

## Executive Summary

**S**ikkim is one of the smallest and the least populous states in India. It covers an area of 7,096 sq. km, extending approximately 114 km from North to South and 64 km from East to West. A miniature of rich and varied depository of biodiversity, Sikkim is shelved in the womb of the mighty Mt. Khangchendzonga and her beautiful ranges extending from west to north. North by the Khangchen Gyao, Gurudokmar and Dongkhyala peak forming cold desert plateau with abundance of rare and endangered faunal resources. The eastern boundary of the state extending from Chimochi peak at the tri-junction of Tibet, Bhutan and India (Sikkim) and follows up to Sharikhidhar Gnanchung (Eastern Blue Dragger shaped mountain) along Thangkarla ranges. The eastern part of the state has unique composition of floral distribution and faunal dominance. The entire lab of the Himalayas has bountiful of water bodies in the form of fresh water lakes attributed by the glaciers and perennial snow capped mountains. These lakes are the transitory halting habitats of a large convey of migratory waterfowls. The Rangit and the Teesta rivers form the main channels of drainage and run nearly North-South. Sikkim is a part of hot spot zone and is enrich with about 4500 species of flowering plants, 362 species of ferns and its allies, 11 species of oaks, 9 species of tree ferns, 30 species of Primulas and 28 species of bamboos, 550 species of Orchids and 36 species of Rhododendrons. In fauna, the state is also very rich, 144+ species of Mammals, 550 species of birds, over 600 species of butterflies and many times more of moths.



Forestry is the major land use in the State and nearly 82 % of the total geographical area of the State is under the administrative control of the State Forest Department. Developmental activities was greatly accelerated in every sector soon after 1975 when Sikkim got merged in the Indian union, as a result, state revenue enhanced to 120.59 cores in 2006 which was only 48.44 cores in 1994. The economy of Sikkim is mainly based on Agriculture and Animal Husbandry. Approximately 11% of the total geographical area is under Agriculture. Tourism is one of the important service sector business activities in the state; about 3 Lakhs tourists visit this tiny Himalayan state annually. Harnessing the hydro electric power is yet another important industrial activity undergoing in the state. Sikkim is a land of vast variation in altitude within very short distances ranging from 300m to 8585m. Elevation plays a prime role in fashioning the ecoregions of the state. Broadly speaking there are five altitudinal zones of vegetation. All have a unique and distinct distribution of vegetation pattern as per their altitude. Protected area network has been playing an important role in maintaining the natural resources of this fragile eco-system and to the economy of the State, providing a base for recreation and tourism. Total area under Protected Area Network of State is 2183.10 sq. km (i.e.30.77 % of state's total geographical area).

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*In Sikkim, the role of water resources in the environment is paramount. The Teesta is the major river system in the state. Sikkim has only natural inland wetlands belonging to the category lakes/ponds. Physiographically, two-third of the state consists of largely snow-covered high hills with deep ravines/gorges. About 46 % of the state is forest covered. The state has cool humid temperatures ranging from 3 - 30<sup>o</sup> C. Average annual normal rainfall in Sikkim is about 2534 mm. The month of July receives maximum rainfall of the order of 480 mm and minimum normal rainfall of 19 mm is recorded in the month of December. Mean daily Relative Humidity varies from 63.8 % to 88.7 % over the basin. Sikkim is characterized with enormous water resources available through various rivers and hill streams. However, the same could not be put to utilization because of the land availability constraints.*

*Soils of Sikkim belong to 3 orders, 7 suborders, 12 great groups and 26 subgroups. It is observed that Inceptisols are dominant (42.84 %) followed by Entisols and Mollisols occupying 42.52 % and 14.64 % respectively. The flora of Sikkim Himalaya has partly been studied by the famous Taxonomist Shri J. D. Hooker as early as 1948 as a part of Flora of British India published in 1872 -1897. Since then, the Botanical Survey of India has been exploring the approachable pockets in parts of Sikkim.*

*Sikkim harbors an enormous biodiversity of medicinal plants that occur right from the humid river valleys to the cold trans-Himalayan desert. Also we have a vast repository of local health traditions and practitioners (Baidya, Amji, Bongthing, Jhankri, etc). There are a large number of traditional healers – Baidya, Dhami and Jhankri in the Nepali community, Amji and Pow in the Bhutia community and Bongthing in the Lepcha community. For these powerful faith healers, 'jhar phuk' is the key word and the first step in an interestingly complicated but inexpensive course of treatment. . The contribution of horticulture to the state's domestic product has been quite significant and therefore this sector has been receiving priority attention for higher levels of rural prosperity. Floriculture also has tremendous potential. The state government has promoted packages of extension and training programme which has received tremendous response from the village community. Poultry farming also is a commercially viable and employment oriented activity aimed at perceptible improvement in the economic condition of the rural poor.*

*The Dairy Development programme in the East, West and South district is being implemented through Sikkim Milk Union Ltd. However, it has still not been able to be a self-sustaining organization. Fisheries are an important area of economic activity. The Sikkim State Pollution Control Board (SPCB) has a regular Ambient Air and Water Quality Monitoring Programme to assess the status of pollution in the natural environment. The Government of Sikkim has launched a unique and innovative programme through the active participation of community called "State Green Mission" with the view to raise avenue plantation along the roads and beautification of all vacant and waste lands to further reinforce wide spread recognition of Sikkim being a Green State.*

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*Listed below are some of the landmark milestones for the Environment Conservation in Sikkim.*

- 1. State Government passed and announced a Comprehensive State Policy on Forest, Environment and Land Use 2000 based on the basic principle of conservation and sustainability.*
- 2. Introduced the Compulsory Environmental Education for schools in 2000.*
- 3. Mandatory Environmental Impact Assessment (EIA)/ Environment Management Plan (EMP) and Catchment Area Treatment (CAT) Plan for all Hydro-Electric Projects (HEP) & Other Projects as well.*
- 4. Ban of smoking & Pan Parag in 2001.*
- 5. The State Government demanded the Status of "Environmentally & Ecologically Fragile Protected State" from the Central Government.*
- 6. Abandoned and closed the Rathang Chhu Hydro Electric Project in West and Firing Range "G" in North Sikkim.*
- 7. To preserve the Heritage and fragile ecology, notified in 2001 sacred peaks, caves, rocks, lakes, chhorten & hot springs and banned scaling of important peaks including Mt. Khangchendzonga (8598m) for mountaineering expeditions, etc., Conservation of unique terrestrial & aquatic eco-system of wetlands/lakes by prohibiting the commercial activities.*
- 8. By legislation, banned the use of non-biodegradable materials like plastics, poly-bags, Bio-medical / chemical waste in 1997.*
- 9. Eco-governance has been strengthened by launching "CM online Website".*
- 10. In 2000 directed all the Government Department & Institutions to keep all compounds green & pollution free. No land shall be left fallow or barren.*
- 11. In 1995 banned the Green felling in forests & no clear felling, only dead, dying and diseased trees allowed to be removed for the bona fide use.*
- 12. In 1998 imposed ban on Grazing in reserved forest areas, plantation areas and water sources areas; fodder collection allowed on sustainable basis.*
- 13. Year 1995-96 declared as "Harit Kranti" year and period 2000-2010 as 'Harit Kranti Dashak' for Green Sikkim through people's participation.*
- 14. Till March 2007, minimum diversion of forest land for non-forestry purposes (approx. 934 ha in last 27 years) and compensatory Afforestation (approx. 2200 ha.) completed.*
- 15. For Community participation in Forest, Environment & Wildlife and Natural resources Protection & Management has been institutionalized through the creation of network of JFMCs (in 1998) / EDCs (in 2001) & WDCs along with the involvement of / NGOs / Panchayats with emphasis on women's participation.*
- 16. Integrated Watershed Development Program (IWDP) for Non-forest areas through the Jilla Parishad with more emphasis on fuel wood and fodder plantation to reduce pressure on natural forests and to enhance the productivity of land.*

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17. On 5th June 1999 launched "Smriti Van" program "A People's Programme" to bring people close to the nature and this Programme has been taken up in the 166 Panchayats. In the Year 2007 "Sanjeevani Smriti Van" at Hanuman Tok Forest area is being started. The concept of "RUKH BHAI TIKA" also initiated.
18. In the year 1998 the State award "Rajya Van Samrakshan Evam Paryavaran Puraskar" was constituted.
19. For Perspective planning State Forestry Action Plan & State Forestry Research Plan were formulated in co-ordination with Government of India.
20. A network Protected Area Network (PAN) of National Parks, Sanctuaries, Himalayan Zoological Park and Biosphere Reserve created for conservation of bio-diversity [PAN-30.69% (42.46% including Biosphere Reserve) of the Geographical Area]. By notification 2001 imposed ban on tourists carrying plastic bags & containers in PAN area.
21. Sikkim State Biodiversity Strategy and Action Plan (SBSAP) formulated under the National Biodiversity Strategy and Action Plan (NBSAP).
22. A State Biodiversity Park at Tendong first of its kind was created in 2001.
23. To protect Patenting and Intellectual Property Rights (IPRs) a State Level Apex Committee has been constituted in 2001.
24. In 2000 imposed ban on lopping of Dhupi tree (*Cryptomeria japonica*) and collection of Nagbeli & Mosses.
25. In 2000 all agencies in the State were directed to use the alternatives of wood in construction to conserve the forests & ecology.
26. A State Medicinal Plants Board (SMPB) was established in June 2002 for conservation and development of medicinal plants sector. Many Herbal Gardens created in various representative areas along with creation of mass awareness for cultivation. A JARI BUTI KOSH has also been created. A Sanjeevani Herbal Garden (about 50 ha area) has been planned at Hanuman Tok near Gangtok. There is restriction for commercial exploitation of medicinal plants from the wild areas.
27. Modern tools for forest protection like Wireless communication network, Arms and Ammunition, Global Positioning System (GPS), Fire Fighting Equipments have been introduced since 2001.
28. State Forest Act has been Amended in 2000 & related rules made with Strong legal provision for forest resources offences. Number of illegal encroachers from forests and protected areas evicted.
29. To avoid the Land slides/slips/erosion of areas, treatments and reclamation has been made an integrated part of project planning.
30. For Tourism Development "Tourism Master Plan" has been developed on the committed principle of Eco-tourism and Nature tourism with strict measures.

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31. *In Urban and Semi-Urban areas the concept of Urban Forestry, Eco-cities & Eco-village has been developed and is under implementation.*
32. *As per State Industrial Policy 1996, only eco-friendly, pollution free and Green industries would be encouraged.*
33. *The Sikkim Human Development Report 2001 and Sikkim People's Vision 2001 documents prepared for perspective and sustainable development of State.*
34. *Organic State – no use of chemicals, pesticides & insecticides etc. and only the use of bio-manure shall be encouraged.*
35. *70 % of the State budget outlay has been earmarked and shall be used for the Integrated development of rural areas.*
36. *The concept of "Model Village" implemented in each constituency.*
37. *In the ruling Sikkim Democratic Front (SDF) Party's decadal conference held in March 2002, a numbers of resolutions were passed for protection and conservation of natural resources, Environment, biodiversity, glaciers, lakes/ wetlands, Wildlife, Medicinal plants and culture/heritage/traditions as well.*
38. *Election Manifesto: In the manifesto of General Election for Parliament & Assembly and for Panchayats election, major emphasis has been given by including the area of concerns for Preserving Environment, Pollution free, Biodiversity, Medicinal plants, Water Resources, traditional knowledge, wildlife, heritage sites, Participatory Afforestation, Plantation, Smriti Van Programme, Herbal gardens and Protection of Forests & Forest lands.*
39. *To reduce the dependence of villages on firewood and forests, Free LPG connection for people below poverty line and economically weaker section of society are being provided since 15th August 2002.*
40. *Constitution of High Level Task Force (Environment Commission) for Environment and Natural Resources.*
41. *Sikkim Green Mission 2006 – To Integrate the People with Nature & Invoke Mass Support for the cause. All road projects to have green/plantation components. 2% budget of SPWD(R&B) and RMDD and 1 % of all other Departments have been earmarked for the Green Mission.*
42. *Sikkim State Biodiversity Board constituted in 2006 and Sikkim State Biological Diversity Rules 2006 formulated.*
43. *Green Roads: All the Road construction agencies have been directed that the construction of road and their stabilization works along with plantation must go together.*
44. *Continue Increase in Forests Cover: In 1987 it was 38.8 4% and in 2003 it has gone to 46.28 % which is the best example of sustainable development in the world.*
45. *Highest Green Protection Index: Sikkim ranks highest on India's Green Protection Index (0.903) by the protection of its natural resources as per Green Indicators 2004, a report by NOIDA; India based NGO Group "INSCRIPTION" in Down TO Earth May 2004.*

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46. *Capacity Building Programme: The State Government has given special emphasis on capacity building of all levels of employees and public as well. 2 % budget of each department is earmarked for the purpose.*
47. *Eco-Clubs, Green Funds created in a number of schools & colleges.*
48. *Gangtok- MG Marg declared as "Spit Free Zone" to minimize the pollution.*
49. *Sikkim Wildlife (Regulation of Trekking) Rules 2005, Guidelines for Appointment of Himal Rakshak 2006, Pokhari Samrakshan Samiti 2006, State Environment Agency 2006, Guidelines for Lake Conservation in partnership with Gram Panchayats and Pokhari Samrakshan Samiti's in Sikkim 2006, formulated.*
50. *Construction Projects: No final bills of executing agency or contractor shall be released until the Environment & Forestry measures are taken along with the clearances.*
51. *The State Government has decided that every family shall have FOUR DUSTBINS for disposal of different kinds of waste materials.*
52. *Glaciers Study & Action Plan to take the timely action on the affect of Global Warming on our water resources, the State Government has decided to constitute a Expert Group for the purpose.*
53. *Ban on killing of Wildlife and aquatic animals has been imposed by the Government.*
54. *In the MOU/ Agreement signed with Power Project Proponents, sufficient provisions has been made for Rehabilitation & Resettlement Plan, Environment Cess @ One paise per unit of electricity sold, Catchment Area Treatment (CAT) Plan, EIA/EMP studies with State Government & Maintaining Ecological balance etc.*
55. *Sikkim Ecology Fund and Environment Cess Act 2005 and the Sikkim Ecology Fund & Environment Cess Rules 2007 enforced from 1st April 2007.*
56. *National Bamboo Mission Programme launched in the State for Development Bamboo Sector from 2007.*
57. *Wetland Conservation Programme for protection, conservation & management lakes and wetlands is being implemented from 2007.*
58. *The Regeneration and Plantation of rear, threatened and endangered species shall be taken up on priority.*
59. *Sir Chogyal Palden Thendup Namgyal Memorial Park near White Hall, Gangtok established in 2008.*
60. *Saramsa Garden upgraded to International standard in 2008.*
61. *Hydrangea Park and Bhanu Path upgraded with modern water fountain in 2008.*
62. *The Eco-tourism Directorate created and notified in 2008.*
63. *Hamro Van Media launched in 2008.*

### *Suggestions*

*The present report is an attempt to integrate information on the driving forces and pressures acting on the environment; the existing state of the environment; the resulting impact and the responses developed to reduce the pressures and improve environmental conditions. In order to mitigate negative impacts on the environment, protect, preserve & improve its quality and strengthen the endeavors of government and all agencies, as well as, ensure participation of masses in environment protection, the report suggests the following initiatives:*

- *In-situ soil conservation vis-à-vis protection of significantly vulnerable areas: Geologically, Sikkim has very fragile zone indicating frequent soil erosion, landslides which are predominantly intrinsic in character causing huge damages to eco-system, environment and threatening the survival of mankind.*
- *Protection and regulation of glaciers must be ensured: Glaciers are renewable store house of freshwater. Global warming is causing them to retreat at a faster rate. As glaciers retreat, banks of erosion debris are left, and recent melting has in many cases led to the formation of lakes behind them. With rapid melting, lake level can rise over the containing bank making these high altitude lakes potentially very hazardous. Catastrophic flooding can be caused down slope with serious damages to life, forest, farms and infrastructure.*
- *Effective policies for urban solid waste management to be implemented.*
- *Measures to prevent and control the pollution in river system to be promoted.*
- *Water quality monitoring network to be further strengthened.*
- *To control air pollution especially by traffic, the following actions to be taken up:  
>> Catalytic converter to be made compulsory in vehicles.  
>> Regular smoke test for vehicles.*
- *Low cost sewerage treatment facilities to be promoted in rural areas.*
- *The Teesta Basin based water conservation plan needs to be prepared to ensure the pollution control due to contamination of feeder streams located in urban areas.*
- *Proper planning required for the protection of the catchments from biotic interference and any infrastructure development.*
- *Strategies for landslide treatment by both the biological and engineering methods to be strengthened.*
- *Wetlands are the main sources of down water supply, hence wetland conservation strategies need to be strengthened and promoted.*
- *CDM through A & R needs active role of the community.*
- *Tourism development is one of the top agenda of the government, hence eco-friendly and sustainable planned tourism spot should be developed.*
- *The State Green Mission is economic and eco-friendly program. The effort should be contemplated to develop this program into way of life of the community.*