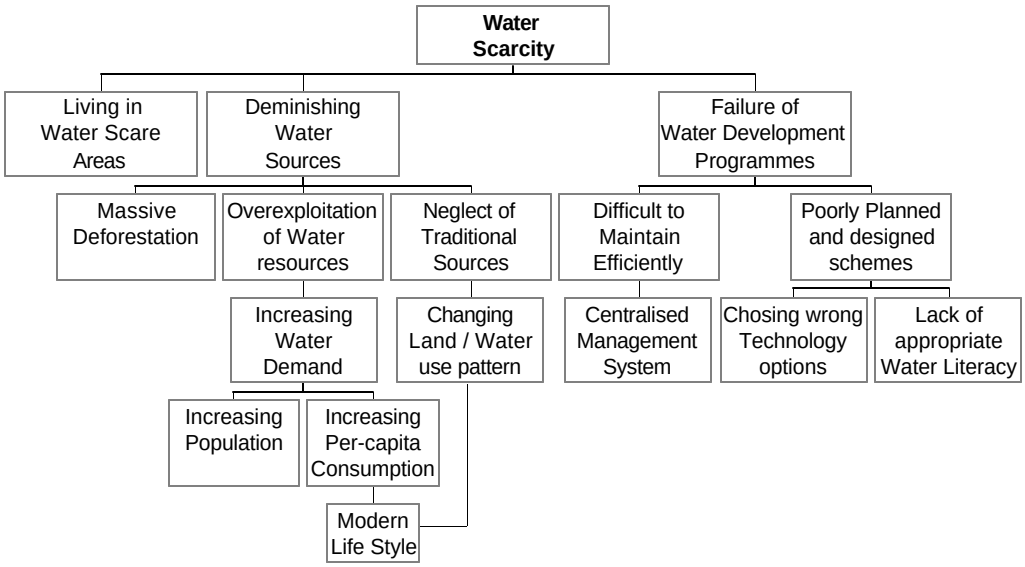
➢ Mr. K M Namboodari: On Water governance issues:

GOVERNANCE ISSUES IN KERALA WATER SECTOR

1 **History of Water Development in Kerala: Traditional Practices:** Traditionally Kerala had very sound systems of conservation and management of natural resources of which water conservation was an integral part. A typical feature of Kerala is the habitation pattern of people, who prefer to live in a dispersed pattern, independently and on their own property, rather than together in clusters as in the conventional concept of a "village". Hence, majority of households owned independent source of water. In water-scarce areas, poor people shared either neighbour's well or a public well for drinking water. Ponds or streams were widely used for bathing and washing purposes.

1.2 Beginning of Current Water Crisis

The concepts of urbanization, and modernization were introduced subsequent to the invasion of British and other colonial rules. Large Dams, Piped Water Supply, motorised pumping etc. are few examples. After the abolition of Zamindari system, people started getting ownership title of land with absolute ownership of natural resources including water.



1.3 Information/Knowledge Gap in WRM

In the name of rapid growth and modernization, adoption of unsustainable, inappropriate and expensive technologies is alarmingly spreading. This may be why even our "rural community" believes that pumps, pipes and tanks can solve all their drinking water problems.

2 Limitations of the Current Pursuits of Solutions

2.1 Centralised Sector Development Policies

In Kerala, until late nineties, a single ministry and centralized State agencies such as Irrigation Department and Kerala Water Authority have always handled Water Sector. Since Local Administrations played very little role in planning and implementing Water Development Programmes, the schemes were seldom need-based. This centralized approach also resulted in planning and implementation of large, state-owned/managed water supply/irrigation systems, which performed so poorly, that they not only failed to produce intended benefits but also became a huge liability to the Exchequer. It is shocking to learn how misleading are the official positions often taken in the context of water resource development programmes.

2.2 Failure to quantify the problem

Every body talks about water crisis in Kerala. There has been umpteen numbers of workshops, seminars, and conferences on the subject. Series of articles have been written and published on water crisis of Kerala. Unfortunately, most of these presentations, only deal with qualitative aspects of the problem leading to highly generalised conclusions. What drive the point, if at all, are the sharpness of the words rather than the power of verifiable proof.

2.3 The Target Oriented/Project/Prescriptive Approach

Since we are familiar with this approach, which is the same throughout the country, I only attempt to highlight following unique features/symptoms of this approach:

1.3.1 Choice of Inappropriate Technology

Ignorance about the unique hydrological, hydro-geological, environmental and socio-political factors of Kerala on one hand and over-dependence on borrowed/bookish ideas (instead of empirical wisdom) on the other, lead to choice of inappropriate solutions (Eg. Pipe Mania, Imported Watershed Concepts such as Mazhakkuzhikal, propagation of mass construction of Roof Water Collection Systems etc.).

1.3.2 Standardisation

This is one of the worst disadvantages of "Project Approach". Standardisation not only leads to total neglect of situation specific data for designs and obviously results in inappropriate designs (E.g. Standard per capita daily demand, water quality standards, non-usage of local materials/know-how), but also to expensive/over designs. The scope of creative innovation is also totally curtailed.

1.3.3 Unnecessarily Cumbersome Accounting Systems

The time, manpower and energy required to meet the prescribed financial/ administrative requirements is very high and in spite of this, the transparency and the accountability is seldom achieved.

1.3.4 Unscientific Linear Project Sequences

Although the term "Project Cycle" is commonly used, they are seldom cyclic and consist of linear sequences such as "Pre-planning, Planning, Implementation, and Post-Implementation" activities. The well-known lesson that development is an iterative/evolutionary process does not seem to be recognised by the "Project" school. One of the obvious limitations of these linear models is that there is no experiential learning and hence very little scope of refinement of project designs.

2.4 Limitations of the Current Decentralisation Initiatives of Water Sector

By early nineties, the national policy on water supply sector changed radically and it has been widely accepted that decentralized community managed water supply schemes are ideally suited for rural areas. Although there was unanimity on the need for decentralization and community participation, the methodology of achieving this has been elusive.

- **In majority of the cases, the technology has been piped water supply schemes that pump from wells. Absence of proper yield testing lead to over pumping resulting in premature drying of source and neighbouring wells.**
- **Measures to conserve/recharge water sources were missing**
- **Technology chosen is expensive and seldom optimal because of dependence on standardized manuals and guidelines.**
- **Scope of revival of traditional systems did not get adequate attention. On the contrary, overemphasis on piped water supply resulted in total neglect of traditional water sources.**
- **Multiple options were seldom considered and an impression is created that only piped supply with house connection is the best option.**
- **Issues related to equity/social justice were totally neglected, and the community participation was restricted to those who can afford to pay**

- **For this reason, a vast section of the community who cannot afford the cost and/or preferred different technology options were left behind**
- **Failed to empower and improve the capacity of PR institutions and the local community (Thanks to the "SO driven" approach)**
- Failed to develop "process models" that perfected the choice, application and management of appropriate and environmentally compatible/sustainable technologies to suit different unique, geographical, cultural, and socio-economical situations

2.5 Limited Experiences of Participatory Action Research

History of development all over the world has taught us that excellent natural resource/rural development models have always emerged through community action researches and/or non-governmental citizen's/civil society initiatives. The State has always benefited from/adapted such models for up scaling. But the need to initiate Participatory Action Research to perfect a socio-technical process model that results in a community empowered to plan, implement and manage sustainable, appropriate and optimal water resource management models is yet to be recognized by the planners of Kerala.

3 Towards Sustainable IWRM in Kerala

3.1 Institutional Arrangement

The "chicken-or the egg" paradox as to whether community action should precede institution building or vice-versa is applicable for pursuit of sustainable solutions to any natural resource management issues. However, what is most effective is initiating series of community action facilitated by experienced professional groups (NGO). Since these initiatives need lot of creativity and flexibility, it is better not to take up these under the PRI dispensation but should ensure their active support. These groups should network and share experiences. The success should lie in initiating concrete action on the ground with limited funding for creating physical assets. Most of the inputs (including financial) should be locally generated.

3.2 Contextual Analysis

The strategy, approach and knowledge base to be developed/used for a choice of solutions and processes will depend on the geographical, physical, social, cultural, environmental dimensions of the area. Hence the first step is to make an in-depth study of these aspects. This is done in the following steps

Identifying System Boundary

This is the geographical boundary of the area where intervention is needed. This may be a Region (E.g.Kuttanad), District, Panchayat or a habitation. Depending on the cultural, social, geographical, hydrological and /or hydro-geological homogeneity, the system can be sub divided into sub systems. In the Water Resource Management, the order of considering these various attributes while dividing into sub-systems are:

- Hydrological
- Hydro geological
- Geographical
- Social/Cultural
- Manageable size

This means that, if the system is homogenous in all the above aspects, then the system need not be subdivided. If hydrologically non-homogenous then divide them into homogenous hydrological sub systems. These subsystems are divided If they are hydro geologically non homogenous and so on. This process can be mostly done using the secondary data available.

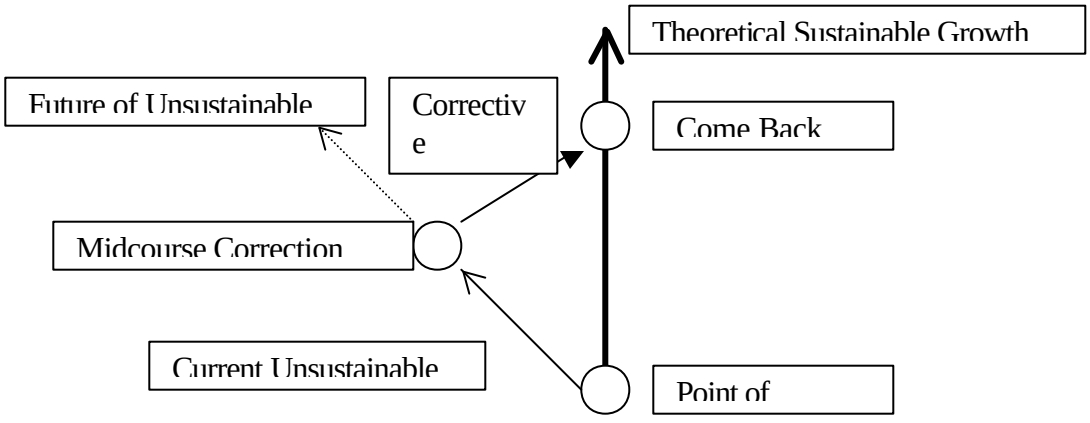
Community Mobilisation/Organisation
Having identified the system/subsystem boundary, community is prompted to understand the need for initiating a sustainable IWRM Programme, which they will spearhead. A team of experienced and dedicated professionals can facilitate this process. The output of this process will be a resolve by the community to develop and implement a sustainable IWRM initiative and formation of a formal/informal committee for this purpose. Until these initiatives culminate into a people's movement, they should remain as non-governmental.

Problem Study/Analysis
It is said that more than 80% of solution is achieved if the problem is studied well. The study will be done through a participatory process of resource persons from the community, a team of facilitators consisting of experienced professionals. Following studies may be required:

1. For each sub system study the change in quantity and quality of surface & ground water resources both in time and space using secondary and if necessary primary data followed by a Systems Analysis
2. Identify various dimensions to the problem (environmental, hydrological, pollution, health, social, political etc.) and define the same in clear terms and make a "Problem Tree"
3. Quantitatively assess and document the merits and demerits of ongoing government programmes, traditional practices and community-managed initiatives in water management
4. Fine tuning the system/subsystem boundaries (if necessary)

During the above studies (particularly the analytical part), care should be taken to ensure active participation of as many stake holders as possible. An efficient moderation technique using scientific tools can filter the prejudices and vested interests during such participatory exercises.

3.3 Deciding on the broad strategy
In most of the cases, the problem tree would indicate that the solution lies in a total change/if not going back in the developmental path. (E.g. abandon modern life style"). This may not be advisable or even desirable because these are relative and value based positions the degree of which might change both in space and time. What is required is to change the future course of direction as follows:



Facilitated by experienced professionals, community decides about the corrective path (Eg. Conserve water, restrict water use, and revive the traditional water sources with necessary changes to suit the present and future needs). This is a very crucial process.

3.4 Identify Local Resource Persons

One should not take the knowledge of the community for granted. This is particularly true in the case of rural Kerala. A vocal and somewhat literate person can easily misguide the community and the facilitators and give an impression that he/she is an expert. While his/her enthusiasm is a social capital, his/her inexperience might be detrimental. The decisions of the community should be vetted on sound logical, and technical basis. Local resource persons with hands on experience and deep insights to the technical, environmental and socio-economical aspects of the problem should lead discussions. If such know-how is not readily available amongst the community, one might need to arrange for external help/advice and impart this knowledge to them during these processes.

3.5 Choice of Technology based on Principles of Water Management

Community uses the "Problem Tree", analytical data and the comparative studies of government, traditional and community/private initiatives and takes broad decision on Technology Choice using the following Water Management Principles:

- Redistribute the available water both in time and space (highly decentralized water recharging and extraction systems)
- Not to extract more fresh water than is supplied by nature every year (Rainfall, Recharge, Runoff). This will result in reduction in water availability and/or deterioration of quality of water.
- Do not allow stagnation of (both surface and subsurface) water, as is the case of neglecting traditional water sources. Maintain the dynamics of all water sources (either by extracting for consumption or allowing to flow off). This will allow leaching of salts from the soil every year.

The principle of subsidiarity, which prompts the pursuer to start solving the problem with least level of institutional involvement, most simple and smallest possible in size and move up the level only if absolutely necessary can be followed while choosing solutions. This exercise will also prevent usage of the proverbial "sledge hammer to kill a fly" (e.g. going for large dams instead of regeneration of natural forests followed by series of soil and water management initiatives in the catchments)

3.6 Initiate Iterative Learning Process

It is one thing to suggest solutions but quite another to be sure about its appropriateness. This can be ascertained only by actually testing them on the ground. We know that development has always been a conscious iterative and evolutionary process. An iterative process that keeps on refining the designs based on experience until near perfect/appropriate solution is found, is a better approach than a lengthy planning process (using manuals & handbooks) followed by a lengthy implementation process. Since community itself spearheads such processes, they will not only own the responsibility but also sharpen their analytical skills.

The entire process of choosing and perfecting technologies by the community needs to be documented to be used as a guideline for future up scaling but not as implementation manuals.

This documentation should highlight as to how the community solved their problem rather than as to what these solutions were.

3.7 Up Scaling

One common challenge, the pilot programmes (however successful) face, is that they will easily be termed as "non-replicable" although they may satirically be praised as "Islands of Excellence". Those who say this never questions as to whose limitation is responsible for the "non-replicability". I have, in my 40 years of experience in different parts of the country, realized that more often than not, the "non-replicability" is due to serious limitations, if not the mental blocks, of those responsible for up scaling. The only solution is either to change the "Up-scaler" or reorient/enlighten him about the alternative delivery models rather than sacrificing the outstanding virtues of community initiatives. I am unable to offer any ready solution to this at least at this moment because lot needs to be learned yet in the Kerala context. However the following lessons might help in designing a new up-scaling strategy:

- Contrary to popular beliefs, process/iterative approach has helped to initiate direct community action in understanding the real situation and choice/application of appropriate technology, much faster than the target oriented, project approach
- Ability to contribute both intellectually and resourcefully by the community to solve their problem is much more than what we were made to believe.
- While every body talks about what the "poor and marginalised" are "deprived of", the fact that the worth of their intellectual and social capital is much more than the financial contribution is not known to many
- Capacity building is not Training. It is developing an environment for collective experiential learning

One of the challenge to planers is to answer the question "can a development interventionist be creative, flexible and at the same time be meeting the financial and administrative requirements of public spending?"

CONCLUDING DISCUSSION:

The following important issues came up for serious deliberations:

1. Water literacy and Media Sensitization:
   - The Unique topography of Kerala that contributes to the IWRM. The need for shift in the paradigm for the IWRM. Water Literacy for the younger generation. Action Initiatives that become a way of life based on belongingness to the ecosystems that govern life. Educate and Involve children and young people in conservation at the Panchayat level.
   - Initiate large scale awareness programme all over Kerala, and to include women and children
   - The fast polluted river basins: Adversary's (not the word Stakeholder) responsibility
   - Inter-state disputes in water sharing
   - Rejuvenation of the traditional practices of water conservation mechanisms& cultural revival
   - A Comprehensive approach towards dug wells. 99% of them are bacteria contaminated
   - Evolve platforms for discussion of issues of livelihoods based on river basins

- Conserve all the water resources including paddy fields, hills, and other wetlands Creative structures for Rainwater Harvesting
- Data Bank on water resources and river basins that leads to river protection

2. Networking and Information Sharing:
   - Network of groups involved in water conservation efforts. Maintain the diversity of representation within the networks. Not easy to institutionalize networks like this due to difference of views and opinions
   - Organise a workshop on International treaties and their implications on our resources and livelihoods
   - Gain an overall understanding of where actions are being pursued and who is working on them by selecting case studies and accessible to all
   - Media support to local groups that has impact on the policy changes
   - Identify the different ongoing struggles for water protection and support them
   - Who takes responsibility towards the path for sustainable development and how to effectively execute this with regard to community regulations, and up to the Central Level with regard regulation and monitoring.
   - Need to document and publicize campaigns around violations, exploitations and other adverse groups. Document and disseminate small and large practices for others to use
   - Citizens water policy as a tool for mobilization, change and pressure

3. NEED Attention:
   - Identify local problems and evolve local specific strategies for the hydrological areas
   - The problems of water should be looked through larger umbrella issues like overpopulation, unsustainable systems of consumption, industrial pollution, waste water recycling etc.
   - River protection campaign involving all groups and networks
   - Results of workshops and discussions should be disseminated widely
   - Team should be organized in order to take this discussion and action forward
   - Focus on a micro-watershed and identify the users and evolve action plan
   - Basin - sub-basin approach through participatory action research
   - Cost effective, appropriate waste management technologies to be disseminated
   - Regional Water vigilance Cell and legal cell comprising resource persons from this workshop
   - Package of priority based ecologically sustainable alternatives
   - Water conservation as an individual's responsibility in his/her daily life
   -
   - Application of affordable, appropriate, sustainable technologies coupled with traditional knowledge
   - *In situ* waste sorting and management of solid waste in order to ensure pure drinking water

The **Impact**:
The Workshop has brought together various NGO's, Groups and Individuals who were working in different parts of Kerala. The real concerns of the participants can be categorized as follows:

1.How to tackle river and water pollution through communities
2.How to evolve a river basin approach to water management including conservation.
3.Effective implementation of Sand Mining Act and rules
4.Tackling Sanitation problem in coastal areas
5.Pollution from bore wells
5. How to evolve workable effective networks among groups working on water and rivers.

Secondly, Having deliberated upon the above issues, at the end the participants sat together to constitute a **forum** to continue discussions to evolve and sustain the future efforts in IWRM in the state. The forum has fixed up second week of November for the follow up meeting. By that time Oxfam India/Svaraj has promised to bring out a consolidated report on the presentations and discussions during the workshop.

One must appreciate the efforts of Mr. Santhosh who coordinated for the Workshop, Dr. Shankar and Dr. Latha who gave much of their time to make this workshop a success. But the workshop owes its success to all the participants.

Many Thanks.

Compiled
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Annexure: 1

Encounters with Watersheds in the Kerala Western Ghats

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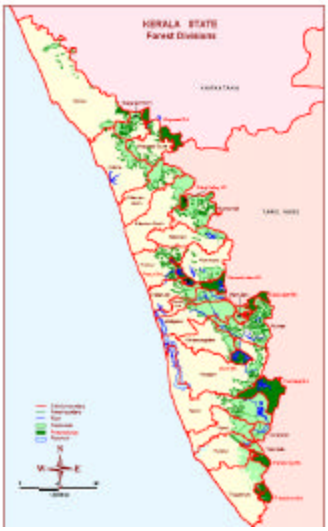

- **Introduction** The Kerala Western Ghats
  56% of land area
  46% forest cover
  40% forest degraded
  Rainfall 3000mm.
  44 rivers
  Density of population 400/km^{2}Dominant agro ecosystems -Rubber, coconut, tea, cardamom, coffee, homestead

- **The Kerala Western Ghats**
  Topography – rugged
  Elevation < 100 m – 30%
  > 1000 m – 25%
  Dominant 100 – 500 m
  Slope < 5^0 – 20%
  > 30^0 – 9%
  Dominant – 20-30^0

- Water:
  Saline – 96%
  Fresh – 4%
  Ice bergs – 3%
  Others – 1**%**

- Rain Fall: Total – 3000 mm; Rainy days – 100
  90% Water – 45 days; Duration – 15 hrs

- Watersheds:

  Low land – 10%
  Mid land – 42%
  High land – 48%

Our State is like a Plank tilted from east to west
Impacts: Floods and Drought
Solution: Stop the running water and make the running water walk.

- Impact of upland management on downstream ecosystems

Land cover	Kunthi puzha (190		Kanjirapuzha (200	
	Area %			
	1975	199	1975	1995
Dense	57	41	38	14
Open	0	8	0	5
Grassland	4	7	0	0
Scrub	3	3	11	2
Plantation	6	13	13	34
Cultivated	29	27	36	41
Sheet rock	1	1	2	2
Water	0	0	0	2
Total	100	100	100	100

- Impact of upland management on downstream ecosystems (Micro watersheds)

Land use %	Vattappara	Cheenikapara
Dense forest	44	32
Open forest	3	13
Scrub	4	2
Forest plantation	6	0
Rubber	17	17
Mixed plantation	19	28
Bare rock	7	8
Total	100	100

- Impact of upland management on downstream ecosystems (Runoff coefficient)

Month	**Vattappara**	**Cheenikkappara**
June	0.53	0.56
July	0.63	0.67

August	0.57	0.59
September	0.55	0.58
October	0.59	0.61
November	0.54	0.56

- Impact of landuse on the hydrological behaviour of microwatershed in the humid tropics (Land cover change)

Watershed – 1

Land use %	19	19	19
Dense forest	10	84	44
Open forest	0	0	3
Scrub	0	2	4
Monoculture	0	2	23
Mixed plantation	0	9	19
Bare rock	0	3	7
Total	**10**	**10**	**10**

Watershed –2

Land use %	1950	1971	1993
Dense forest	100	62	32
Open forest	0	0	13
Scrub	0	0	2
Monoculture plantation	0	26	17
Mixed plantation	0	8	28
Bare rock	0	4	8
Total	**100**	**100**	**100**

Impact of landuse on the hydrological behaviour of micro-watershed in the humid tropics (Runoff coefficient)

Month	Rainfall (mm)	W1	W2
June	750.6	0.46	0.63
July	1019.4	0.53	0.66
August	255.6	0.67	0.74
September	186.2	0.88	0.96
October	305.26	0.72	0.82

November	266.8	0.48	0.56

N=12, P< 0.10, SE-0.123

We conclude

Causes

- Seasonally high rain fall
- Steep terrain
- Drastic change in land cover and landuse
- Absence of comparable data, low-cost technology, community participation

Consequences

- Floods
- Droughts
- Landslides and soil erosion
- Low water table

Recourse

Integrated watershed development with community participation