

# THE NEHU JOURNAL

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# *The NEHU Journal*

Vol. III, No. 2, July 2005

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# *The NEHU Journal*

Vol. III, No. 2, July 2005

This issue of the journal continues the tradition in general and Meghalaya in particular begun with the article by Dr. Beng S. Kortesom, an anthropologist at Uppsala University, on 'Traditional political institutions' on which much needs to be debated even what has already been done by the London School of Economics professor of North-Eastern Hill University. I think this article feeds the debate further ahead by arguing in favour of the possibility of a new kind of governance based on the wisdom of indigenous people rather than arguing whether or not such governance can be labelled as democratic, liberal or gender-oriented. The article provides one of the latest and most considerate account of the movement of the Khasis towards achieving what the author calls, indigenous governance. Although I am personally a little skeptical about the optimism that abounds in his article, I am indeed happy and proud to have this article in this issue of the journal.

The next article by Prof. A. C. Sinha presents a rare account of the search for 'tribes' in colonial and post-colonial India, and the relevance of this search despite the failure of anthropologists to define what a tribe is or delineate its characteristics without running into serious problem with contemporary data. He shows how the tribes represent a spectrum of social, economic, educational, demographical and technological conditions. He concludes by arguing that this variation may be taken into consideration while de-recognizing some of the tribes in India, which has somehow eluded national politics so far.

In the third article, Prof. Badaphin War draws Anthropology and Linguistics closer than by perhaps anyone earlier by bringing in rich data and deep analysis of Khasi folk titles. The Khasi folk titles show how the community once upon a time (and still depict) individual person-nature on the basis of natural categories. Such titles are not certainly typical of the Khasis, but she reveals the Khasi-ness in them very well, as much as she provides linguistic analyses of the same. It is a pleasure to read the article even if one does not know the Khasi language or has no idea about Linguistics.

**NEHU**

## EDITORIAL

This issue of the journal has a clear focus on the region in general and Meghalaya in particular. It begins with the article by Dr Bengt G. Karlsson, an anthropologist of Uppsala University, on 'traditional political institutions' on which much needs to be debated than what has already been done by the London School of Economics partners at North-Eastern Hill University. I think this article takes the debate further ahead by arguing in favour of the possibility of a new kind of governance based on the wisdom of indigenous people rather than arguing whether or not such governance can be labelled as democratic, liberal or gender-neutral. The article provides one of the latest and most considerate account of the movement of the Khasis towards achieving what the author calls 'indigenous governance'. Although I am personally a little skeptical about the optimism that exudes in his article, I am indeed happy and proud to have this article in this issue of the journal.

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The fourth article is by Dr B. P. Sahu of the Centre for Adult and Continuing Education. And his article on the state of water in Shillong is indeed educative. I think every resident of the city, whether indigenous or not, should read this extremely informative article on water.

The fifth article, written jointly by Prof. B. S. Mipun and Ms. S. Purkayastha, both of whom are Geographers, is equally educative about some of the most important issues of public health in the city, and about how the hospitals and nursing homes themselves have been sources of diseases rather than places where people go for treatment of their diseases. Although based on rather limited data, the article is also revealing about the lack of responsibility that the government, the hospitals, and the civil society have shown by allowing the health institutions of the city to pollute the streams and endanger the life and health of people living downstream. I think the merit of this article lies in drawing our attention to a hitherto ignored but very important consequence of unplanned urbanization.

Finally, there are three book reviews, two by Prof. David Syiemlieh of History Department of this university and one by Dr. S. C. Daniel who retired from this university recently after teaching at the Department of Philosophy for many years.

I hope you enjoy reading them.

**T B Subba**

**Editor**

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## State of Water in Shillong

B. P. SAHU

Oceans cover about three fourths of earth's surface. According to one UN estimate, the total amount of water on earth is about 1400 million cubic kilometres, which is enough to submerge the earth with a layer of 3000 metres depth. However fresh water constitutes a very small proportion of this enormous quantity. About 2.7 percent of the total water available on the earth is fresh water of which about 75.2 percent lies in Polar Regions and another 22.6 percent is present as ground water. The rest is available in lakes, rivers, atmosphere, moisture, soil and vegetation. What is effectively available for consumption and other uses is a small proportion of the quantity available in rivers, lakes and ground water. Worldwide, 69 percent of water is used in agriculture, 23 percent in industry and only 8 percent for domestic purposes. The state owns the water and the hydraulic infrastructure for storing and conveying it through canals, dams, and reservoirs in order to ensure that water becomes available where and when needed. The crisis about water resources development and management thus arises because most of the water is not available for use or it is characterised by highly uneven spatial distribution.

Water on the earth is in motion through the hydrological cycle. The utilisation of water for most of the users, i.e., humans, animals or plants involves movement of water. The dynamic and renewable nature of the water resources and the recurrent need for its utilisation requires that water resources are measured in terms of its flow rates. Thus water resources have two facets. The dynamic resource measured as flow is highly relevant for most of developmental needs. The static or fixed nature of the reserve, involving the quantity of water and the area of water bodies, is also relevant.

India gets approximately 4000 billion cubic meters (BCM) of water every year from all natural sources. Out of this 700 BCM are lost in evapo-

ration and another 700 BCM are lost during the flow on ground. A large part of water, which is approximately 1500 BCM, flows into the sea. The remaining water availability is only 1100 BCM. Out of this ground water recharge accounts for 430 BCM per year and the present utilized surface water is 370 BCM (President's Address at the National Water Convention 2005). The balance unutilized water which may be harnessed is 300 BCM.

Even without the above statistics some individuals recognise the importance of clean drinking water, which is one of life's most precious commodities. It is also understood by few that water, as a commodity, is going to become increasingly scarce in the days to come. The twin subject of its rational use and equitable distribution is going to be even more complicated in the years to come.

The problem of water is global. Nearly half the world's population, mostly in developing countries, suffer from diseases resulting from insufficient or contaminated water. According to WHO, 2000 million people worldwide are at risk from water-borne and food-borne diseases. More than five million children die each year due to water-borne diseases. Therefore, it is imperative that the next major source of tension in the world will be water, not petrol. When pollution of water is increasing, the quantity of water is getting reduced, and the water table is falling steadily there is catastrophe lurking around the corner. Water as a subject touches every one, but it is little understood by most. Everyone has an opinion about water, and when water is concerned it seems emotions and passions dominate rational and scientific thinking.

The trouble with water is that it quickly collects all the murk of human settlement and it pollutes itself in the process. Equally, the state of water in most countries reflects the madness, mismanagement and misgovernance of those countries. People in the hills do not get water and their traditional springs are drying because there has been massive deforestation. In the plains, innumerable wells – traditional sources of drinking water – are losing this precious liquid because of the excessive use of ground water for irrigation.

A country that is using 20-40 percent of available freshwater is said to be suffering from water stress according to the estimates of the United Nations Environment Programme. About one third of the population of the world are living in the countries that are experiencing water stress. As demand for water grows, this figure can rise to two thirds. As world population

is projected to grow from 5.7 billion in 1995 to 9.4 billion in 2050, about 18 percent of the world's population will be in water scarce areas and 24 percent in water stress areas. At present in India, water supply service coverage is to the extent of 75 percent of the population.

### Drinking Water Problem in India

More than 800 million people in South Asia do not have access to adequate sanitation and out of 800 million, 150 million people do not have access to safe water. India's deplorable record with drinking water programmes has stunning figures. In 1972, surveys revealed that there were 1,50,000 drinking water 'problem villages in India'. By 1980, some 94,000 villages were covered and some 56,000 were left uncovered. But the 1980 survey revealed that there were some 23,100 problem villages. Again, by 1994, there were only 70 uncovered villages but the 1994 survey revealed 140,975 problem villages (*Down to Earth*, February 28, 1988). One wonders why this extraordinary discrepancy between government records and information from non-governmental sources? Corruption and incompetence resulting in bad water supply schemes, and excessive exploitation of ground water are some of the possible reasons behind such discrepancy. Although, India is lucky to have a huge quantity of water, theoretically as much as 173 mham, but a lot of it is lost due to evaporation every year. The problem is that the state, instead of the communities and households, has emerged as the sole manager and distributor of this important commodity.

The National Water Policy has assigned the highest priority for drinking water supply needs followed by irrigation, hydropower, navigation and industrial and other uses<sup>10</sup>. It was Rajiv Gandhi who had first given a high profile to drinking water programmes by making it one of the five technology missions, whose progress would be directly reported to him. A reasonably good programme was developed but a part of it soon deteriorated into standard pumps and pipe programmes, which often failed to yield water. With such a complex issue as water, mistakes are inevitable. In the successive five-year plans and the intervening annual plans, efforts have been made to rapidly develop water supply and sanitation systems. In celebration of the "International Drinking Water Supply and Sanitation Decade" the Government of India launched some programmes in April 1981 with a view to achieve 100 percent water supply facilities in rural areas by the end of March 1991. However, due to financial and other constraints, the targets originally set for

the decade were scaled down to 90 percent in the case of urban water supply and 85 percent in the case of rural water supply, and 50 percent in the case of urban sanitation and 5 percent in the case of rural sanitation. As per the policy, provision for drinking water is to be made in all water resource projects. Water development projects have facilities for providing safe water for human consumption. Almost all the projects implemented in the country provide water for domestic purpose although some of the projects were not meant for this purpose.<sup>6</sup> Drinking water requirements of most of the mega cities in India are met from reservoirs of irrigation or multi-purpose schemes existing in nearby areas and even by long distance transfer. For example Delhi gets its drinking water from Tehri Dam and Chennai from Krishna Water through Telugu Ganga project.

The per capita water use in the country has decreased from around 5277 cubic metres in 1955 to 2,466 cubic metres in 1990. Per capita availability of water, which was 6,008 cubic metres in 1947, has fallen to 2,266 cubic metres in 1997. This gives a broad indication of the growing water scarcity in the country since independence and consequently, the serious drought situations year after year in several parts of the country. Of all natural resources, fresh water resources have been exploited the most. For the people, access to water is still dependent on location. Deforestation and changes in land use are major causes of imbalance in the hydrological cycle. Industrial pollution, rapid urbanisation and agricultural runoff have worsened the problem.

Urban centres in India are facing an ironical situation today. On one hand, there is acute water scarcity and, on the other, the streets are often flooded during the monsoons. This has led to serious problems with quality and quantity of ground water. This is despite the fact that most cities receive good rainfall. However, the rainfall occurs during short spells of high intensity. Most of the rain falls in just 100 hours out of 8760 hours in a year. Because of such short duration of heavy rain, most of the rain falling on the surface tends to flow away rapidly leaving very little for recharge of ground water<sup>8</sup>. Most of the traditional water-harvesting systems in cities have been neglected or fallen into disuse, worsening the urban water scenario. One of the solutions to the urban water crisis is harvesting rainwater, i.e., capturing the runoff. This is practised on large scale in cities like Chennai, Bangalore and Delhi where rainwater harvesting is part of the state policy. Elsewhere, countries like Germany, Japan, United States, and Singapore are also harvesting rainwater.

## Water Situation in North-East India

The North-Eastern hilly states stretch over seven Indian states: Assam, Nagaland, Manipur, Mizoram, Tripura and Meghalaya, touching the southern slopes of the Brahmaputra Valley and the northern, eastern and southern slopes of the Barak Valley of Assam. The climate and rainfall vary considerably across the region. Encircled by hills and plateaus, rainfall varies even more than the temperatures do. The average annual rainfall reaches a peak of 13,390 mm in the Cherrapunji-Mawsynram region<sup>12</sup> while the northern slopes of the Brahmaputra Valley receive an annual average rainfall of 2,500 mm, the area south of the valley and the northern part of Meghalaya receive an annual rainfall of about 2,000 mm.<sup>5</sup>

The water resource potential of the region is the largest in the entire country. Given its heavy rainfall, it has also abundant groundwater resources. But only a small part of the region has been studied to estimate the ground water potential. The maximum scope for development of ground water exists in Assam, Arunachal Pradesh and Tripura. The available surface water resources have hardly been tapped because of the rugged nature of the terrain.

## Profile of the Present Study Area

Shillong, the capital of Meghalaya, lies on the eastern part of the state. Perched at an altitude of 1520 metres above sea level, the city stretches for about 6 kilometres on an elevated tract. It is situated on a plateau bound on the north by the *Umiam* gorge, on the northwest by the great mass of the *Diengiei* hills that rise up to a height of 1823 metres above sea level, and on the northeast by the hills of Assam. The *Umshyrpi* and the *Umkhrah* rivers, which finally merge and form the *Umiam* River is the source of water. The city has an area of 10.36 sq. kilometres having a population of 2,68,000. But as per AUS Aid project the population is estimated to be 450 thousand. The mean annual rainfall in Shillong is 2,954 mm.

The catchment area of the city spreads over 220 square kilometres including the adjoining areas. The topography of its catchment area is hilly with deep gorges and ravines. A vast tract of the catchment area is open with grass, broomsticks and occasional patches of ground-cover comprising "lower storey" vegetation, while the other parts are covered with open and

degraded forests. There are multiple networks of seasonal and perennial streams including rivulets running through the catchment areas. During summer, these streams are flooded and they discharge into the *Umkhrah* or the *Umshyrpi*, originating from the higher ridges of the Shillong plateau. These streams and rivulets can also be used for traditional water harvesting systems. Meghalaya has 5600 kms of river length and canals, 0.0008 lakh sq. kms of reservoirs, and 0.0002 lakh sq. kms under tanks and ponds.

### Present Water Situation in Shillong

In the month of March, discussions in Shillong revolve around one word - water. At this point of time water supply becomes a burning issue. The water shortage has become a chronic phenomenon over a period of time. Scientific management of water is not a priority of the government. An indicator of this is the number of tankers making rounds, traversing length and breadth of the city in the times of water crisis. Queues for water are a common sight. Poor people gather at water points to collect water, watermen are seen carrying water in small tins, and coarsely made four wheelers to suit the purpose of carrying water causing phenomenal noise pollution is also seen on the roads. The water boys often have monthly contracts with different households and food centres in the city including hotels. Each tin of water is sold at Rs.5. City dwellers grumble about the incompetence of the government to provide clean and potable water. The city as a whole faces an ironical situation due to acute water crisis. The better-off urban residents enjoy access to cheap municipal water, or have their private access to water sources, and the poor are forced to take recourse to expensive private water vendors. Households which purchase water from private vendors pay two to six times more per month on an average for one tenth as much water, than households with municipal connections. Lack of water is a serious issue not only in Shillong, but also in other Indian cities. In Shillong it is not the lack of water, it is the poor distribution system, which is the cause of serious concern. Today the urban agglomerates suffer from chronic inefficiencies, including unreliable water quality and limited supply.

At present the PHE department of the government of Meghalaya supplies 70 gallons of water every day. The task of distributing water lies with the municipal board. The PHE department pumps water from the Mawphlang treatment plant and supplies it through a stretch of 22 kilometres. The present arrangement of pumping water is conducted through service-

able pumps from the reservoir created by the dam constructed across the river *Umtrew*. The dam is expected to take care of the dry months of the year and improve the gap between demand and supply. The water is distributed through a number of zonal reservoirs located at various places within the greater Shillong area. The entire area has been divided into ten zones. The PHE has targeted to supply 113 gallons of water per day by 2005.

The other side of the story about Shillong water problem is that people in the city take water for granted. Even in dry months water is seen flowing everywhere, from the open taps, from the broken pipes, and from the huge pipes in community washing areas. The city people have not learnt to respect water as a scarce commodity. They do not seem to realise that today clean water, clean air and clean drinking water come at a price<sup>4</sup>.

### **Shillong Water Supply Project with Australian Assistance**

The Government of Meghalaya is already in the process of executing the Shillong Urban Water Supply and Environmental Sanitation Project (SUWESP) with Australian assistance of 58 *lakh* Australian dollars in the first phase. The total assistance is to the tune of Rs.60 crore for the project. The project started with the construction of mass gravity dam across the river Umiew. The scheme was started by the state government from the State Plan Resource and by raising LIC loans. The intake structure of the Greater Shillong Water Supply Project and the approach bridge have been completed. The approach bridge carries the delivery size of 2 x 600 mm. The second phase of the project is to be completed in 42 months and 120 *lakh* Australian dollars were earmarked for it. The aim of the project was to develop and demonstrate sustainable strategies for urban water supply, sanitation, drainage, and solid waste management. Constructing small pilot projects in identified areas and preparing a detailed project report enabling the state government to seek external assistance from the World Bank, Asian Development Bank and other similar international institutions were also the aims of the project. The PHE and Urban Affairs Department would be the nodal departments to implement the project. The department of the state would assist in project implementation, and the chief secretary along with the planning and finance departments would oversee, monitor, and evaluate the scheme.

The project commenced in the United Nations International Year of Fresh water, and would be executed by Kellogg Brown and Root Pvt. Ltd, in partnership with the Meghalaya Government. It would facilitate water sec-

tor reform and improve services to poor and vulnerable communities. By improving basic services like water and sanitation, Australia is helping lay the ground work for ensuring that the poor can improve their economic prospects and participate more fully in society. Further the project would develop sustainable approaches to water use for the benefit of future generations and enhance the efficiency, management, delivery of water supply and sanitation to the urban residents. It would strengthen urban water sector reform process, and demonstrate that continuous, efficient and sustainable water service provision can be achieved. The project will serve as a stepping stone to further encourage reform at the state level. A successful project implementation should open the door to widespread and quicker reform. The strategic initiative will help urban public health and water sanitation services and make much policy and institutional reforms, and harness the skills of local NGOs and other stakeholders to develop better water supply, sanitation and sewage services, support key water-governance reform, strengthening local authority capabilities through institutional reforms, improve community awareness and education, improve water supply, sewage and solid waste services.

The project has two main components. The first one emphasises on technical assistance sector reform and the second one lays stress on follow-up investment projects and physical investments to improve bulk water supplies and demonstrate the feasibility of continuous and safe water supply. In addition to focussing on statewide water policy framework, the technical assistance component will also focus on a business model for increasing private sector participation in service provisions. The investment component will improve quantity of water provision and attain continuous service. The project is also expected to generate benefits in improved institutional performance, both with respect to the operation and maintenance of water supply and services, and general municipal administration.

It is envisaged that the benefits of water sector reform will help in uninterrupted water supply to the city and the people will have direct access to quality water and sanitation services. Further they have to pay much less than the current rate, which is 40-70 times higher than public tariffs for water. The consulting NGOs' effort would establish a sustainable sector-wise strategy that can be replicated across the entire state, benefiting urban residents with clean, affordable and continuous water supply.

The Greater Shillong Town has been segregated into 10 zones. The surveillance group (five groups) called Quick Response Team headed by an Executive Magistrate would move around these ten zones to ensure ad-

equate and uninterrupted water supply everyday. The work of each team is to move in allocated areas and inspect every locality with the help of headman and the secretary of the locality. In case of shortage of water, a complaint is registered at the control room in the Deputy Commissioner's office for speedy redressal of the grievance. Much of the responsibility lies with the headman of the locality who can inform the team leader in case there is any shortage of drinking water.

A total lack of participation and interest in government projects is a significant factor in Shillong. Almost all instances highlight mass apathy. The state subsidises water, but the people squander it without a thought. Then the state runs out of money for new projects or for maintaining the existing new ones. The state then becomes water scarce; arranging water supplies for the masses becomes progressively bigger challenge. Yet, the people never realise that water is a scarce resource, although they continue to face the crisis. It is ridiculous that Meghalaya receives so much of rain throughout the year that it can keep a modern aircraft carrier afloat and yet faces water crisis. Lack of awareness, involvement and education coupled with complacency and apathy are forcing Shillong to remain dry for many months each year.

### Critical Appraisal of the Greater Shillong Water Project

The objective of Shillong water project is to provide adequate infrastructure in promoting water sector growth in private sector. If successful, it would help in keeping populated areas clean, have better hygiene and improve sanitation. It would also help in improving the health of people by way of proper treatment of water, thereby bringing down the incidence of typhoid, cholera, diarrhoea, malaria, filariasis, shistosomiasis and other such communicable and infectious diseases. But several questions are still not answered: Will the government and the Australian agencies be able to deliver water in required quantity and in potable form? Will the project really bring down the water prices by 30-70 times of the present rate? Are the people of Shillong ready for privatisation of water, especially where traditionally they have been enjoying it as free gift of nature? Who is the "owner" of the water that is being privatised? Was the Central or state government not competent to provide the service that is being provided by an outside agency? Was the opinion of the people taken on privatisation of water supply? How will the government repay the loan? Can it generate the loan amount from water supply?

Table 1. Daily Water Supply in Shillong (in MGD) - Million Gallon per day

Date April 2004	Total Water Supply Received (Excluding wastage as per meter reading)	Quantity released from the reservoir at Mawphlang	Loss during transition as wastage
1-4-04	4.10 MG	7.44 MG	3.34 MG
2-4-04	4.66 MG	7.49 MG	2.83 MG
3-4-04	4.56 MG	6.64 MG	2.08 MG
4-4-04	3.99 MG	7.35 MG	3.36 MG
5-4-04	4.40 MG	7.33 MG	2.93 MG
6-4-04	4.42 MG	6.91 MG	2.49 MG
7-4-04	5.42 MG	7.44 MG	2.02 MG
8-4-04	3.73 MG	7.13 MG	3.40 MG
9-4-04	5.05 MG	7.20 MG	2.15 MG
10-4-04	4.48 MG	7.20 MG	2.72 MG
Ten days (total)	44.81 MG	79.46 MG	34.65 MG

Source: *Shillong Municipality, April 2004.*

The above table shows the status of daily water supply in Shillong over a period of 10 days during the month of April 2004. The data reveals that 79.46 MG of water is released from the reservoir at Mawphlang and the total amount of water supply received is 44.81 MG. The loss during the transition is to the extent of 34.65 MG over a period of 10 days. If calculated on monthly basis the average loss is to the tune of 103.95 MG and over a one-year period it comes to 1247.4 MG, which is sufficient to cater to 40 percent of the present population of Shillong.

It was the colonial state that centralised control over water resources. The independent state inherited this, and continued with it. As a consequence, the state took upon itself the role of being the sole provider of water. This led to communities and households being no longer the primary agents of water. This also led to a decline in management of rainwater. In its place, there came a growing reliance on surface water, primarily rivers and ground water. Today the people are dependent upon the state for water. This is a problem of which solutions can only be provided by experts.

In Shillong there should have been no water crisis at all. Water is everywhere waiting to be tapped. There are many natural water springs discharging about 60,000 to 1,00,000 litres per night, but there seems to be no

plan to tap and make use of this very precious source of water. As a result, most of the water literally goes down the drain. There is a need for retention of water through proper watershed management. But long term plans depend on how the people can be motivated to consent to building small dams and reservoirs.

The people of Meghalaya had a glorious tradition of managing and harvesting water. They used tanks to store rainwater and produced intricate systems based on the use of check dams, ponds and storage structures to manage the local watershed. The best thing would therefore be to revive the traditional knowledge of water-harvesting to effectively tap the local springs and small rivers, with check dams from where the water simply need to be pumped and supplied equitably by locally instituted community management systems with the help of village administrative institutions called *Rangbah Shnongs*.

Community participation in the present water supply project of Shillong is almost zero. The state agencies are merely engineering bodies, who neither understand the local social issues involved, nor the needs of the people. The community has the right to know the details of the scheme including the utilisation of the funds and the technical details of the scheme. But after a project is sanctioned, the work is usually handed over to the contractors. Social issues and community participation figure at the bottom end of the contractors' priorities. The people give up their own efforts when they see the government doing all the work. It is time to shift this responsibility to the people, so that they can manage it better with the help of their traditional knowledge.

There are innumerable faulty water projects in India. The government of Meghalaya must realise that if they want the project to succeed, things have to change. More crucially, community participation<sup>2</sup> is one of the most important elements the policy makers need to address. There is need to adopt supply-driven approach instead of the existing demand-driven approach. Management of water is really a question of good governance, which includes establishment of varied institutions from the state to the community level, proper pricing, transparency, accountability, strict regulation, integrated economy, and comprehensive environment management, appropriate choice of technology, good research, data collection and mass education.

## Problems of Shillong Water Supply

The following are the most common problems of water supply in Shillong:

1. At numerous points there are unauthorised or illegal tap connections.
2. The poor quality of pipes leads to leakage and contamination of water. The pipes are often not replaced even when it is damaged.
3. There is run-off sewage in open places and sewage is discharged directly into the drains. All of these lead to serious public health concerns, pose environmental hazards and portray a poor public image.
4. The supply pipes get blocked with silt and are prone to frequent bursts and leaks.
5. Water monitoring facilities are either non-existent or at absolute infancy.
6. There are no legislations to form water-user cooperative societies in Meghalaya. User associations can play a crucial role acting as substitute for formal legal action and serving as pressure groups to enhance efficiency of the bureaucracy.
7. The ecological aspect of it includes:
  - Unplanned development, including rampant unscientific sand mining and quarrying.
  - Lack of efforts to make artificial ponds and tanks to preserve water.
  - The increase in population leading to diverse land utilisation and destruction of forests.
  - Widespread shifting cultivation, without any regard to land, soil and water conservation in catchment areas.
  - Deforestation for commercial, pastoral and agro-economic activities.
  - Forest fire for shifting cultivation purposes.
  - No rainwater-harvesting structures.

## Watershed Management

A watershed is an area with a uniform drainage pattern. In other words it is the land area from where water drains into a given section of the river. Depending on the length of the section, it could be as large as the entire

Indo-Gangetic plains or as small as a village<sup>1</sup>. Selecting a watershed as a unit assures the sustainable flow of water to an area provided the people are empowered at the local level to manage their resources. It can help to solve the problem of water to some extent. What is needed is a composite watershed blue print, with plans to have rainwater-harvesting schemes. With additional water harvesting structures, Shillong may see a return to the days of plentiful water.

### **Reviving Rainwater-Harvesting Traditions**

Rainwater harvesting essentially means establishing relationship between the people and their environment. It also means enabling the people to use water judiciously and empowering communities to manage their own affairs<sup>3</sup>. Today what Shillong needs is a revitalisation of all its ancient traditions of water harvesting. The people who practised water harvesting in ancient times knew that if they did not catch water where it fell, they would be left with no water later<sup>13</sup>. It is also necessary to make rainwater-harvesting mandatory for all new constructions.

The source of all water is rain. River water, water in lakes, ponds and wells, water that seeps into the ground, tap water and even the bottled water, are all products of the rain water. When we harvest rainwater, there is no requirement to construct the dam across a river and block its natural flow, building canals or laying kilometres of pipeline at the cost of state exchequer. In India we get about 100 hours of rainfall in a year. This 100-hour of rainfall needs to be caught, stored, and used over 8660 hours that make up the entire year. So it is essential to catch the water where it falls<sup>11</sup>. For this we need to create water-harvesting structures. These structures need to be eco-region specific according to the type of need of the people staying in a region. It should also be according to the indigenous knowledge system existing in the community and local wisdom, but scientific and based upon participation of the community for better local water management. A little bit of water arithmetic helps in having a scientific structure.

Water harvesting means collecting the water when rain falls on the ground or before it falls on the ground. It may be on roof-top, in the garden, driveway, pathway, in the backyard, storm water drains, roads or pavements, where ever. The idea is to channelise this water into some storing place which could either be an external storage device like a tank or an underground pit. In places like Meghalaya, which get rainfall throughout the year

barring the dry spell, external storage is preferred.

The amount of water that can be captured depends on the rainfall per day, roof-top size and plot size. The volume of water that can be captured is the product of the roof top area or plot area and mm of rainfall received. This amount when multiplied by the run-off coefficient (taking into consideration the gradient of the place and the amount of rainfall) determines the amount of water that actually flows. Sharper the gradient more is the water flow in that direction. Thus, we have:

$$\text{Water harvested} = \text{Rainfall (mm)} \times \text{Area of catchment} \times \text{Runoff coefficient}$$

For harvesting water we require pipes - PVC or galvanized iron, mesh or a sand filter, a sump, and aquifer for receiving the water. It could be a dug well, tube well, a recharge well or simply a recharge pit. Installing a water harvesting system in a building would cost between Rs 2,000 to 30,000 for buildings of about 300 sq. m. This estimate is provided by the Delhi-based Centre for Science and Environment.

The need to harvest water is manifold. With no solution in sight to augment water, the only option is to capture rainwater where it falls. This also makes ecological, financial, and political sense while promoting community<sup>7</sup> and household based water-harvesting systems. Rainwater harvesting is an advanced, ecologically safe and permanent water operating system. Water so harvested can be used for toilet, gardening, and even washing of clothes. For an effective water harvesting, supply and distribution system with an institutional approach is required, where residents are empowered to manage their own affairs with the state playing a supportive role.

### **Intervention Strategy**

1. The PWD should publish a series of leaflets under a scheme tentatively entitled ‘the new water ethics’ to make the average citizen aware of the nature of problem.
2. The price mechanism of domestic water supply should be such that it should fix the responsibility upon each individual to judiciously use water.
3. The public should be made conscious to adopt low flow toilet cisterns in the houses.

4. The government should make sewage connections compulsory in every building.
5. The technocrats should provide technical know-how to the people to adopt efficient rooftop harvesting structures. The harvested water from rooftops can be stored in underground water tanks. The excess of water can be used to recharge dug and bore wells.
6. There is a need to take up water literacy programmes to make people realise the importance of conserving water. The government and NGOs must undertake campaigns to create awareness among users on the importance of water-harvesting and diverse technology that can be used.
7. There is need to motivate the residents, with a series of community level meetings and awareness-building workshops with emphasis on women's participation in planning and management of drinking water. The communities need to plan projects with a focus on the use of rainwater and building up the local capacity.
8. Local eco-parks can also be made to harvest water.
9. Demonstrate water harvesting structures in the form of prototype models to the people.
10. The people may be provided with the technical know-how of storing water underground for their gardens.
11. And lastly the emphasis should be on strengthening the institutional structures for distribution, supply and availability of water.

## Conclusion

Technology cannot increase the water content of the rivers, but it can improve harnessing and conservation techniques so as to make water available for every individual. Water crisis is an ecological issue with commercial causes but no market solution<sup>9</sup>. The capacity to harness water depends entirely on the technological and economic strength of a society. The adoption of modern technologies for storage considerably increases the potential for utilizing the water available in nature. There is also urgency for remedial and preventive measures to save the catchment area. The approach has to be multi-pronged encompassing both short-term and long term strategies. It should include administration and enactment of relevant legislations, irrespective of

the ownership of land, for ecological survival of the catchment areas. There is no substitute for well-established ground vegetation and all other measures are just incidental. The role of forests in controlling soil erosion cannot be denied. So there is immediate requirement of adopting viable technology for saving the catchment areas. Engineering structures also need to be established as ancillary measures. The government should go for resource mapping of water assets, present status of utilization, quantum of utilisation, etc. Drainage maps must be done for identifying major runoff flows, drainage outlets, watercourse, infiltration and percolation characteristic of the soil. Thematic maps can help to evolve specific technical guidelines for innovations and experimentations. Social mapping is also needed for the people who are users. Development of the community should take place in its own natural environment and through active participation of the people. Where possible bunds can be built and the hilly and uneven lands may be fenced. Contours can also be carved on the slopes to hold the rainwater. Check dams can be constructed across the streams, which can further be connected to small cement tanks for steady water supply. The need of the hour is to have composite water-shed blue prints, with plans to have rainwater-harvesting schemes. This is the first step towards building the local capacity of the people for management of their own water resources. The issues to be sorted out are clear and enforceable water user-rights, safe drinking water, decentralized delivery, privatization, and pricing of water.

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Shillong is a city with a population of about 1.5 million. It is a rapidly growing urban centre with a large number of people moving in from rural areas. The growth of urban areas has led to a significant increase in the demand for medical services, especially in the field of health care facilities. There are six governmental hospitals and five private hospitals, two government dispensaries, and three private nursing homes in Shillong Urban Agglomeration, which are all located near or within residential and commercial areas. Besides there are various pathological clinics and private chambers, which too are located in such highly populated areas. While there is need for more medical services there are serious problems of biomedical waste management and disposal of the waste generated by present hospitals and nursing homes located in Shillong leading to serious threats to public health in the city.

Different categories of hospital waste require different modes of storage, treatment, segregation, handling and disposal, as per the guidelines provided by the Ministry of Environment and Forest, Government of India under the notification on Bio-medical Waste (Management and Handling) Rules 1998. But those guidelines have been ignored in Shillong. The changing scenario in health care centres, increase in the use of antibiotics, cytotoxic drugs, use of radioactive agents and radioactive substances are a major concern for public health in and around the city. This has been further endangered due to unscientific waste management practices like discharge of untreated hospital wastes, including chemical discharges, into the streams of the area, which results in severe water pollution in the surrounding areas.

## *Book Reviews*

**Reverend Robert Evans, *The Great Earthquake of 1897 in the Khasi-Jaintia Hills*, translated by Basil Morris, NEHU Publications, Shillong, 2003, pp. xvii-40, Rs. 95.**

The earthquake of 12 June 1987 struck shortly after 5 pm. It is believed that this was the most devastating earthquake to have struck these parts of the country in recorded history. Its epicentre in all probability was somewhere in the Khasi hills. So calamitous were the tremors, so devastating the effects it had on the land with hundreds of deaths resulting from its intensity, that it has been called the "great earthquake". The Richter scale was not in operation then, but descriptions of the severity of the tremors give us the impression that it was intense, "Category A" in the parlance of the time. Natural calamities such as this have left their imprint in human memory. Many Khasis who experienced the disaster calculated their age and those of their children using the date of the earthquake as a reference. A new and safer form of house construction "the Assam type," became preferred to the earlier stone structures introduced by the colonial regime after that earthquake. So marked was the imprint of this great earthquake that exactly a hundred years after it struck, the people of Shillong, if not elsewhere in the Khasi hills too, were gripped with the fear of another devastation, as if natural calamities return at the centenary!

The paperback booklet under review is a translation of an account of the great earthquake written by Reverend Robert Evans, a missionary of the Welsh Calvinistic Methodist Presbyterian Mission in the Khasi Hills - 1878-1901. Written in Welsh and published soon after the incident it describes, the account has gone unnoticed outside Welsh church circles till the translation of it into English by Basil Morris. The introduction to the translated publication and the translator's note provides an account of how Morris got interested in locating the original text and getting it translated for publication by the North-Eastern Hill University Publications. The account has seven very short chapters. The first "God and Earthquake" gives a Christian perception of why natural calamities strike. The second chapter will be of more interest to the lay person, as it gives an account of previous earthquakes in the region. One would have hoped the third chapter to have gone into the details of what occurred that fateful late afternoon. This is a disappointment as it gives

a very sketchy account of the disaster. The next chapter narrates the natural effects of the incident while the fifth section provides the spiritual effects in its aftermath. An interesting section in the last but one chapter contains the experiences of several witnesses of the earthquake. The last chapter provides events connected with the natural disaster, particularly the devastation of Shella village on the south face of the Khasi hills.

To those familiar with the accounts of the 12 July 1897 earthquake, this booklet is a welcome addition to the existing literature on the subject. However there is nothing very significant of the account it attempts to recapture. Much more details are found in the official report of the earthquake published by the Government of Assam. Other Catholic and Presbyterian missionary accounts have been written with more empathy for those affected than the tribulation of god as Robert Evans projects. Another interesting and more humane account but little used source is the diary of Hajom Kissor, the founder of the Unitarian Church in the Khasi-Jaintia hills. In part it will be this stiff evangelical portrayal of the cause and effect of the earthquake which will deter its use as a more reliable account of the quake.

David R. Syiemlieh

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**Vehicles of Grace and Hope: Welsh Missionaries in India 1800-1970**, edited by D. Ben Rees, William Carey Library, no place of publication stated, 2002, no price indicated, pp. iv, 259, paperback edition.

The last of the Welsh Presbyterian missionaries left the Khasi-Jaintia Hills in 1969 following the decision of the Government of India that all foreign missionaries leave the region. Though the missionaries who laboured in these parts of the country have periodically returned and their church leaders continued the connection, it was wearing thin until interest was sparked with the television programme and publication of Nigel Jenkin's *Gwalia in Khasia* in 1995. Since then the exchange between Wales and the Khasi-Jaintia Hills, "their biggest overseas venture" has grown in a variety of ways. One way has been the publication of literature in Welsh, English and Khasi on the connection.

D. Ben Rees' edited work under review is a welcome addition to the literature on the subject. A minister of the Presbyterian Church of Wales, he has researched and written widely on the Welsh missions to the Indian sub-continent. With the support of other church persons he has been able to present a ready reckoner on each of the missionaries who came to India under the Welsh Presbyterian Foreign Mission, as it was then called, the Baptist Missionary Society and the London Missionary Society and some independent missionaries. The volume was compiled for three reasons: his response and reaction to some Welsh TV programmes on the missionary work in North East India; that the work should be ecumenical in nature to include the efforts of denominations other than the Welsh Presbyterians; and to include those who kept the witness in Wales as far as India was concerned.

India, according to the editor, has been in the psyche of the Welsh since the 18<sup>th</sup> century. This comes out very clearly in the sheer number of their missionaries, among other, who came to India. The biographical accounts of the missionaries are arranged in alphabetical order with large sections given to the more common of Welsh surnames, the Evans, Jones, Williams and Thomas. The name of the authors of the sketches is indicated below the list of references used for drawing up the life of these Welsh missionaries to India. There are entries too on the missionary societies, the presbyteries, some of the larger churches and their mission fields.

The author has however not given much attention to the role the Khasis and Mizos played in the growth of the church in these hills. There are entries on only a few of their pastors and church elders which makes me think that in time it would be a useful exercise were someone to focus attention on the "native". Apparently the author and his collaborators were not in touch with persons in their former mission field. This has resulted in a number of errors in spelling of names of persons and places. The photograph on the front cover which is the only photograph used, shows the last of the Welsh missionaries in the Khasi hills with church elder. (The note at their front piece wrongly indicates that the missionaries were with students of the Khasi-Jaintia hills.)

Church historians, missiologists, persons linked with the ongoing

programmes of the churches in North East India which trace their origins to the Welsh Missions, and readers in Wales are sure to find Ben Rees' *Vehicles of Grace* a useful text.

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**Anil K. Rajvanshi, *Nature of Human Thought: Essays on Mind, Matter, Spirituality and Technology*, Nimbkar Agricultural Research Institute, Phaltan, 2005, Rs.100/-.**

In *Nature of Human Thought*, Anil K. Rajvanshi explores the nature of human thought. He hopes to add to the already existing enormous amount of knowledge on this exciting subject. He believes that remarkable phenomena occur due to the interaction of human thought and material surroundings. He argues that since human thought is produced by brain, it must be physical in nature. Therefore, he comes to the rather uncommon conclusion that human thought is controlled by scientific laws. What are these scientific laws? Finding an answer to this significant question is the avowed purpose of writing this book. An ingenious conceptual framework is proposed by the author to show the intimate relation between deep thought, space, time, matter and universal consciousness. He makes use of the latest brain research and cosmology. He admits that his ideas are conjectural. He is not deterred by this since he believes: "The black magic of today is often the science of tomorrow".

The author has arranged his essays under three sections, namely: basic theme, deep thought and more, and spirituality, technology and sustainability. The first section contains the philosophy of human thought and its interaction with matter, and also the interrelationship of time, space and universal consciousness. It deals with the concept of death and reincarnation, which never fails to arouse the curiosity of people. The second section deals with the fruition of deep thought, while the third with spirituality and technology, which are considered to be effective tools of sustainability. The first section consists of five interrelated essays, while the second and third

sections consist of seven essays each, which take up certain individual issues.

The author bases his thoughts on Patanjali's *Yoga Darshan*, which he considers to be a definitive and scientific writing on the control of human thought.

The author has his own definition of spirituality. He says: "Spirituality is nothing else but understanding ourselves and the laws of universe through the tools of science and technology". (p.59). I have serious difficulties in accepting this 'scientific' definition of spirituality. It seems to me to be completely one-sided, ignoring deliberately the crucial religious dimension of spirituality.

But the topics dealt in this book are not only interesting, but also contemporary. It is extremely readable. It is written in simple and straightforward style. The Sanskrit words and scientific terms are made understandable by giving their meanings in English and simple explanations. The drawings go a long way in making one understand complicated scientific notions. Notes and references are elaborate and very useful. The author's sense of honesty and integrity is exhibited clearly, when he talks about himself with candour. Some of his experiences seem to be surreal. He has a wonderful gift for telling stories. His careful observations, recommendations to school children, suggestions and conclusions are worth considering, especially his recommendation to the students of professional courses. He says very insightfully: "There is a general tendency among students of professional courses to give a step-motherly treatment to humanities but I believe study of such subjects gives one a well-rounded education. Hence I feel that humanities should form a compulsory part of the curriculum in all professional colleges" (p. 85). The author tries to practise what he preaches. There is a certain charm and directness about this book.

Anil K. Rajvanshi has a degree in mechanical engineering from IIT, Kanpur and a PhD from the University of Florida, USA. He has been doing research in the areas of renewable energy, rural and sustainable development and spirituality. It is no wonder that he has been attracted strongly by Mahatma Gandhi and his "experiments with truth" since he was a devoted adherent of sustainable living. His essay on "Mahatma Gandhi, A votary of sustainable living" is worth reading for its clarity, strength and conviction.

The author ends his preface to the book by wishing "Happy reading and thinking". I wish the same for the future readers of this book. I hope that

many such readable and knowledgeable books will come out of the 'stable' of this young scientific thinker of modern era. This book is available from Nimbkar Agricultural Research Institute, Phaltan-Lonand Road, P.O. Box 44. Phaltan-415523, Maharashtra, India.

S.C. Daniel

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