

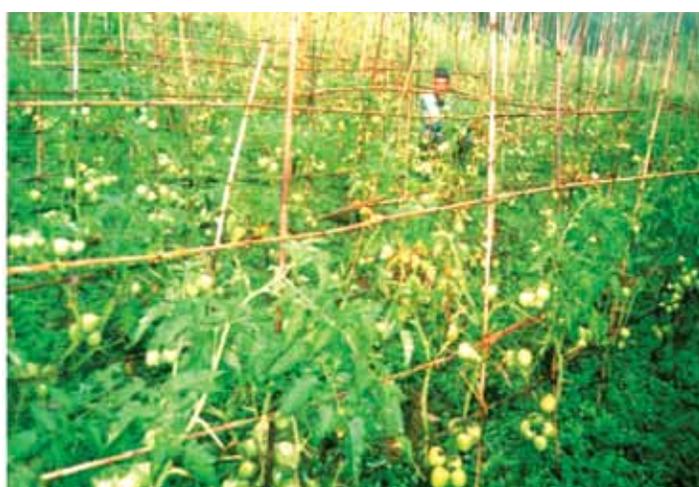
# CLIMATE CHANGE INITIATIVES IN SIKKIM

Sandeep Tambe and M. L. Arrawatia

The Government of Sikkim has been sensitive to this emerging threat of climate change and proactive steps are already underway to mainstream climate change adaptation in the development planning of the State. Scientific studies, adaptation programs, multi-sectoral institutional mechanisms and village consultations have been organized to better understand and tackle this threat. These ongoing initiatives compiled from various departments are presented here.

## 1. Strengthening the rural water storage infrastructure

Building household, community and village level storage tanks to strengthen the water storage infrastructure. The farmers innovatively utilize these storage tanks by harnessing the flow of springs during night time (which was earlier going waste) to fill up these tanks, which is used during day time for domestic use as well as minor irrigation of kitchen garden, green house crops etc. The discharge of existing spring water during night time which was earlier unutilized, is now being used efficiently by storing it for diversified use during daytime.



Household level water storage tanks and livelihood outcomes



Community level water storage tanks



Community level water storage tanks

## 2. Rejuvenating dried up lakes

In mountain terrain, lakes play an important role in naturally recharging ground water. Reviving dried up lakes by improving their catchment, de-silting to enhance their water holding capacity and piping water from a perennial source has been initiated. Healthy lakes translate to adequate ground water recharge which in turn supplements the dry-period discharge (base-flow) of springs and streams located downstream.

**2008**



**2011**



Nagi lake in Namthang, South Sikkim

**2008**



**2011**



Deythang lake in Ravangla, South Sikkim

**2008**



**2011**



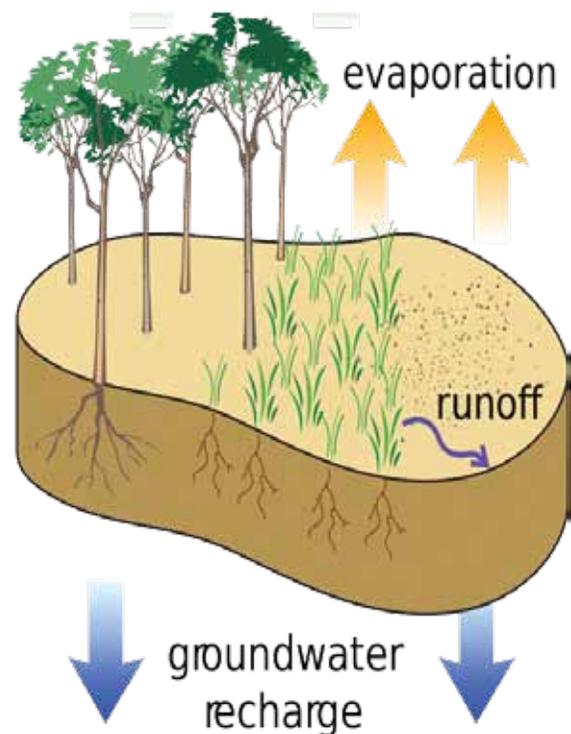
Dolling lake in Barfung, South Sikkim



Protection of Karthok lake in Yuksam, West Sikkim

### 3. Enhancing the dry period base-flow of streams by developing their hill top catchments

The natural ground water recharge in mountain areas is only 10 per cent. In spite of adequate rainfall, most of it just flows away as surface runoff due to steep terrain causing soil erosion, landslides and floods. Reviving the dry season discharge of streams by taking up artificial recharge works in their upper catchments to increase their base-flow during the dry season has been initiated. The upper catchments of critical streams in drought prone areas like Rolu, Seti, Reshi and Rohtak in south and West Sikkim have been developed to enhance the natural ground water recharge.

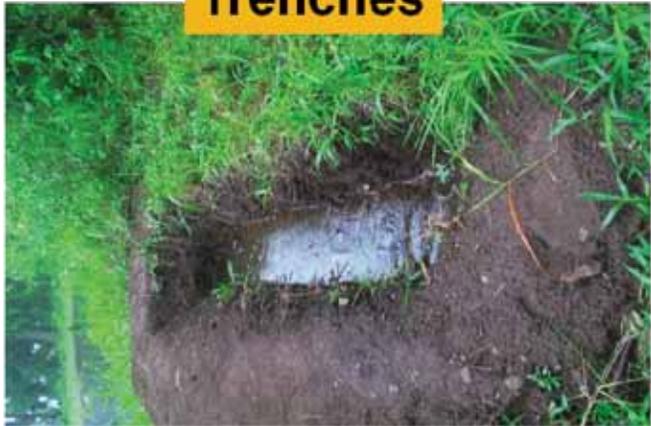




**Trenches**



**Ponds**



Ground water recharge works on sloping lands to enhance the infiltration of rainwater

#### **4. Establishment of livelihood schools for training and placement of youth**

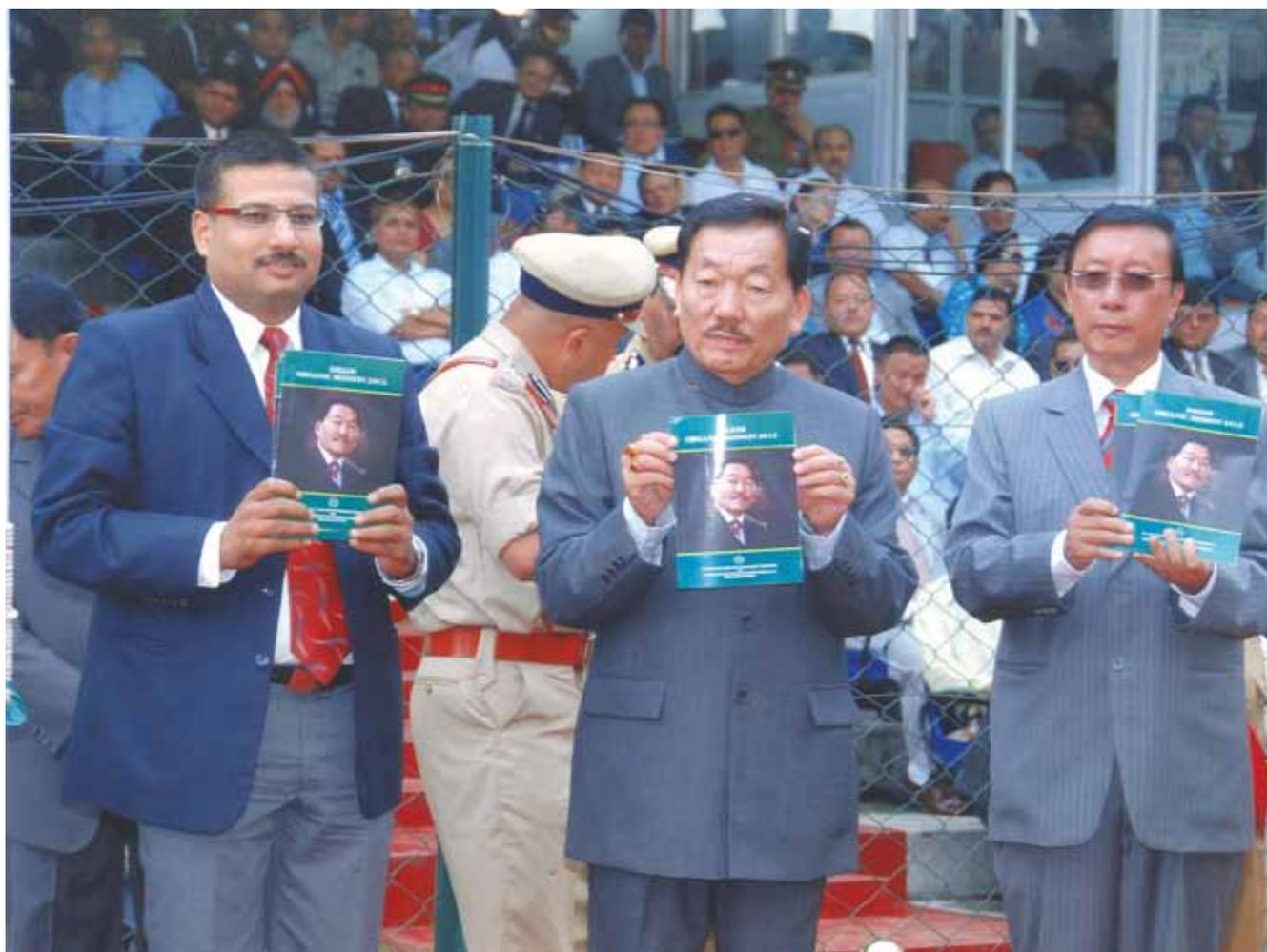
With rising costs of inputs for agriculture, fragmentation of land and growing literacy, the youth of the state aspire for service sector jobs and self employment. This sector is relatively more climate resilient compared to traditional rain-fed farming. Hence in the year 2009, the Government of Sikkim established the State Institute of Capacity Building <[www.sicb-sikkim.org](http://www.sicb-sikkim.org)> in South Sikkim to help aspiring unemployed youth to develop skills in upcoming and traditional sectors so that they can positively engage with the labour market and get gainfully employed. This Institution is an apex training institution and has a network of 30 livelihood schools operating in various parts of the State. These livelihood schools provide skill development training to youth in 55 disciplines according to their educational qualification and personal capacity. These training and placement programs and self employment initiatives have helped in building the capacity of the rural youth in the service sector and ensured their placement thereby generating climate change resistant livelihoods for the rural youth.



The trainees of Syari Livelihood School after their placement in various companies

## 5. Sikkim Organic Mission

The seeds of Sikkim Organic Mission were sown in 2003 when the Government declared the state as Organic in line with the vision of the Chief Minister for achieving a total organic Sikkim by the year 2015. A three-day national level workshop involving all the leading contributors in the organic movement of the country held during year 2009 provided an important platform from where the activities of Mission took off in the present direction.



Launch of Sikkim Organic Mission 2015

The workshop culminated in a detailed Road Map for converting 58,000 ha of the State into organic in a three years phased manner. Since 8,000 ha area was already certified under various projects, the targets set were 18,000 ha each in the first two years and 14,000 ha in the final year 2013 which would ensure complete organic certification of 58,000 ha, making Sikkim the only fully organic state in the country. This has helped Sikkim find a place in the Global Organic Map and likewise, enquiries for different local produce has been coming from across the world.

To undertake this, Sikkim Organic Mission was formally launched on August 15, 2010 by Shri Pawan Chamling, Chief Minister of Sikkim. Ten Service Providers were given the mandate of developing Internal Control System (ICS) for Organic Certification and covered 18,242 ha in the first year covering 14,234 households who have already been issued First Year Conversion Certificates. 20,500 ha area has been allotted to 13 Service Providers in the second year. Three Certification Agencies were selected for the first phase and five for the second phase. As incentives for adoption of organic farming, all registered farmers in the first year have been allocated Rural or Vermi Compost pits to augment the production of on-farm organic manure.



Vermi compost hatchery



Rural compost pit cum urine pit

Three livelihood schools have been opened at Daramdin, Bermiok and Tadong to impart three months training to educated unemployed youths of Sikkim to meet the required manpower for Internal Control System. Two batches have completed training so far. Out of the total 516 students enrolled 460 have passed out and 436 have already been engaged by the Service Providers as Field Officers/ Supervisors. The third batch has started recently wherein 386 students have been enrolled. 12 local educated youth were sent to Jaipur on a month long training program on ICS Development. They are now working as Service Providers.

The success of the Mission's initiative can be gauged by the fact that Aamir Khan Productions selected Sikkim Organic Mission as one of the stories for their Television reality show "Satyamev Jayate" which highlights extraordinary stories affecting common people's lives.



Bermiok livelihood school students

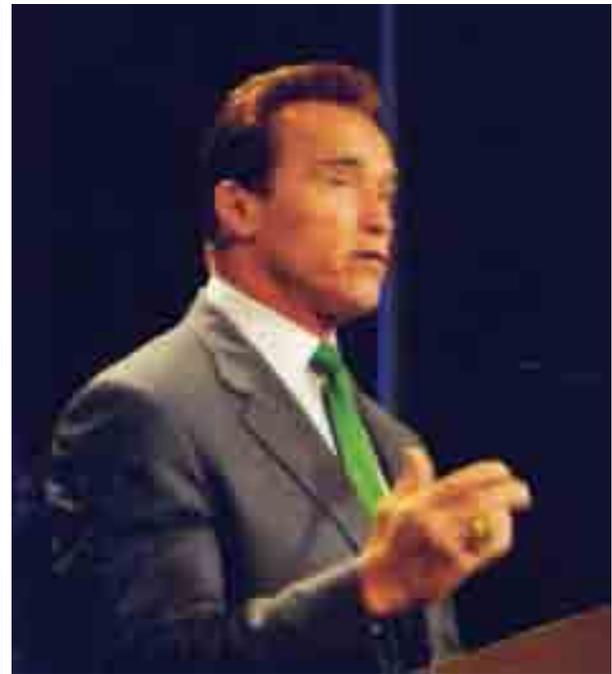
## 6. State Green Mission to help REDD+ aimed at mitigating climate change

Conceived by the Chief Minister - Shri Pawan Chamling himself, as a symbol of the government's resolve to convert Sikkim into a model "GREEN" State, the State Green Mission is now an annual ritual observed on the 15th day of June every year. This Mission has helped in ensuring strict protection and development of the natural resources and consequently as per the assessment by the Forest Survey of India, the State Forest and Tree Cover has increased by 3.5% from the year 1997 (44.09%) to 2011 (47.59%). This will help to reduce emissions from deforestation and forest degradation (REDD+) which is considered as an important mechanism under the UNFCCC aimed at mitigating climate change.



Flagship participatory greening programmes of Sikkim

Shri Pawan Chamling, Chief Minister of Sikkim participated in the Governor's Global Climate Summit at California on invitation of the California Governor, Mr. Arnold Schwarzenegger.

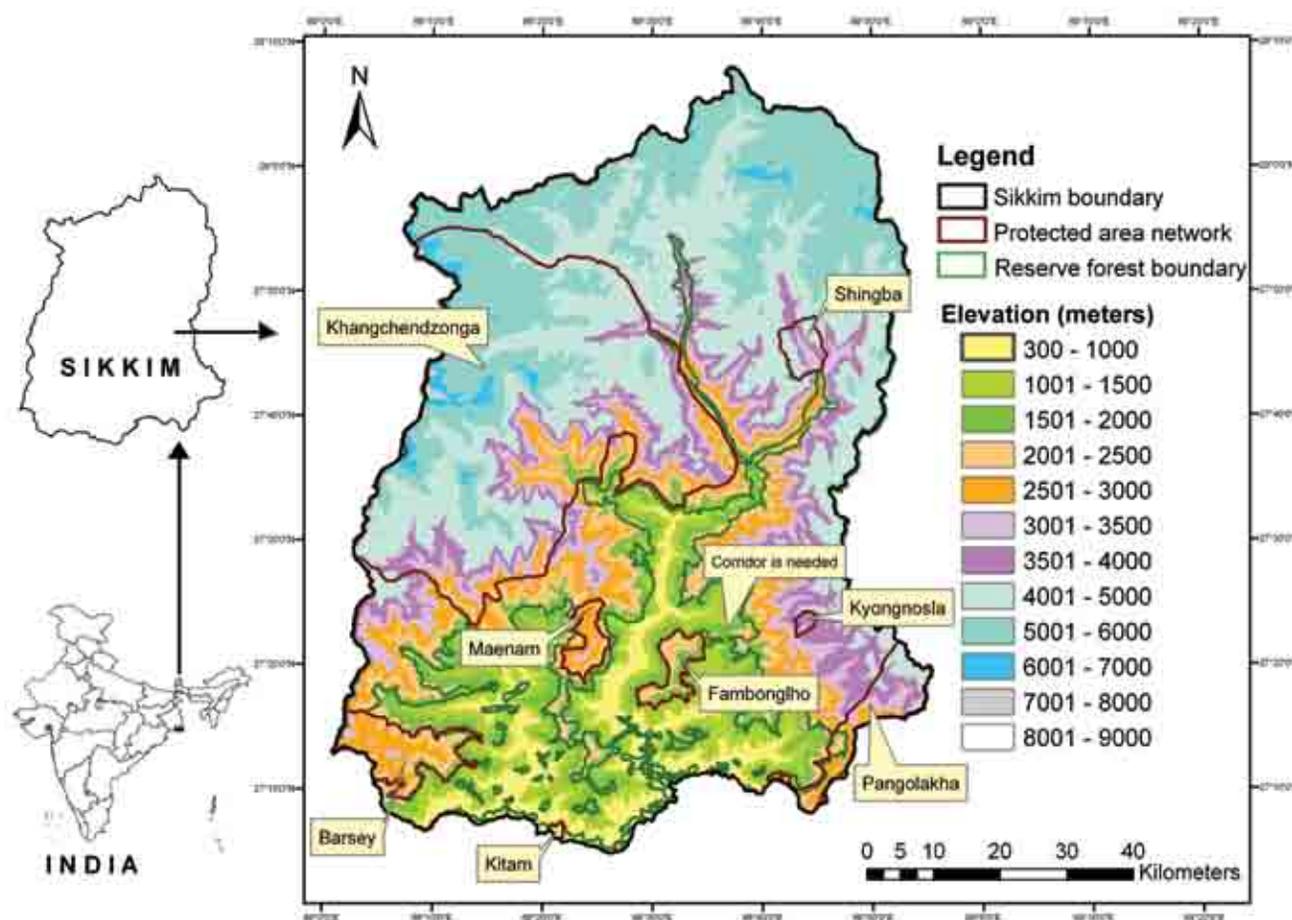


## **7. Protecting the sanctity of natural heritage sites**

Mt. Khangchendzonga (8,598m), globally the third highest peak and the highest in the country is regarded as the guardian deity of the State. The whole landscape of Sikkim is considered sacred and the various mountains, rivers, lakes and caves revered. The State Government has put a blanket ban on scaling of sacred peaks and also defilement of sacred caves, sacred rocks, sacred lakes, chortens and sacred hot springs. This has helped in protecting the sensitive mountain ecosystem of the State and safeguarding it from defilement and degradation.

## 8. Protecting natural heritage

Coverage of protected area in the form of sanctuaries and national parks at 32% of the total geographical area is the highest in the country and compares favourably against the national average of 5%. All the eco-regions from subtropical to alpine have been represented in the protected area network and existing threats and pressures reduced significantly to enhance the habitat quality for wildlife.



Protected Area Network of Sikkim

## 9. Glacial and Climate Change Studies and Adaptation Programme

Several studies have been taken up to study Glaciers, Snow Cover and Climate Change. An Advisory Council- 'Sikkim State Council of Climate Change' for providing policy direction and institutional mechanism for effective implementation of various climate change adaptation programmes has been constituted by the State Government. Sikkim may be the first Himalayan State to have carried out basin wise glacier inventory way back in 1999 by the Science & Technology Department of the State Government in collaboration with the Space Application Centre, Department of Space, Government of India. The inventory of glaciers of Sikkim was carried out using satellite data of 1<sup>st</sup> January 1997. Based on this work, an atlas of the Glacier Inventory maps was also prepared. As per this study, Sikkim has 84 glaciers covering an area of 440 sq km. The total extent of permanent snowfields was measured as 251 sq.km. This makes total extent of area under glaciers and permanent snowfields as 691 sq.km.

## 10. State policy of banning green felling in forests

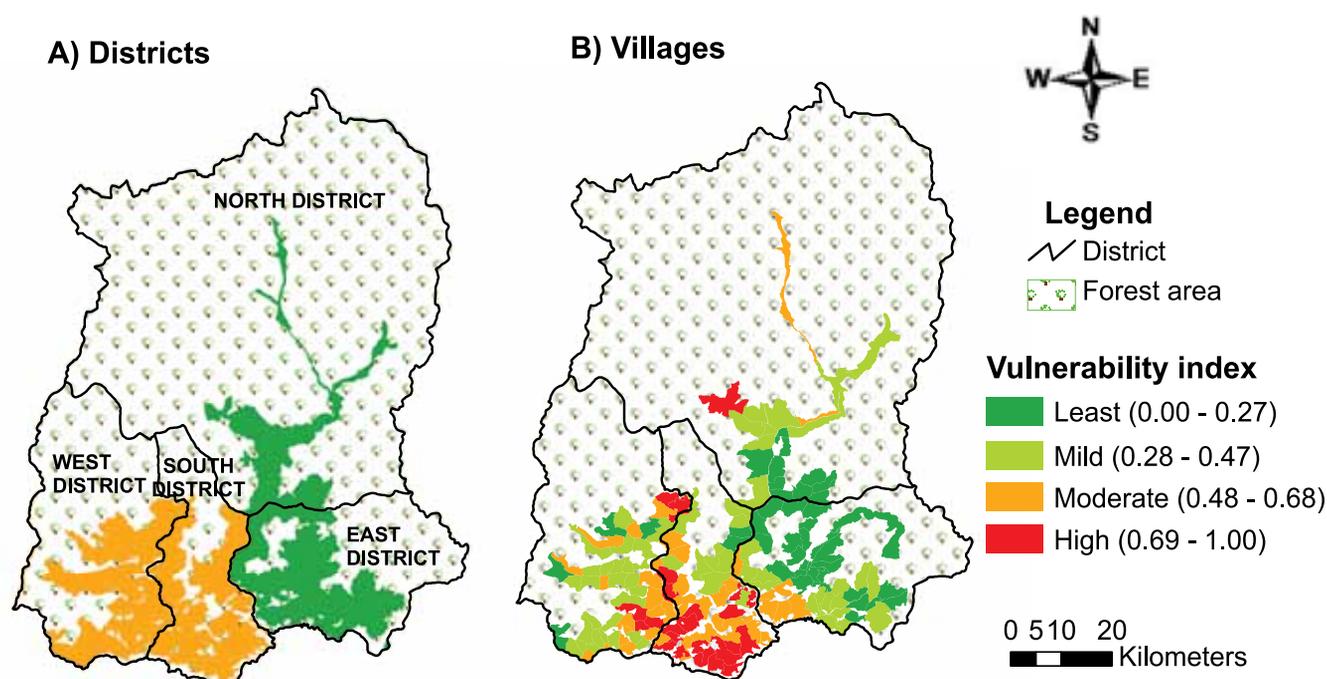
Felling of trees in Reserve Forests has been restricted and export of timber outside the State has been banned. Tree felling rules for private holding has also been framed and implemented. Only dead, dying and diseased trees are allowed to be removed for bona fide use. The State Government took up the task to protect the existing natural forests and to bring the degraded forests and agricultural fallows under afforestation since 1995. The positive response of the people has led to the increase of forest cover in the State. The total ban on green felling for commercial purposes and the defence of this philosophy for over a decade has resulted in transformation of open forests to dense. Needless therefore, to mention that planners, scientists and advisors are increasingly of the view that Sikkim is eligible to claim carbon sequestration cost for amelioration of regional climatic conditions by retaining and regenerating forest cover. Forest protection, wildlife conservation and maintenance of environmental fabric in the mountains of Sikkim have been the prime focus of the Government over the last several years. Legislations, rules and guidelines have either been put in place or revised and amended to make them more stringent.



Unique Sal-Chir pine association in Kitam Bird Sanctuary, South Sikkim

## 11. Climate Change Related Vulnerability Assessment of the Rural Communities at the Gram Panchayat Level

Sikkim is the first state in the country to undertake a “Climate Change Related Vulnerability Assessment of the Rural Communities at the Gram Panchayat Level”. In this study it was found that climate change impacts have resulted in a reduction in the temporal spread of rainfall, and an increase in the intensity, with a marked decline in winter rain. The subtropical villages (less than 1000 m), especially in the drought-prone zones were found to be more vulnerable due to an increased outbreak of pests, diseases and weeds. Spring water sources are drying up and preservation of seeds during warmer winters is becoming risky. A high variation was found in the sensitivity and adaptive capacity due to the diverse developmental profile of the villages. Hence while climate change adaptation-related developmental interventions need to have a diverse sectoral profile, they must geographically target areas with specific interventions. This study will provide a scientific basis for designing climate change adaptation policy and programmes.



## 12. Expanding cultivation under Drum Stick

Improving nutrition while building resilience to climate change : Drum Stick (*Moringa spp.*) is a fast growing, drought resistant, indigenous tree that has the potential to improve nutrition, boost food security, foster rural development and support sustainable land-care. This tree was traditionally cultivated in West Sikkim on a small scale. Since the plant requires less water and is drought resistant, area expansion under this crop has been undertaken by the Horticulture and Cash Crops Department on a large scale using a cluster approach as a climate change adaptation strategy. To ensure additional income generation of farmers for their livelihood, large scale cultivation of drum stick is being undertaken in various clusters of South district like Raikagaon, Salghari, Sripatam, Kateng Bokrang, Karek and Dong. The farmers are being provided with seedlings/cuttings along with organic manure with training on latest technology on package of practice. With proper care, the average yield expected is 52 tonnes/hectare. A number of value added products can also be prepared from the surplus production.

### 13. Ban on Grazing and Climate Change Benefits

A decade (2000-2010) of wildlife conservation by making the national park, sanctuaries and forests “cattle-free” in a participatory manner and a haven for wildlife and sustaining this status in the Sikkim Himalaya Landscape, thereby, securing the future of a global biodiversity hotspot including the Khangchendzonga National Park (highest national park in the country) and several adjacent sanctuaries and reserve forests. In Sikkim, the Forest Department backed by a rock solid political will embarked on this mammoth exercise a decade ago, and over five years of sustained effort succeeded in making all the protected areas and adjacent forests spanning across 6 lakh hectares of a global biodiversity hotspot cattle-free. The ban was successfully imposed with the help of the local community spearheaded by the EDCs, JFMCs and local NGOs. As a result more than 10,000 cattle and 500 herders were weaned out from the protected areas of the State and were also provided with financial assistance. The impacts of this ban was assessed independently by various national institutes and NGOs, which indicate encouraging findings of wildlife habitats recovering, wildlife populations bouncing back and herders not reverting back to their earlier livelihood even a decade after they were phased off. This successful experiment was a pan-state effort and has resulted in a significant improvement in the forest cover as well.



Past practice of open grazing and conversion of forest into artificial pastures



Future target to preserve old growth, temperate oak forest

## 14. Universalizing Sanitation and becoming the First Nirmal Rajya in the Country

Basic sanitation and good hygiene are fundamental for a healthy, productive and dignified life. Poor access to sanitation and hygiene reinforces gender inequalities and results in chronic diarrhoeal diseases that debilitate victims and, coupled with malnutrition, induce a negative spiral into poverty. The productive activities of poor rural people, such as schooling and farming, are severely restricted by ill health from water and excreta-related disease. Safe water and clean environment, free from open defecation results in good health and hygiene. Sikkim is the first and only Nirmal Rajya in the country having achieved 100% sanitation in 2008. All the 165 Gram Panchayats and 4 Districts have achieved 100% coverage of toilets and open defecation has been eradicated. Sanitation was universalized by transforming an ongoing routine development program into mission mode by adopting a saturation approach with time bound targets. Sikkim is the first and only Nirmal Rajya in the country, to have achieved 100% coverage of toilets in 2008 under the Total Sanitation Campaign (TSC), a national programme.



Shri Pawan Chamling, Chief Minister of Sikkim receiving the Nirmal Rajya award from the president of India in 2008

## 15. Zero Waste Trail

The Yuksam-Dzongri is a world-famous trekking trail in the Khangchendzonga National Park attracting more than 5,000 tourists annually from all corners of the world. The trek offers spectacular views of the Mt. Khangchendzonga (8598m), globally the third highest peak and highest in the country. The trek winds through pristine oak, rhododendron and fir forests before opening up into the vast expanse of alpine meadows. In order to ensure that this trek route remains clean and hygienic, a need was felt to have a proper waste management system to ensure that all the disposable waste is brought back. With this objective, Khangchendzonga Conservation Committee, TMI-India and the Forest Department joined hands to set up a Zero Waste Trail concept. A management system was put in place, wherein all the disposable non-degradable items being taken inside the park (like cans, plastic, thermocol, glass etc) was recorded in the check post during entry, and was disposed in the 9 bins setup nearby when the tourists exited. This waste was further segregated into more than 21 chambers by the supervisors and transferred to the resource recovery centre. The waste is safely stored for around 10 months until it becomes a truck load full to be transferred to the recycler. This way a large quantity of waste was not only converted into a resource but also the pristine ecosystem of a global biodiversity hotspot preserved.

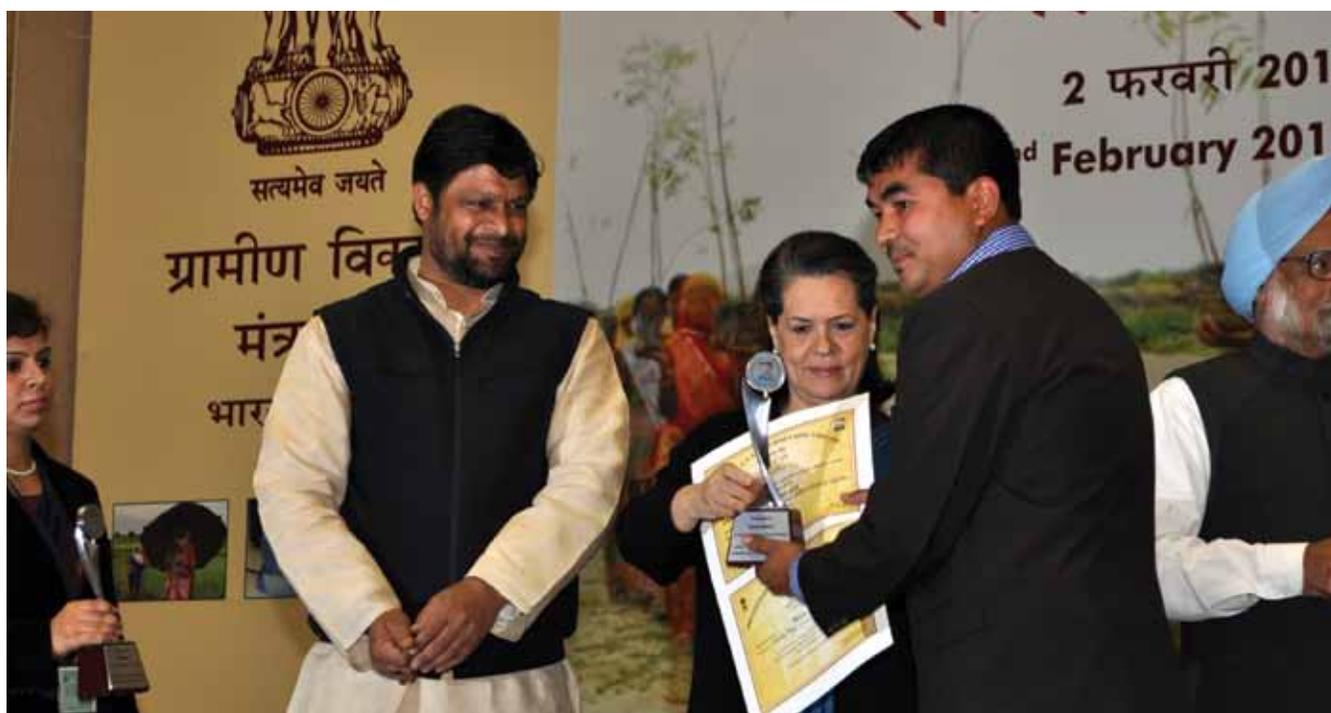


## 16. Strengthening the implementation of Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA)

This national flagship programme guarantees 100 days of wage employment in a financial year to every rural household demanding employment. Sikkim State is amongst the front runners in the implementation of this program, which has been able to provide on an average 85 persondays to a rural household resulting in an outcome of Rs 10,000 additional climate-resilient annual income for 65% of the rural households of the State. This money has been utilized mostly by women to buy nutritious food, for sending children to better schools, buying clothes, house repairing and for health treatment, thereby enhancing the human development status of rural Sikkim.



Best district national award under MGNREGA for North District during 2011



Best Gram Panchayat national award under MGNREGA for Chuba Phong Gram Panchayat during 2011



Best Gram Panchayat national award under MGNREGA for Martam Nazitam Gram Panchayat during 2012



Rozgaar Jagrukta Puraskaar for VHAS NGO under MGNREGA during 2011

## 17. Participatory conservation of lakes – Pokhri Sanrakshan Samitis

Some lakes of the State have become mass ecotourism destinations, receiving as many as 2,000 visitors per day during the peak tourist season. Tsomgo (Changu) in East Sikkim, Gurudongmar in North Sikkim and Khecheopalri in West Sikkim are the mainstay of the tourism industry of the state, generating footfalls of more than 4 lakh tourists resulting in incomes of more than Rs 50 crore annually to the tourism sector. In order to ensure their long term ecological security with people's participation, the Forest Department enlisted the support of the local community and institutionalized their role under the Pokhri Sanrakshan Samiti (PSS) initiative. These committees were given the responsibility of preserving the lake and its catchment and maintaining the cleanliness and sanitation in lieu of collecting a nominal lake conservation fees from the tourists. Implementation of this innovative and participatory policy has resulted in significant improvement in the conservation of the lake, its catchment, solid waste disposal, sanitation and interpretation of the values of the lake to the visitors.



## 18. Participatory conservation of high altitudes – Himal Rakshak

Nearly 60% of the geographical area of the State lies above 3,000 meters. This sub-alpine and alpine landscape of the Sikkim Himalaya, locally referred to as Himal is a repository of unique, globally significant wildlife, and also forms the headwaters of important perennial rivers. Improved ecological health of this ecosystem translates to sufficient water in the streams even during the dry season, which sustains agricultural and horticulture crops, thereby directly translating to food and health security of the villagers living down-stream. The lower and upper hill forests have been brought under the JFMC/EDC network, while the alpine region has been protected by enlisting the support of local, knowledgeable resource persons recognized as Himal Rakshaks. These Himal Rakshaks have helped in trap demolition, reducing retaliatory poisoning of carnivores, curtailing grazing pressure and also undertake regular monitoring of biodiversity.



## 19. Expanding the Network of Minor Irrigation Channels

Rice is cultivated in the terraces and along the river valleys and local rice varieties like Attey, Timmurey, Krishnabhog, Bachhi, Nuniya, Mansaro, Baghey-tulashi, Kataka, Champasari, Sikrey, Taprey etc. are adapted to agro-ecological zones between 300–1800 m. Traditional varieties of rice e.g. Krishnabhog, Nuniya and Kataka are famous for their aroma, medicinal importance and fine quality grain. This rice cultivation needs flooding, and water from the nearest water source is tapped and directed through minor irrigation channels using gravity flow. A number of irrigation schemes are underway to expand the minor irrigation network in the State so as to ensure assured irrigation benefits. Funds were sourced from AIBP and MGNREGA national programs to create these MICs.



## 20. Torrent Training Initiatives for Flood Control

Climate Change is expected to intensify the precipitation patterns and the frequency of extreme weather events like cyclones, hailstorms, cloudbursts etc is expected to further rise in the future. These events result in accelerated discharge owing to the steep terrain and convert the mountain streams into raging torrents during the monsoons. These torrents if not trained cause immense soil erosion, damage to farmer's fields and landslides as well. Torrent training (jhora training) has been provided a renewed emphasis to ensure that this flood water does not cause damage and is safely drained into the larger rivers. Funds from the national flagship program – MGNREGA were used by the Rural Management and Development Department to fund these flood control works.



## 21. Converting Barren Sloping Lands to Productive Terraced Fields

Being the steepest and highest terrain in the country, large areas owned by the farmers are steep and barren and need investment to make them productive. These steep lands also contribute significantly to soil erosion and floods. Terracing of barren land is being taken up on a large scale by cutting the hill slope into steps, providing supporting walls and levelling the land. The edge has to be often reinforced by constructing dry stone walls about one to two meters in height. This terracing of barren land to make it productive serves multiple purposes by maintaining soil fertility, enhancing ground water recharge and increasing agricultural production. Cultivation of maize, broom grass and ginger is taken up in these new lands and has resulted in higher incomes to the rural households as well.



## 22. Green School Programme

In order to strengthen environmental education in schools, the Green School Programme (GSP) has been introduced in the year 2009, in all the 182 Senior Secondary and Secondary schools of the state. The Green School Programme enables the school eco-club students to play a part in the environment management system at the school level. The students become auditors of their own natural resources and become responsible for the school's action for the environment. The activities taken up by the students relate to traditional rain water harvesting and reusing waste water, assessment of the transport system of the school, listing of the floral and faunal wealth in their biodiversity register, study electricity and other forms of energy consumption at the school campus and explore ways in which it can be minimized and finding out the type of waste the school is producing and learning composting and waste segregation methods. All these tasks help the students to become paryavaran mitra, the green ambassadors of the school and contribute toward making their school a Green School. Acknowledging the efforts of the schools, the Chief Minister - Shri Pawan Chamling has announced annual cash prizes up to Rs. 5.0 lakh for the top five green schools of the state and has launched the prestigious Chief Minister's Green School Rolling Trophy as well.



### 23. Ten minutes to earth

Planting trees has been a tradition in Sikkim. This activity has been institutionalized with inspiration from the Chief Minister – Shri Pawan Chamling. On 25th of June every year, people all over the State take time out to participate in this annual ritual of plantation aptly named “Ten Minutes to Earth”. This programme embarked on its unending journey from the year 2009 onwards when six lakh saplings were planted. Since then this has become an yearly activity. Forest Department plays the nodal role in the distribution of saplings all over the state. This ten minutes activity is expected to help in sequestration of 1400 tons of carbon dioxide annually.



## 24. Enhancing drinking water security

Ten Blocks (Duga, Rhenock, Khamdong, Namthang, Melli, Jorethang, Namchi, Sikkip, Soreng and Kaluk) in the south-central part of the state lie in the rain-shadow of the Darjeeling Himalaya and hence receive only 150 cm annual rainfall (half of the average annual rainfall of the State) and consequently fall in the drought prone zone. The spring discharge closely mirrors rainfall patterns. With longer winter droughts, with no rainfall received for 5-6 months from Nov-April, many of the local springs in the drought prone zone are now becoming seasonal. These ten Blocks comprise of 63 Gram Panchayats where during peak lean season women have to carry water from far off sources. In an effort to strengthen the resilience of the local communities, specially women, water storage tanks are being constructed in these drought prone areas. These tanks store the spring water discharge during night time (which was earlier not being utilized) and hence enhance the drinking water security of the vulnerable local communities. Funds from the national flagship program – MGNREGA were used by the Rural Management and Development Department to construct these tanks.



Before



After

## 25. Establishing plantations of fast-growing indigenous tree species

Many of the steep lands in the drought prone zone are being brought under economic use by establishing plantations of fast growing indigenous tree species. These fast growing tree species will not only help in conserving soil, water and sequestering carbon but also provide assured additional economic returns to the farmer. *Terminalia myriocarpa* (panisaj) and *Alnus nepalensis* (uttis) are the two fast-growing indigenous tree species preferred by the farmers. Funds from the national flagship program – MGNREGA were used by the Rural Management and Development Department to establish these plantations.



## 26. High value contract farming in floriculture sector with assured marketing linkages

The Sikkim State Cooperative Supply and Marketing Federation Limited (SIMFED) an apex cooperative of the state initiated contract farming in Asiatic and Oriental Lilium by sourcing the 75,000 bulbs from Holland. The Nav Uday Self Help Group of Lingdong, East Sikkim took the initiative and with an initial investment of about Rs 6,000 was able to earn Rs 44,000 in three months. The cut flowers were marketed by SIMFED in New Delhi. Diversifying the sources of farm income and providing assured marketing linkages helps farmers to adapt to the risks associated with climate change.



## 27. Increasing efficiency of water use - drip irrigation system

The on-farm handling of water is very important besides developing water sources to ensure round the year irrigation. The application of drip/micro-irrigation helps in increasing productivity by 30% to 100% with 50% to 70% saving of water. Thus drip irrigation is becoming a major component of precision farming. It helps in supplying water directly to the root zone of the plant. The Drip/Micro Irrigation includes emitting water by drippers, micro sprinklers, mini sprinklers, micro jets, misters, fan jets, micro sprayer foggers, emitting pipes. All types of surface and subsurface irrigation systems are covered under Drip/Micro Irrigation Technology. The Horticulture and Cash Crops Development Department is utilizing drip irrigation successfully in orange orchards, high value vegetables like tomato and cole crops in greenhouses and flower crops. With the use of drip irrigation system, the production and productivity of various horticultural crops have increased substantially.



The Drip/Micro Irrigation Farming is being increasingly practised in the State

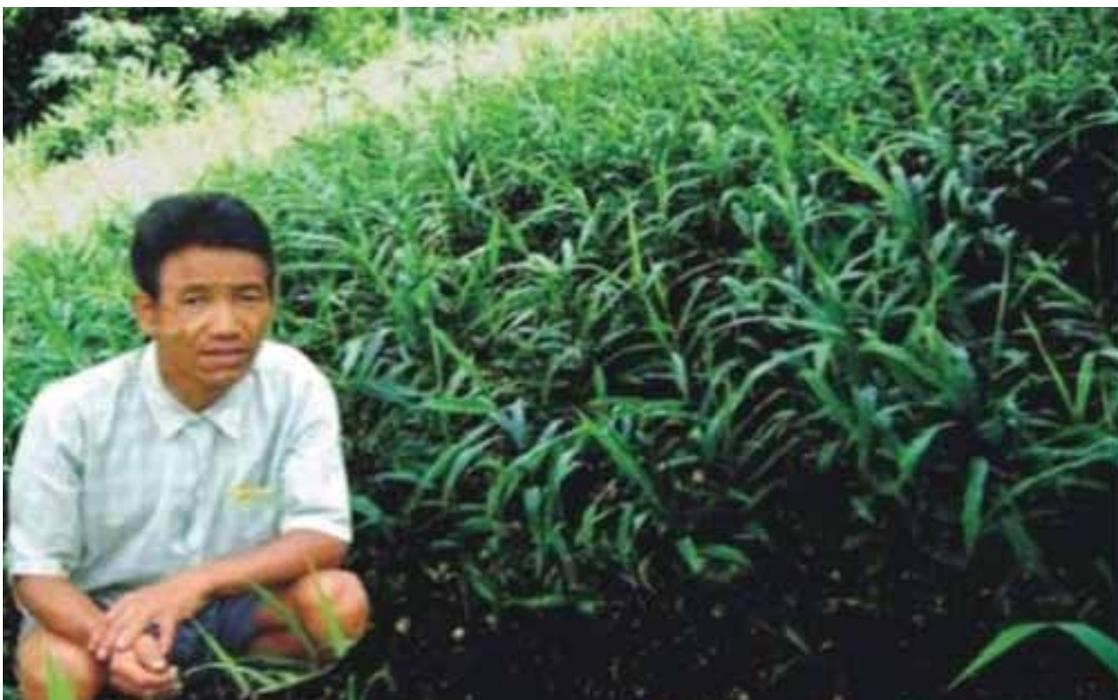


## **28. Conserve soil and moisture by means of mechanical measures – bench terracing of sloping lands**

The agro-climatic zone of the State is marked by steep slopes, weak geology and heavy rainfall. Offlate, with impacts of climate change, the precipitation patterns have intensified resulting in heavier rainfall spells. This results in leaching of the soil nutrients, washing away of the fertile top soil leading to decline in soil productivity. Conservation of soil and moisture is necessary for ensuring the sustainability of mountain agriculture. Hence, the Food Security and Agriculture Development Department is providing 50% subsidy to the farmers to take up bench terracing of sloping lands. This conversion of sloping land into agricultural terraces also helped in increasing the arable land available for the farmer. Production of cash crops like ginger on this newly terraced land has also helped in providing increased incomes to the farmer.



Bench terracing of sloping lands is aiding in soil and moisture conservation, while increasing the arable land available to the farmer



## 29. Strengthening the resilience of farmers to face longer winter droughts

Due to impacts of climate change, winter droughts have become increasingly frequent with little or no rainfall received in the 5 months from November to March. Consequently, the farm production was adversely impacted. To strengthen the resilience of the farmers, and strengthen their adaptive capacity to winter droughts, the Food Security and Agriculture Development Department intervened by demonstrating the new technology of GENAP Water Tank on a community basis. The objective was to provide water for Irrigation on a community basis. The Community Water Tank (GENAP Water Tank) of capacity 49,500 litres was installed in Dongkhola Watershed in South District in which 4 villagers were covered. Water from the nearby stream was collected and stored in this GENAP Tank. Once the water was made available these farmers started cultivating different kinds of vegetables like tomato, broccoli, cabbage and cauliflower in their small fields and in less than 1 acre area they could earn reasonably good income.



### **30. Providing credit and marketing linkages in cooperative mode**

The Sikkim Government has identified and encouraged local cooperatives for implementing various programs and policies to improve the living standards of people. In East district of Sikkim, the Luing Perbing Multi Purpose Cooperative Society Ltd. having 311 members, has representation from almost 60% of the households of the entire gram panchayat. Initially, the society was primarily dealing with controlled items of the public distribution system. Soon they diversified into credit business by giving Kisan Credit Card to 11 members amounting to Rs 1.10 lakh for agricultural purpose. As on 31st March, 2012 the cooperative has loaned an amount of Rs 100 lakh to its members. They have also provided vehicle loans to three members for commercial purpose. Apart from distributing various types to loans to its members, the society has also started marketing agricultural and dairy produce of its members, there by linking credit with marketing.

### **31. Promoting climate resilient livelihoods in drought prone zone through poultry farming**

The villages falling under Mellidara Gram Panchayat, South Sikkim lie in the climatically challenged area in the rain shadow of the Darjeeling hills. Thus, this area is dry and drought prone and there is an acute scarcity of water resources. Since land based crops were not giving adequate returns, the Department of Animal Husbandry, Livestock, Fisheries and Veterinary Services promoted the adoption of poultry farming (broiler) in a large scale by supporting the poultry farmers in terms of capacity building for adoption of scientific management practices, arrangement for the supply of broiler chicks within the state at a reasonable price, providing veterinary services and marketing tie up with the Denzong Agriculture Cooperative Society Ltd. This area has now become one of the highest producers of poultry meat in the state having a total annual turnover of Rs 400 lakh. The farmers have formed Cooperative Societies i.e. Sadam Turuk Payong Poultry Growers Cooperative Society, Payong Poultry Growers Cooperative Society and Mellidara Poultry Grower Cooperative Society and are serving as a role model, ushering in a new era of poultry industry in the State. Now, not only has the problem of drought been overcome, but local entrepreneurship has been promoted to uplift the economic status of the village.





### 32. Promoting climate resilient, high value farming of baby corn

Maize is a traditional crop of the state and is grown during the pre-Kharif or summer season under rainfed condition. It is a hardy crop, well adapted to the region and is used mainly as a feed to the animals, but is characterized by assured but low returns. The Food Security and Agriculture Development Department, demonstrated the possibility of organic baby corn cultivation in order to provide assured but high returns to the farmers. Inputs like seed and manure, training and method demonstration, market linkages with SIMFED and processing of baby corn at Government Fruit Preservation Factory at Singtam was arranged to facilitate the transfer of technology. Baby corn is a shorter duration (60-70 days) crop, produces higher green biomass for cattle fodder and resulted in six times more profit to the farmer. Buoyed by this success story, more farmers have taken up baby corn farming in the adjoining villages to meet its growing demand in soups, pizzas and salads.



### **33. Re-introduction of traditional buckwheat crop to help farmers adapt to longer winter droughts**

Due to frequent winter (Jan-March) droughts, the farmers were reluctant to grow Rabi crops like wheat and mustard which require atleast two to three spells of irrigation for good production. Hence, more and more land was left fallow in winter, after harvesting the Kharif crop. Hence, the Food Security and Agriculture Development Department, reintroduced the traditional buckwheat crop which is tolerant to moisture stress in an organic mode, provided inputs like seeds and manure, transfer of technology and tied up the minimum support price from SIMFED. This crop resulted in net incomes of Rs 19,500 per ha to the farmers apart from conserving soil moisture, suppressing weed growth and providing fodder. This technology has now been adopted by the farmers in the neighbouring villages.



### **34. National award for ground water augmentation from Ministry of Water Resources, Government of India**

The National Ground Water Augmentation award of the Ministry of Water Resources, Government of India was awarded to the Dhara Vikas programme of the state in the NGO category. WWF–India received this award for their work in supporting the State Government for providing technical support to this programme. This prestigious national award was given away by Shri Pawan Kr. Bansal, Minister of Water Resources in a glittering function organized during the India Water Week celebrations at India Habitat Centre, New Delhi on 13th April, 2012. The award was received by Ms. Priyadarshinee Shrestha, Landscape Coordinator of WWF – India’s - Khangchendzonga Landscape Programme based in Gangtok. WWF-India, with the support of People’s Science Institute and SIRD, Karfectaar had facilitated the training component of the programme by providing training to field level functionaries consisting of field facilitators, barefoot engineers and ACFs leading to the development of five master trainers in the state. A total of 45 trainings were organized during a span of 2 years, which enabled successful implementation of the programme at the field level.



### 35. Recognition for Village Spring Atlas initiative under Dhara Vikas programme

The eNorth East Award Summit was jointly organized by the North East Development Foundation and the Department of Information Technology, Government of Nagaland on 25th Nov, 2011 at Kohima, Nagaland. The award was received by Mr. Ghanashyam Kharel, IT Manager-MGNREGA, RM&DD and Mr. Bikash Subba, Faculty- SIRD. The nomination of RM&DD titled “Village Spring Atlas for the conservation of Himalayan springs and adapting to climate change” bagged the Jury Special Mention in the Environment and Tourism Category for its innovative deployment of ICT tools especially the internet medium to reach out to a bigger clientele base. The objective of this initiative was twofold, first to initiate conservation of these mountain springs by undertaking resource mapping of the springs on a GIS platform to better understand this valuable resource, and the preparation of a village spring atlas. The data collected from the extensive component of the study has been made accessible online in the webportal <http://sikkimsprings.org>. This online database provides information on the location, GPS coordinates, land tenure, catchment status, dependency, discharge (supply / demand) of nearly 700 springs of Sikkim and is also linked to google earth. It is expected that the results will help to better design the revival of mountain springs and to also mainstream this approach as a climate change adaptation intervention.

**SIKKIM SPRINGS**  
**ENSURING RURAL WATER SECURITY**  
 Rural Management & Development Department, Government of Sikkim, India

**Conserving Sikkim Springs**

Originating from deep aquifers, cool clear water flows from hundreds of springs that dot the mountain landscape of Sikkim. Sikkim springs are natural wonders and play a vital role in ensuring rural water security. Learn more about the springs and about the threats to their future and how to conserve these nature's gems.

**Springs database**  
 Delve into the growing inventory of spring resources of the State, developed with extensive field work.  
[ADD](#) [EDIT](#) [VIEW](#)

**Spring atlas**  
 Explore the springs in Google Earth, on a GIS platform and learn more about them.  
[View springs in Google Earth](#)  
[View springs in Map](#)

**Weather data**  
 Access 18 remote Automatic Weather Stations (AWS) data.  
[Download](#)

**Blockwise online progress**

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[Conserving springs](#)   [Conserving lakes](#)   [Conserving streams](#)



### **36. Preparing the State Action Plan on Climate Change (SAPCC)**

The State Action Plan on Climate Change (2012-2030) was prepared after several rounds of consultation with support from key Departments of the Government of Sikkim and facilitated by the German Technical Cooperation (GIZ). This plan lays down in a comprehensive manner the multi-sectoral threats posed by Climate Change and the mitigation and adaptation strategy for the future. This plan is currently under process of finalization in the Ministry of Environment and Forests, Government of India. This plan can be downloaded from <http://moef.nic.in/downloads/public-information/Sikkim-SAPCC.pdf>.

### **37. Promoting pilgrimage tourism as a climate resilient livelihood**

The Sidheshwar Dham, Solophok, South Sikkim was conceptualized as an iconic and unique pilgrimage and tourism initiative by Shri Pawan Chamling, Chief Minister of Sikkim. This project recreates the spiritual landscape of India atop the picturesque Solophok hill in South Sikkim with great grandeur and splendour. This pilgrimage complex is adorned by a massive 108 feet statue of Lord Shiva in sitting posture encircled by the 12 Jyotirlinga shrines, with exact replicas of the Char Dhams (Badrinath, Dwarka, Jagannath Puri, and Rameshwaram) and the Sai Baba temple in the foreground. This initiative bagged the “Most Innovative and Unique Tourism Project Award 2010-11” for the vision and construction of a world class Pilgrimage cum Cultural Tourism Complex. Lakhs of tourists visited this new destination in the first year itself, resulting in an additional contribution to the State’s economy and providing employment to thousands of people. Namchi, is a drought prone area falling in the rain shadow of the Darjeeling Himalaya. The growing climate resilient incomes from this tourist destination will help in facilitating adaptation to climate change.



### **38. Glaciers of the Sikkim Himalaya are in relatively better health**

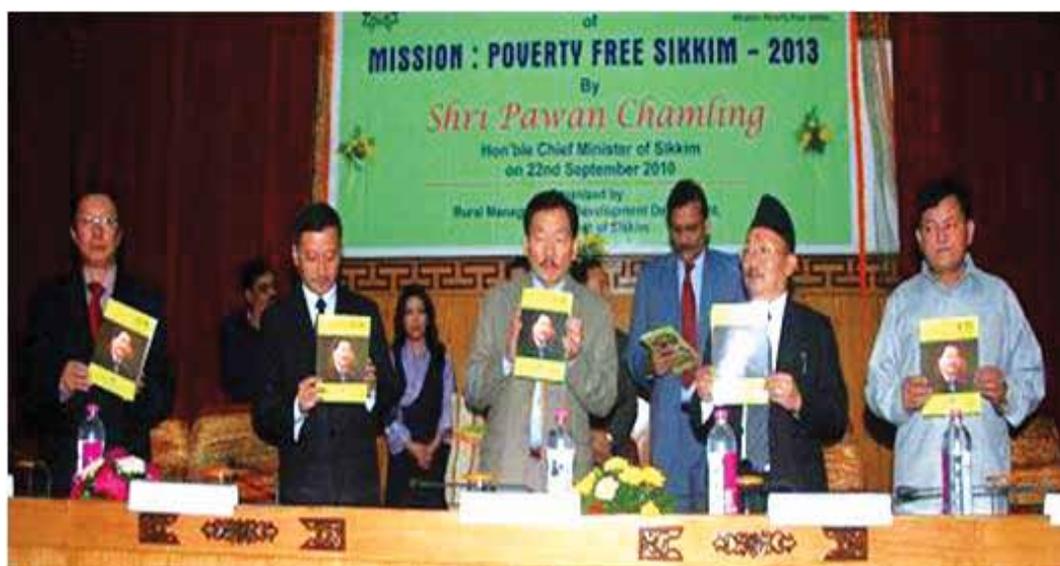
Glacial studies conducted by Ministry of Environment and Forest, Government of India indicate that all the Himalayan glaciers have shown cumulative negative mass balance during the last three decades of 20th century. Degeneration of the glacier mass has been the highest in Jammu & Kashmir (single glacier, 10 years record), relatively lower in Himachal Pradesh ( 3 glaciers, 10 years record), even lower in Uttarakhand (one glacier, 10 years record) and the lowest in Sikkim (one glacier,10 years record), thus clearly showing a declining trend from north-west to north-east. The glaciers of the Sikkim Himalaya were found to be in relatively better health.



Snout of Zemu glacier in North Sikkim

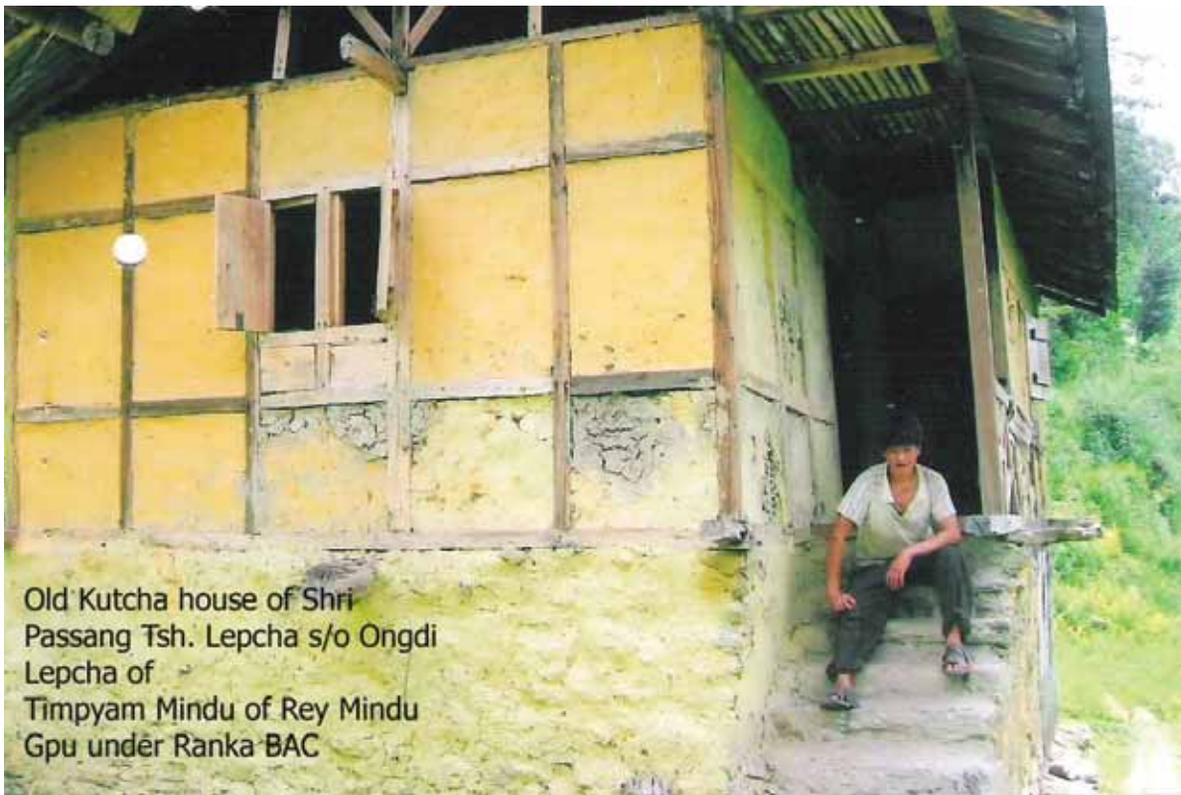
### 39. Mission Poverty Free Sikkim

The journey of a state towards freedom from poverty : Climate Change impacts the poorest the most. In Sikkim, the groups that are vulnerable to poverty are the landless and near landless (own less than half acre of land), whose main source of income is wage labour, agricultural labour (khetala) and share cropping (adhiadar, kutiadar). Other causes include social vulnerabilities like families led by single mothers, families led by the aged and persons with work-limiting disabilities. The consistent efforts and pro-poor policies of the Government of Sikkim have made a serious dent on the incidence of rural poverty. The Planning Commission, Government of India has defined the family based rural poverty line in 2009-10 as living on less than Rs. 3,364 per month. By this measure in rural areas, 33.8 per cent of rural population in the country and 13.1 per cent (0.08 million individuals) of the rural population in Sikkim live in poverty. In Sikkim, the percentage of poor people (Below Poverty Line or BPL) has come down from 41.4 per cent in 1994 to 30.9 per cent in 2005, with a rapid decline to 13.1 per cent in 2010 (Planning Commission of India, 2012). This 17.8 per cent rate of poverty reduction between 2005 to 2010 in Sikkim state is the second best in the country, and more than double the nation rate.



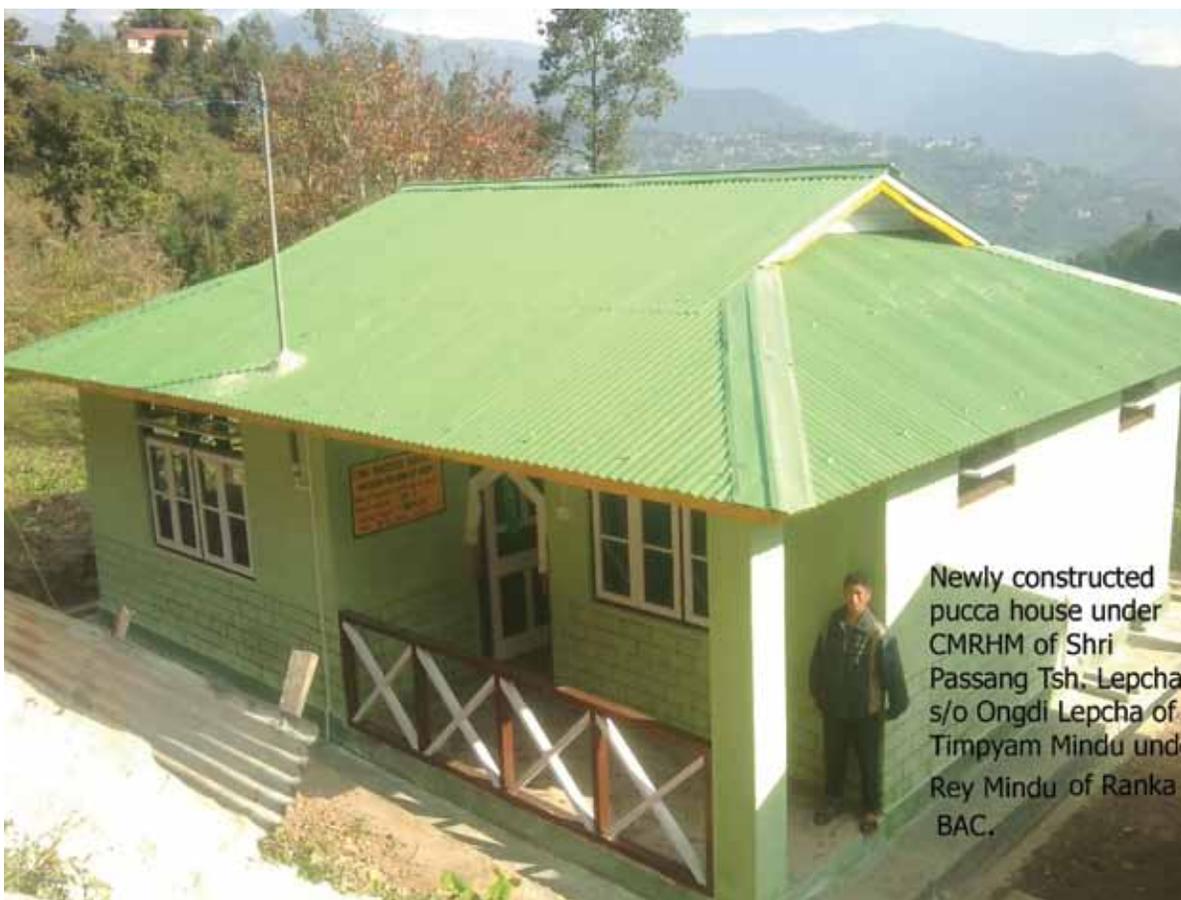
### 40. Chief Minister's Rural Housing Mission

Climate change has resulted in an increased frequency of extreme weather events which have started manifesting in the form of cloud bursts, hailstorms, landslides and cyclones. Temporary (katcha) houses are not only vulnerable to these extreme weather events but also susceptible to collapse during earthquakes. Hence, the rural housing program has been improved and integrated under the Chief Minister's Rural Housing Mission with the aim to attain a "katcha (temporary) house free status" by 2013. This program will ensure that the poor in mountain areas will have access to improved and safe housing, by providing a financial grant of Rs 4 lakh in instalments in "owner driven" mode. Also, they will be able to utilize their life savings in educating their children, have access to better healthcare and livelihoods.



Old Kutchha house of Shri  
Passang Tsh. Lepcha s/o Ongdi  
Lepcha of  
Timpyam Mindu of Rey Mindu  
Gpu under Ranka BAC

Housing Before (2010)



Newly constructed  
pucca house under  
CMRHM of Shri  
Passang Tsh. Lepcha  
s/o Ongdi Lepcha of  
Timpyam Mindu unde  
Rey Mindu of Ranka  
BAC.

Housing After (2012)

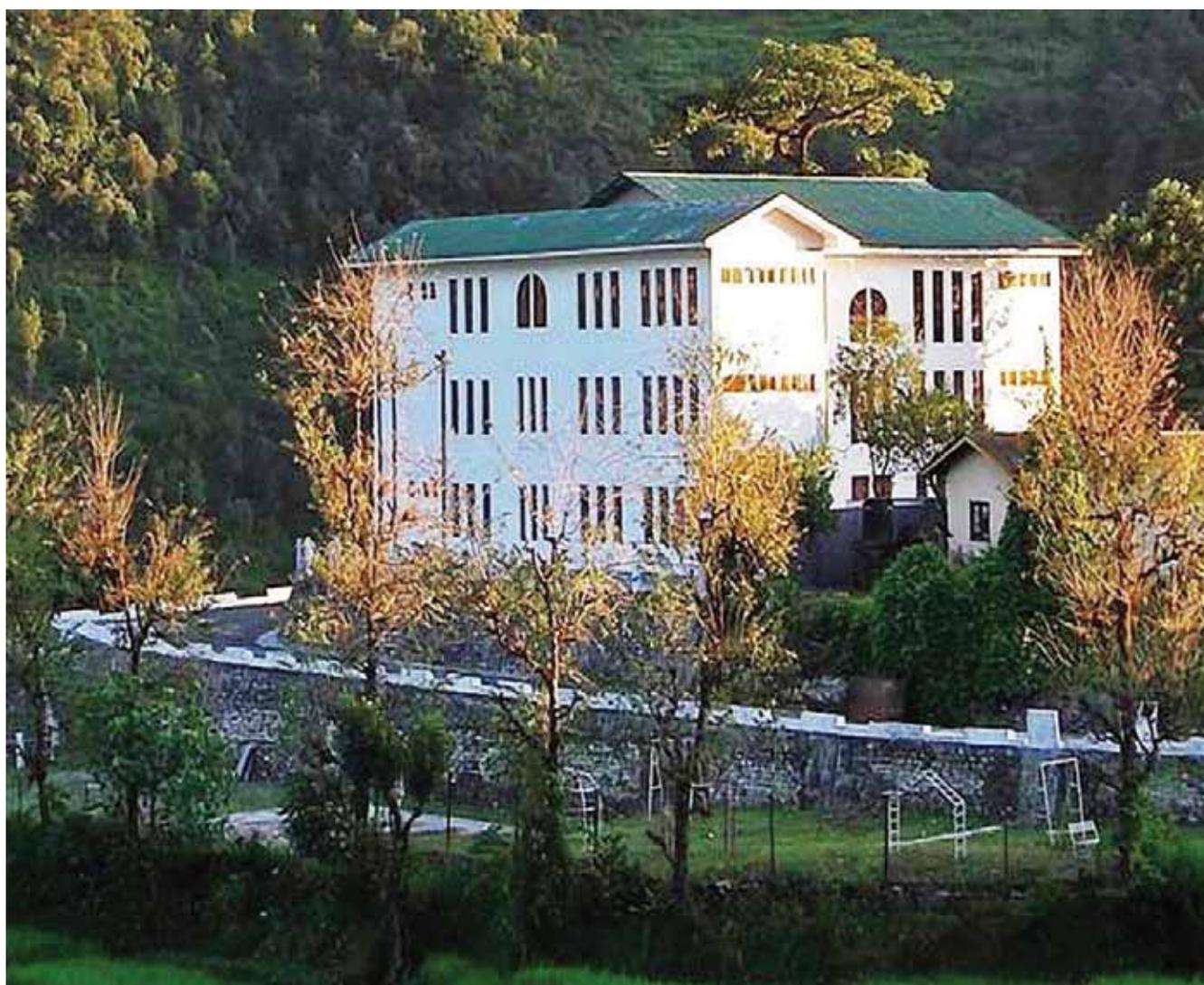
#### 41. Decentralization for need based and responsive governance

Decentralization has been firmly anchored by providing adequate funds, functions and functionaries at the local level. The state has a two tier system of local governance in rural areas - the gram panchayat or the elected government at the village level and the zilla panchayat or the elected government at the district level. The varied development profile of the villages, coupled with their diverse needs and aspirations and remote location, make decentralization imperative for need based development. The State has been performing exceptionally well in performance and accountability of the Panchayats. During 2010-11, Sikkim was ranked 3rd in the country by the Ministry of Panchayati Raj, Government of India in the performance and accountability of Panchayati Raj Institutions (PRIs). Also Mellidara gram panchayat received the Rashtriya Gaurav Gram Panchayat Award.



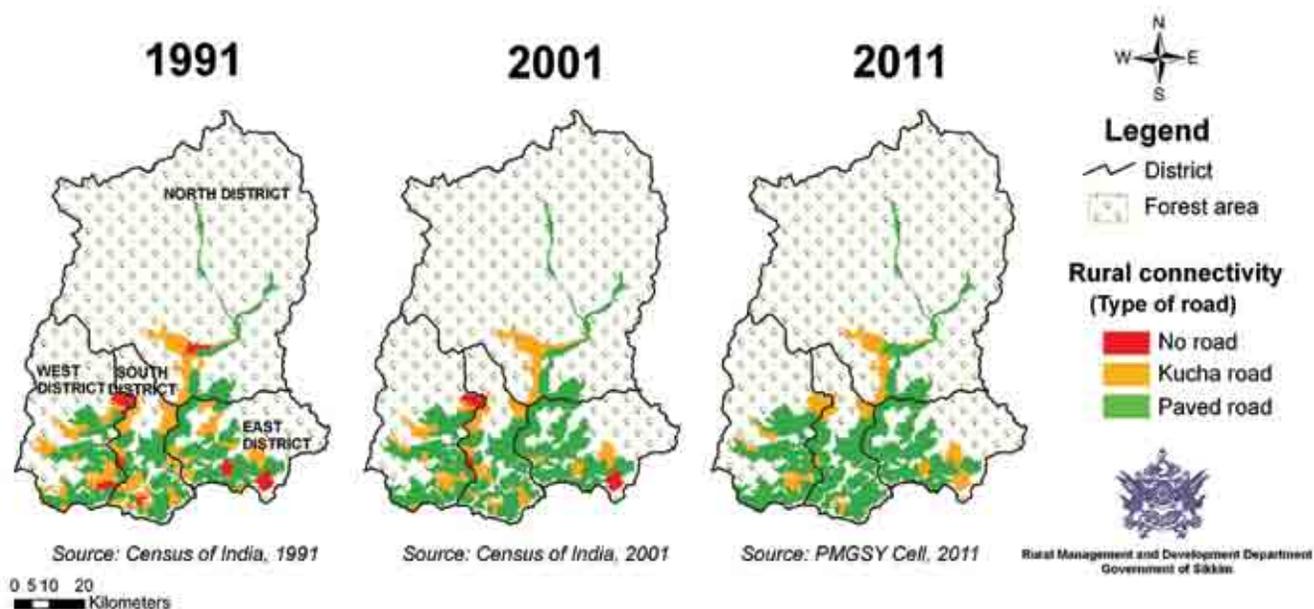
#### **42. Strengthening governance by creating Gram Panchayat Cluster Offices (Block Administrative Centres) to reinforce last mile delivery of programs and services**

The Block Administrative Centres (BACs) have been recently established by the State Government to provide administrative, accounts and technical support to a cluster of gram panchayats. These centres function as support office to a cluster of five to six gram panchayats having a population of 15,000. A BAC is manned by officers from administration, accounts, engineering, agriculture, horticulture, forestry and education sectors to support a cluster of gram panchayats. These Gram Panchayat Cluster offices have helped in strengthening governance and last mile program delivery. They have resulted in need based and efficient delivery of programs related to infrastructure, livelihoods, water conservation and safety net programs related to cash and food transfer, thereby enhancing the resilience of the local community to climate change impacts.



### 43. Extensive rural connectivity to expand non-farm rural economy

Roads in mountain terrain have a high per beneficiary cost due to scant population, coupled with high construction costs due to the difficult terrain and low volume of use per day. However they provide significant social benefits in terms of access to health and education services, providing market linkages and improving access to government programs. Roads help not only to accelerate economic development in rural areas but also in providing secondary and tertiary sector livelihood opportunities to the local community by expanding the non-farm rural economy. Rural connectivity has received top priority with funding support under the Pradhan Mantri Gram Sadak Yojana (Prime Minister’s Village Road Programme) national flagship programme ([www.pmgysy.nic.in](http://www.pmgysy.nic.in)). With the construction of 1,000 km of new roads over the last decade, the number of unconnected habitations has now come down from 410 to 244 over the last five years. The plan is to connect all habitations having population of more than 500 with all weather paved roads over the next few years.



#### 44. Spring shed development to revive critical springs

Mountain springs emanating naturally from unconfined aquifers are the primary source of water for the rural households in the Himalayan region. With impacts of climate change, manifested in the form of rising temperatures, rise in rainfall intensity, reduction in its temporal spread with a marked decline in winter rain, the problem of dying springs is being increasingly felt across this region. The spring discharge generally shows an annual periodic rhythm suggesting a strong response to rainfall. The mean discharge of the springs was found to peak at 51 litres per minute during the post monsoon (sep-nov) and then diminish to 8 litres per minute during spring (mar-may). The lean period (mar-may) discharge is perceived to have declined by nearly 50% in drought prone areas and 35% in other areas over the last decade. The springshed development approach funded under the MGNREGA-Dhara Vikas programme to revive five springs using rainwater harvesting and geohydrology techniques showed encouraging results, with the lean period discharge increasing substantially from 4.4 to 14.4 litres per minute during 2010-2011.'



Trenches and pits being dug to capture surface run off on sloping land in the recharge area of a spring to enhance the artificial ground water recharge in order to increase the dry season discharge of the spring