SYNTHESIS

A person is either the effect of his environment or is able to have an effect upon his environment
-Anonymous

SYNTHESIS

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Our natural capital in air, water, land, bio-diversity and eco-system is continually being encroached upon and there is an urgent need to protect our heritage and traditions that are under threat. As our knowledge of the environment's own threshold to recover from damage has increased, there has emerged an awareness of the irreversibility of human actions and the urgency to maintain the symbiotic relation with nature. Managing the activities of the people in a way that conserves the habitats and resources and at the same time promotes development is extremely complex and difficult. To ensure sustainability, there is a need to integrate the environmental concerns with the economic, social, and developmental concerns.

To address the issue of sustainable development there is an utmost urgency to assess the present environmental scenario, trends of environmental pressures and to evaluate the mitigation measures so as to minimize the impacts. The State of the Environment Report provides to the utmost extent, information on the environmental trends and changes and their significance for effective, efficient environmental planning and management. While the Department of Ecology and Environment, Government of Karnataka did prepare State of the Environment Reports in the past, the present State of the Environment Report is a more comprehensive attempt to provide an independent assessment of the State of Karnataka's environment in the year 2002-2003. The objective of the present State of the Environment Report and Action Plan is to identify and prioritise environmental issues and to correlate with the potential threats arising due to environmental degradation. It provides recommendations and action plans at the legal, institutional, regulational, financial and implementation levels not just in isolation but tries and links them with the ongoing and/or proposed strategies of the respective concerned departments/institutions. The Report also provides directions to enhance capacity of institutions so that environmental priorities can be set and to develop and implement necessary policy and mitigation measures.

Framework of the Report

The Report documents the present status of sectoral areas comprising both natural resources as well as the related activities and their impact on natural resources. Sectors like biodiversity, air quality, water resources, forests, coastal zone management deal with the status of environment and the effect of human interventions on them; while sectors like industrial pollution, transportation, mining and quarrying, energy, wastes, water supply and sanitation, urban planning deal with the activities and their effect on environment.

The sector pertaining to health has drawn from the findings of the other sectoral studies and is treated separately as health problems arise due to synergistic effects of several activities. It is important to clarify here that water has been divided into two sectors – one dealing with water resources and another with consumption activities of people and problems of sanitation as water is an important resource and its usage is a major activity. All the sectoral studies followed a uniform framework in their study of the subject, based upon the terms of reference. The sectoral studies have reviewed the current environmental situation in the State as relevant to the sector, analysed the pressures and underlying causes, impacts, legislations as pertaining to the sector and have suggested a set of recommendations and action plans along with a framework of economic social, legal instruments where relevant.

Blue agenda represents water resources, rural and urban water supply and sanitation and coastal zone management.

Brown agenda represents the sectors whose activities cause environmental degradation, industrial pollution, air quality and indoor pollution, waste management, mining and quarrying, land degradation and transport.

Green agenda represents the forest and biodiversity sectors.

Purple agenda represents urban planning, energy and health sectors which are impacted by the above mentioned sectors

Methodology

The process of selecting the sectors for the State of the Environment Report study as well as the process of identifying experts / consultants for the study was a highly participative and interactive process. The Secretaries to government, heads of departments were involved from the inception stage of identifying sectors and preparing overall terms of reference for the report as well as the specific terms of reference for the identified sectors. Several consultants were short-listed based upon their area of expertise and the presentations made by them to a select group of Government and World Bank officials and the best were then selected as consultants to the Report. Since primary data was unavailable, it was decided to depend on the secondary data to reflect the current status as it is difficult to obtain primary data due to time constraint for the purpose of this State of the Environment Report.

While accurate and reliable data is essential, the environmental information management lacks the right type of data to enable systematic and consistent data analysis. While data related to the environment is collated by most departments, the data is either not updated regularly or it is not available for the entire State or does not cover the parameters required for environmental analysis. For some aspects of environment for example data on water quality and quantity there has been regular monitoring, since it is easy and inexpensive to obtain the data, while some aspects like air quality, environmental impacts on health, complete data is not available since air quality is monitored only in select places and positioning equipments in several areas is expensive. Where data exists, the methodologies used by different departments for the same parameter are different which hinders the data correlation.

The value of this state of environment report lies in the fact that disparate data and information have been transferred into meaningful and relevant material to enable decision making. Remotely sensed data has considerable potential for providing time series environmental conditions for large areas. Such data maps have been sourced and placed in the sectors pertaining to forests, land, mining and water resources. However, despite the potential of such data the availability of large scale change maps is limited. It is recommended that remote sensing be used as an effective monitoring tool by all institution to record envirnmental changes over time.

The development of an environment information system (EIS) would be most appropriate at this stage. Such a system would bring together integrated monitoring and databases, remote sensing and GIS capability and set standards for the environment information system. This would also facilitate public accses to environmental information and data sharing. Duplication of databases could also be avoided.

The non-availability or lack of relevant information either leads to a delayed response to an urgent problem or the formulation of faulty or costly policies. Availability of accurate, credible information on environmental trends will not only raise awareness and public participation in environmental discussions, but also at the same time would make the departments more accountable.

In spite of the handicap faced in obtaining primary data, with the existing secondary data, the State of Environment Report portrays a realistic assessment of the present state of the environment in the state, the pressures on the environment, underlying causes and impacts and conclude with sectoral strategies and action plan.

Since many sectors overlap, at every stage of the Report, inception, interim report, draft final reports; consultants would present the outline of their reports in workshops and based on the feedback make revisions. In addition to this, three workshops were also held for various stakeholders at Mangalore, Bellary and Bangalore to validate the findings of the Reports. More importantly, at the draft final report stage, the reports were circulated to all the concerned Secretaries to Government, heads of departments and their feedback obtained. We would like to place on record the cooperation and interest evinced by all those who responded, participated in the workshops and provided valuable inputs to the report.

Overview of Karnataka's Current Environmental Status

Blue Agenda

Needless to say, amongst the sectoral studies, water has had high priority and attracted the most interest. Dirty rivers / water bodies are a reflection of our way of life, decaying testimony and mirror to the rapid urbanisation, the current agricultural techniques, industrialisation and our sanitation practices. The increasing pollution to the water bodies constitutes the biggest threat to public health. We simultaneously abuse and worship our rivers. Municipal sewage treatment facilities wherever they exist in the State do not remove the presence of heavy metals before discharging the effluents into the rivers. Over extraction of water for irrigation and urban consumption has lead to drying up of several water courses.

The demand for water continues to escalate. Seventy five percent of the cropped area in the State depends on low and uncertain rainfall. The State receives an average rainfall of 1138 mm ranging from 569 mm in the eastern part of the State to 4029 mm in the western part of the State. There has been deficit rainfall in most parts of the State since the past three years, emphasizing the need to focus on activities for harnessing rain water and recharge of ground water.

Seven river basins drain the State with the Krishna and the Cauvery being the main river basins. While there is over utilisation of water in irrigated areas leading to environmental pressures, there is also under-utilisation of water in several other potential areas due to incomplete irrigation projects. About eighty percent of the west bound river water is not fully utilised and is allowed to drain into the sea.

Inequalities and inefficiencies in the distribution system leads to water supply falling short of the demand in both urban and rural areas for all sectors. Sixty four percent of the rural habitations and forty seven percent in the urban areas receive less than the State stipulated water supply norm of 55 and 135 litres per capita per day for rural and urban areas, respectively.

Discharge of industrial organic pollutants, municipal effluents and sewage into the water bodies, leaching of pesticides and fertilizer into ground water, crop violations, and ineffective watershed management especially in the upstream of command areas have degraded the water resources of the State. As a result, the problems of water logging, salinity and siltation occur especially in the command areas, affecting the quality of ground water and causing health related water-borne diseases. Polluting substances include organic matter, metals, minerals, sediments, leachate, and toxic chemicals. The water quality and pollution is generally measured in terms of the concentration or load of any of the pollutant materials or substances in the water as mentioned above based on prescribed standards which vary depending on the source of sampling of the water and the purpose.

Fourteen districts of the State have more than the admissible limits of 1.5 microgram per milli litre of fluoride, affecting 10 to 67 percent of the habitations of these districts. Also, 13 districts are affected by brackishness, there is excess nitrate in 8 districts and excess iron in 12 districts. These problems related to water quality are not mutually exclusive and overall affect 37 percent of the habitations in the State. The study of ground water in the vicinity of major industrial areas of Attibele, Jigani, Bidadi, Devanahalli, Nanjangud, Machenhalli revealed that the ground water exceeded the permissible limits for total dissolved solids.

By 2001, only 15% of the rural areas in the State were covered with some form of sanitation system. Such inadequate coverage leads to open air defecation resulting in contamination of soil and water. There is also a problem of mis-utilisation of the constructed toilets. In the urban areas also, only 36 of the 226 local bodies, excluding Bangalore, have been connected with underground drainage system. Slums with inadequate or non-existent sanitation facilities are further cause of environmental degradation.

The Government programmes of Swachcha Grama Yojana, Nirmala Grama Yojana and Swajaladhara focus on participatory management. There is need to have increased greater sanitation coverage in the rural areas.

Projects in 8 towns of the State under the National River Conservation Project are aimed at interception and diversion of the municipal sewage from entering into the rivers. It is true that considerable progress has been made in this direction under the programmes mentioned above, still many households in the rural area do not have toilets and most villages lack drainage and sanitary facilities, thus causing serious health problems and contamination of water. There is urgent need to provide adequate and safe drinking water in the rural areas. Provision of adequate water supply and sanitation facilities are the responsibilities of the local village panchayats but, however, this focus is generally on drinking water supply and sanitation is neglected.

At present, there is no facility to test the quality of water in the villages. The Rural Development and Panchayat Raj Department should consider this as a priority and provide water testing facilities in a group of villages or at places close to the villages. The possibilities of tie up with nearby engineering colleges may also have to be explored. The self-help groups, particularly women self-help groups should be motivated to take up management of village sanitation and community toilets.

Karnataka has an indented shoreline of 320 kilometers characterized by lagoons, bays, creeks, spits, sand dunes and long beaches. The coastal and marine ecosystems are also under some degree of threat due to occupational pressures, salinity intrusion, siltation, water pollution and unsustainable marine fishery activities. Selective scooping by trawl nets has exerted pressure on the benthic organisms.

Mining of sand near estuaries, removal of clay from river banks has accelerated top soil removal which is resulting in water logging. The Coastal Zone Regulation Notification, 1991, under the Environment (Protection) Act, has helped in regulating activities detrimental to the coastal environment. The present work of mapping the coastal and riverine stretches in the cadastral maps and also installing pillars along the coast to physically benchmark the High Tide Line would help the local administration in the three coastal districts to regulate activities in the coastal areas.

Brown Agenda

Development, population pressures have had their resultant effect on quality of the natural resources land, air and water. Karnataka has the dubious distinction of having over 80 percent of the land under rain fed cultivation, next only to Rajasthan. The consecutive drought in most parts of the state over the past three years has only compounded the problems. Almost 40.3 percent of the total geographical area of the state is affected by soil degradation caused due to subsistence farming practices, accelerated soil and water erosion, erratic rainfall and high density of livestock population. The watershed project has so far brought in 32 lakh hectares under integrated land management practices, but still more than 75% is yet to be covered.

One of the main environmental problems is the use of chemical fertilizers and chemical pesticides contaminating the soil and water. In Karnataka, though the average use of fertilizers (10-11 kg per hectare) is lower than the national average of 16 kg per hectare, there is an increasing trend in the use of fertilizers from 8.27MT in 1996-97 to 12.94 MT in 2000-01. Maximum fertilizers consumption occurs in paddy and sugarcane growing districts of Belgaum, Bellary, Raichur, Mandya and Davanagere. Use of pesticides, especially insecticides for the crop of cotton, red gram and vegetables while lower than the national average is still a cause for concern. The pesticides, which are not easily biodegradable enter the aquatic fauna herbivores and human body through food and water and accumulates in the human body over a period of time. This bioaccumulation in the body is a serious health hazard. While specific information on this is still very scanty, yet isolated studies have revealed the presence of pesticides beyond permissible limits especially in vegetables. Fortunately, the ban on DDT and BHC and increased adoption of integrated pest management practices have curtailed the use of some very harmful pesticides. However, the risk of pesticide leachate and its effect on human health remains.

Improper disposal of municipal, biomedical and industrial and hazardous waste has reduced in the past few years. Private facilities of the disposal of biomedical waste are

now operational in Bangalore, Mysore, Dharwad and Belgaum and two other facilities are under construction in Gulbarga and Mangalore. Of the 227 Urban local bodies, 215 local bodies are now moving towards compliance of the Municipal Solid Waste (Management & Handling) Rules 2000, by applying to the KSPCB for authorization to scientifically dispose their waste. However, there is laxity in enforcement. Resource crunch of the urban local bodies, inadequate disposal facilities, problems of mixed waste, illegal disposal of waste impact health.

The accelerated growth of industrial service and transport sectors and mining activities has also led to problem of water management, air pollution and land degradation. Improper disposal of industrial effluent and other solid wastes is another cause of concern. 14292 industries of all categories are under the consent regime of the KSPCB. 140 industries including sugar, bulk drugs and pharmaceuticals, distilleries, pulp and paper, cement and thermal plants fall into the category of highly polluting industries. While some of the large industries have their own effluent treatment plants, most of the smaller industries even though situated within industrial estates let out their effluents after primary treatment in to the nearby sewer lines or in water bodies

Mining and quarrying activities have led to land degradation and affected biodiversity especially the districts of Chickmagalur, Bellary and Gulbarga. Slurry from mines, effluents with toxic chemicals and discharge of leachate from mine waste, surface runoff from overburden dumps during the rains are causing moderate to severe extents of water pollution in the areas surrounding the mines. Closed or abandoned mines are also environment hazards mainly due to surface runoff. The closed gold mines in Kolar district are also a cause of concern due to the waste dumps and the possible leaching that may occur. Quarrying for minor minerals, especially sand, has affected the fragile riverine ecosystems of the coastal areas. Quarrying for building materials and granite in the districts of Chamarajanagara, Tumkur, Mysore, and Bangalore has also resulted in land degradation and depletion of ground water. Open cast mining also causes substantial noise pollution.

Urban air quality has been showing a gradual decline and in the rural areas indoor air pollution is a cause of major concern. Suspended particulate matter is very high in the commercial areas of Bangalore as well as in the Hassan and Davanagere.

Most of the locations monitored in Bangalore registered carbon monoxide levels higher than the standards stipulated. On both the monitoring occasions, oxides of nitrogen were found to exceed the standards at commercial locations, while for sensitive location the levels exceeded more than 5 times the standard. Other Municipal Corporation areas such as Mysore, Gulbarga and Mangalore have moderately high levels of suspended particulate matters.

The major source of high suspended particulate matter levels is from combustion of fossil fuels. In most of the locations monitored for air quality sulphur dioxide has been below the norms except in the Baikampady area of Mangalore where it is recorded as moderately high. The small size particles of respirable particulate matter are easily inhaleable and are a result of fuel combustion and re-suspension of road dust.

Other emissions causing concern are carbon monoxide, particulate lead, hydrocarbons and other organic carcinogens. The introduction of unleaded petrol, low sulphor diesel and LPG for the bi-fuel mode vehicles is likely to bring down these levels in the near future. The most important factor causing indoor air pollution is indoor heating and burning of solid fuel during cooking. 97% of rural and 73% of urban households use biomass fuels. Other causes of indoor air pollution include tobacco smokers and dust mites which lead to many health effects including discomfort, irritation, chronic pathologies, and various cancers. However, air quality monitoring leaves much to be desired in terms of number of pollutants being monitored, selection of monitoring sites and low density of monitoring stations.

The environmental problems associated with the transport sector can be attributed to significant growth in vehicular traffic, the composition of vehicles, nature of roads and road network, quality of fuel used and inadequate

monitoring. Air pollution and noise pollution occurs where the density of vehicles is high, especially in Bangalore, moderate in other major urban centres like Hubli-Dharwad, Mysore, Belgaum, Mangalore and Gulbarga, and minimal in other urban centres. Most buses, auto rickshaws, and motorcycles grossly exceeded the noise level, and on Bangalore's Mahatma Gandhi Road, the levels were as much at 82.5 dB. Roads passing through protected forestlands and other ecologically fragile areas, such as the Western Ghats, have longer-term impacts on the local ecosystem, particularly because they fragment ecosystems, despoil wetlands, and interfere with animal movement corridors. Port activity leads to pollution of water as well as soil/beaches due to oil spillages and washouts of containers.

Green Agenda

Karnataka's forests unique in their formation and diversity, are not only a source of livelihood to many people, but also act as "carbon sinks". Forest cover is computed as 19.3% of the geographical area of the state. This represents 5.5% of the forest cover of the country. 70.71 % the forest cover is classified as dense forest. Karnataka is ranked fourth in the country in regard to area under tree cover. The per capita forest to tree cover availability is 0.8 hectares. The Western Ghats of Karnataka are listed as one of the 18 mega biodiversity hot spot in the world. This hotspot is home to about 4500 plant species, and the forests of the state are home to 10% of the tiger and 25% of the elephant population of the country. However, to date, our knowledge of many of the biodiversity species is still very limited. Sustained initiatives of the Government over the past many years has resulted in the raising of plantation cover to about 16 Lakh hectares of both forest and non forest land. Even though there has been an increase in the protected areas of the state, yet biodiversity losses are irreversible.

Beginning with a Forest Policy in 1952, focused on forest, soil and water conservation, an exclusive act, the Wild Life Act was enacted in 1972 and the Forest Conservation Act in 1980. Though, all these Acts had an element of biodiversity conservation, yet it is only the Biological Diversity Act, 2003, that provides for several measures aimed at conservation, sustainable use and equitable sharing of the biodiversity resources. With this Act, the protection of biodiversity resources now extends beyond the forest protected areas into the non protected areas and aquatic life and avian also. The Act provides for the establishment of the National Biodiversity Authority and State Biodiversity Boards. The Biodiversity Board for Karnataka was constituted on 19-6-2003.

Policies to manage the green cover have undergone radical change in their focus and approach. The forests have now been opened to village forest committees through the joint forest management approach and this participatory approach has yielded positive results.

In spite of the initiatives taken, there continues to be loss of forest and biodiversity due to increasing anthropogenic pressures, unsustainable use of resources, inadequate participatory management, habitat destruction and fragmentation. Introduction of exotic organisms, invasive species such as weeds and insects also pose a serious threat to biodiversity. Open areas in urban ecosystems are also shrinking, so are old irrigation tanks that constitute urban wetlands. Many have drained, others are highly polluted and eutrophicated, resulting in a loss of their biota, including indigenous fish communities and migratory waterfowl.

Concerted efforts have to be made to address certain issues like removal of trees for firewood, grazing in the forests and also to meet development demands for hardwood, pulpwood, bamboo, canes and medicinal plants. It is possible to evolve an effective and integrated policy to make available firewood to the rural areas by raising plantations both on wastelands and farmlands. In the same way the need for pulpwood, bamboo can be met by suitable agro forestry practices and also by encouraging regeneration of bamboo and cane species.

Purple Agenda

Poor efficiency in energy utilisation in the agricultural, transport, industrial and domestic sectors as well as distribution losses is leading to depletion of non-renewable resources. Depletion of non renewable resources, unequal

distribution of energy, improper location of power plants, degradation of forests due to firewood collection and hydro, nuclear power projects and transmission lines, soil pollution due to fly ash in thermal power plants, air pollution are some of the environmental impacts which have surfaced due to thermal power plants and captive diesel generator power supply units.

Urban environmental problems stem from the inadequacy in the urban planning framework, and the supply-demand mismatch between the needs of the urban population (in terms of housing, water supply, sewerage system, garbage disposal and the need for open spaces). The city corporations and municipalities no doubt deal with environmental issues, pertaining to waste management, sanitation, treatment of wastewater etc. Still, they are perceived as general health issues and not as environment issues. The environmental component is lacking in the preparation of the Master Plan for the cities.

Environmental pollution triggers varied and widespread allergies and disorders in the general population thereby affecting the quality of human life. Growing number of diseases have been linked to environmental exposure. These diseases range from traditional water borne, food borne and vector borne ailments and acute respiratory infections to asthma, cancer, arsenicosis, fluorosis, certain birth defects and developmental disabilities.

Outdoor air pollution due to industries and transport and indoor air pollution due to incomplete burning of fuels are responsible for increasing respiratory infections and allergies. Pollen, dust mites, fungi and irritants like tobacco smoke, formaldehyde, cleaning agents and areosols are known to trigger asthma, increased bronchial hyperreactivity, wheezing, irriatation of eyes and have been on an icrease now. Sleep disturbance due to increased noise pollution has also been on an increase.

Lack of sanitation and safe drinking water facilities, disposal of untreated industrial waste waters, increased use of chemical fertilisers and pesticides have shown an increase in number of attacks of gastroentritis, viral hepatitis and typhoid. Injuries sustained by sanitary workers and rag pickers while handling bio medical and municipal solid waste have been infected with germs causing abscess, impetigo, erysephalas, exposure to food wastes with plastics and fungi grown on food waste cause allergy, asthma, rhinitis, etc.

Economic and Legal Instruments

There are several direct and indirect economic and legal instruments in the State which are being used to curtail environmental degradation. Some include the Command and Control Methods (CAC), Economic instruments or Market based instruments, and Community based instruments.

Under the Command and Control Methods, often used by the Government, are the taxes and levies under the existing laws and regulations. They are implemented and monitored by various governmental bodies such as Pollution Control Board, rural and urban local bodies, Department of Forest, Water Resources, Mines and Geology, etc. Economic instruments can be divided into three categories, namely price and tax based instruments, quantity and quality based instruments and hybrid instruments. Mix of various tax-subsidy-quota systems are often evolved as operationally feasible strategies. With difficulties in the legal and policing system to control pollution other market based instruments, collective community based instruments can be introduced. Empowering groups of people to take the responsibility of managing the environmental problems is one such instrument.

Polluter pays principle

Polluter pays principle is not a part of the basic environmental law of the land. It requires that a polluter bear the remedial or clean up costs as well as the amounts to compensate the victims of pollution. Most industrialized countries subscribe to the polluter pays principle. The polluters should internalize the costs of their pollution, control it at its source, and pay for its effects, including remedial or cleanup costs, rather than forcing other states or future generations to bear such costs. The remedial costs should also include costs to restore the damaged ecology or degraded environment. This principle has been recognized by the Indian Supreme Court as a 'universal'

Initiatives of the Government

- Task force for the control of air pollution in Bangalore City set up on 10-09-2001 under the Chairmanship of Additional Chief Secretary.
- Supply of 5 percent ethanol blended petrol in 20 districts from 9-5-2003 and in the remaining 7 districts from the end of September 2003.
- The State Biodiversity Board has been constituted in July 2003 under the Biological Diversity Act, 2003.
- Around 1.2 million hectares of forest and non forest land have been afforested in the last 25 years in the state.
- To encourage sandalwood cultivation, the Karnataka Forests Act has been amended. The ownership of sandalwood trees grown on private lands now vests with the land owner. The rules governing felling, transport, conversion and disposal of sandalwood have been liberalised. Provision has been made for payment of market value to owners of sandalwood trees.
- The Watershed Development Programme is being implemented in 26 districts. This programme involves reclamation of alkaline and saline land and afforestation.
- Government order dated 16th January 2004, provides for site and environment clearance for mining projects. Mandatory environment clearance is required for mining projects (major minerals) with leases more than 5 hectares from Ministry of Environment and Forests, Government of India and for mining projects of major minerals with lease area less than 5 hectares and for minor minerals with lease are above 0.5 hectares from State Environment Clearance Committee.
- The Karnataka Groundwater (Regulation for Protection of Sources of Drinking Water) Act 1999 of the Rural Development and Panchayat Raj Department, amended in December 2003, prohibits sinking of borewells within 500m of public sources of drinking water.
- Nirmala Grama Yojana is under implementation since 1995 to built household latrines in rural areas. Under this programme, households in villages would be sanctioned with a maximum financial assistance of Rs. 2000 or 80 percent of the unit cost.
- Swachha Grama programme has been initiated to promote total village sanitation and all round development of villages.
- The Department of Ecology and Environment has isued directions to the Bangalore Mahanagara Palike, Horticulture Department, Public Works Department and Trnasport Department to use only tertiary treated water for non potable purposes.
- The Karnataka State Highway Improvement Project is a major effort to upgrade and improve transportation infrastructure with assistance from World Bank. It will widen and strengthen 991 kilometers of road to two lane width and also rehabilitate 1277 kilometers of existing carriageway in two phases between 2001-2007.
- The Jala Samvardhane Yojana Sangha (JSYS), has been set up to facilitate planning and implementing the task of rejuvenation of tanks with community participation.
- The Raitha Kayaka Kere programme of the Minor Irrigation department focuses on improving rural livelihood by developing and strengthening community-based approach for improving and managing selected tank systems.
- The Lake Development Authority has been set up in 2002 for restoration of tanks in urban areas.
- For the first time a definition of hertiage building is given in the amendments to the Town and Country Planning Act, 1961. The preparation of Outline Development Plan and Comprehansive Development Plan has been given a go by. The amendment provides for preparation of Master Plan in one stage within a period of one year. Further, there is a mandatory provision requiring revision of Master Plan once in ten years.
- An Authority has been set up by the State government to oversee the maintenance and development of Lalbagh, Cubbon Park, and Freedom Park.
- Fly ash utilisation in Raichur Thermal Plant is around 35 percent and is expected to reach 60 percent in a few years.
- Electricity companies in the state are providing subsidy for those using solar water heaters in their monthly electricity bills.
- The entire coastal stretch of 320 kilometers along with riverine estauarine stretches is being mapped and the coastal regulation lines of High Tiide Level and Low Tide Level and zonation are being depicted in the cadastal maps. The pillars indicating the distance and direction from the High Tide Level are being shown in the ground and or the maps.

rule to be applied to domestic polluters as well. Moreover, it has been accepted as a fundamental objective of government policy to abate pollution.

Institutional Setup and Environmental Management

The Government of India is a party to many international environmental conventions on biodiversity, ozone depletion, climate change, hazardous waste and trade in endangered species of fauna and flora. The Government of India has put in place a sound legal framework for environmental protection and natural resource conservation which includes Environment (Protection) Act, 1986, the Air (Prevention and Control of Pollution) Act 1981, the Water (Prevention and Control of Pollution) Act 1974, the Biological Diversity Act 2003, the Wildlife Protection Act, 1972, the Forest Conservation Act, 1980. Notifications under the Environment (Protection) Act include, Hazardous Wastes Management and Handling Rules, 1989, Municipal Solid Wastes Management and Handling Rules, 2000, Biomedical Wastes Management and Handling Rules, 1998, Batteries (Management & Handling) Rules,2001. A separate notification for the regulating activities in the coastal areas of the country, the Coastal Regulation Zone Notification, 1991, is also under force. The strong legislative base demonstrates political commitment.

Environmental management in the State is the responsibility of all the stakeholders, citizens, NGOs and government departments. However, implementation of the statutory acts, rules and regulations issued from time to time under the Environment (Protection) Act is the fundamental responsibility of the Department of Ecology and Environment and the Karnataka State Pollution Control Board. The department of Urban Development is statutorily responsible for implementing the Municipal Solid Waste (Management & Handling) Rules, 2000.

Department of Ecology and Environment

The department of Ecology and Environment was established in 1981 with the objective of improving the environment and ecological situation in the State. The department's mission is to protect and improve the environment, ecology and natural resources of the State through the prevention and control of pollution while ensuring the sustainable development of the State. Since 2001-02, the department has also been implementing the Government of India programmes of National River Conservation and National Lake Conservation.

The department is also responsible for protecting and conserving the ecologically sensitive 320 km coast line of the State through the Coastal Regulation Zone Notification, 1991. The department has set up offices in the three coastal districts of Karnataka to protect the coastal environment. For the first time the entire coastal stretch is being mapped to the cadastral scale and statutory lines are being demarcated with the support of the National Hydrographer's Office, Dehra Dun. This will enable the local people to have the first hand knowledge of the Coastal Regulatory Zone regulations, compliance to which would help in conserving the coastal ecosystem.

Under the Department of Ecology and Environment, the Lake Development Authority was set up in June 2002 to regenerate the urban lakes. The Authority headed by the Chief Secretary, Government of Karnataka, has Secretaries to Government, Heads of Departments and NGOs as members. The main objective of the Authority is to identify lakes for development, set modalities for development and maintenance of lakes and encourage public-private partnership in lake conservation and development.

As mandated under the Biological Diversity Act, 2003, the Karnataka State Bio-Diversity Board has been set up by the Department in June 2003 to protect and conserve the rich bio-diversity of the State for the future by identifying, documenting, creation of database and developing programmes for conservation of endangered, threatened species.

The department functions with the following main objectives :

- Facilitate the development of policy on the issues related to the environment and the ecology in the State.
- Ensure effective implementation and statutory compliance to the Environment (Protection) Act, Air

and Water Acts and all the other notifications issued under the Environment (Protection) Act.
- Facilitate and coordinate awareness programmes, studies and research activities on environment and ecology related matters.
- Oversee the activities of the Karnataka State Pollution Control Board, Lake Development Authority, Bio-Diversity Board and CRZ Offices, Environmental Management & Policy Research Institute (EMPRI).
- Evaluate the effectiveness of Government institutions in terms of their major environmental functions.
- Strengthen the capacity of local institutions to address local environmental problems.

In order to achieve the stated objectives, the Department adopts the following strategies:

- Explore economic investment incentives / disinvestments to reduce pollution.
- Use of the media effectively to create awareness about environmental matters and environmental law.
- Integrate efforts of different Government agencies having similar objectives and programming functions that help in environment protection and eco-system improvement.
- Facilitate and encourage institution / individuals in implementing plans / projects / schemes for environment protection and improving the eco-system.

In future, the department would focus on promoting use of cleaner technology in industries, to reduce pressure in the natural resources. The department would also make efforts to ensure the protection and sustainable use of bio-diversity in the State, and work towards protecting the intellectual property rights of the people having traditional knowledge.

The department realizes the importance of making environmental education as a part of the curriculum and is strengthening the scheme of eco clubs in the State. Overall, the future challenges of the department would lie in bringing down the levels of all forms of pollution and reduce environment related health problems. The department faces a major constraint in the lack of sufficient budgetary support. There is also a lack of priority of environmental issues in practice. The other constraint that the department faces is non-inclusion of mandatory environmental appraisal in various developmental projects other than industrial projects.

Karnataka State Pollution Control Board

The Karnataka State Pollution Control Board was constituted by the Government of Karnataka on 21.9.1974 under the Air and Water Acts to restore, protect and enhance the quality of the environment in the State. The Board works closely with Central, State, and local stakeholders. The Board is headed by a Chairman and comprises of 17 members. The central office is located in Bangalore with 28 field offices at the district level. To support the enforcement activities, one Central Laboratory at Bangalore and seven regional laboratories at districts have been established. The activities of the industries are controlled by granting consents and authorizations. Wherever violations are noticed, penal action is initiated by the filing of the criminal cases against the violations.

Prioritisation Matrix

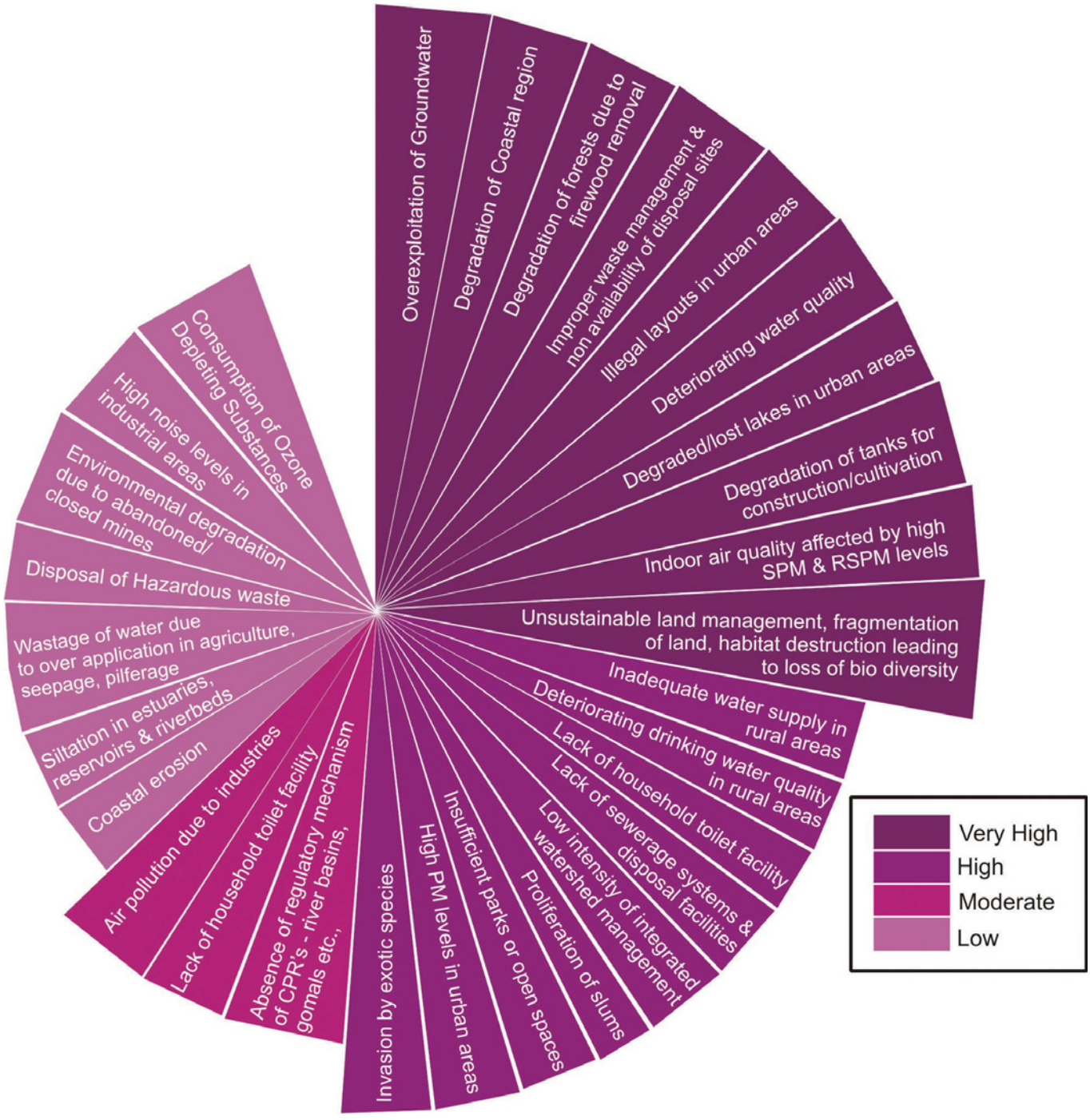
Composite Prioritisation Matrix

For each sector, the consultants have identified and prioritized major problems and the degree of concern of the whole state. This has been represented in each of the sectors as prioritization matrix. As a part of synthesis, it was necessary that the prioritization matrix of each of the sectors be consolidated to represent the whole picture for the state.

The prioritisation matrix given by the consultants were specific to their sector and hence to arrive at a state scenario, all problems of all sectors were compiled in the order of severity. While, some problems are common to more than one sector, during the consolidation exercise, the problem having higher ranking was retained.

Though, a common representative name was framed, care has been taken to include all the other common problems discussed in other sectors. The outcome of this consolidation exercise has been a crystallized list of all the major problems as given in the composite prioritisation

Composite Prioritisation matrix



matrix. The problems have been categorised into either very high, high, moderate or low category.

Problems which need to be addressed with utmost urgency include groundwater depletion; coastal and forest degradation; unsustainable land management through urbanisation; improper waste management and indoor air quality. Water quality, quantity; saniation and sewage systems; watershed management issues arise high in the prioriitisation list.

Issues of common property resources and air quality deteriorisation due to industries rank in moderate level while issues like noise pollution, disposal of hazardous waste, improper water management, issue of closed and abandoned mines, coastal erosion, siltation and consumption of ozone depleting substances rank low in the prioritisation.

Resource-Activity Impact Matrix

While carrying out the consolidation exercise, the impact of various activities on the resources like air, water, land, biodiversity, forest, coast and health has also immersed. This has been depicted in the Resource – Activity Impact Matrix. It was found that the degree of impact of each activity was either as high, medium and low.

Mining and quarrying was found to have a high impact on five of the resources, namely, land, forest, biodiversity, coast and health. Industrial pollution and water supply and sanitation have high impact on water, land, coast and health resource, while, forestry as an activity has high impact on water, land, biodiversity and forest resources. Agriculture activities have high impacts on water and land, both quantitative and qualitative. Activities like waste management, urban planning, transport and energy have high impacts on either one or two resources, as these activities are intensive in urban or semi urban areas. While analyzing the resources, it was found that both coast and health are at very high threat from industrial pollution, mining and quarrying, water supply and sanitation and waste management.

Resource-Region Impact Matrix

Another output of the consolidation exercise was the Resource-Region Impact matrix. The impact on various

Resource - Activity Impact Matrix

Resources	Industrial Pollution	Mining and Quarrying	Transport	Urban Planning	Water Supply and Sanitation	Waste Management	Energy	Forestry	Agriculture
Water	High	Low	Low	Medium	High	Medium	Medium	High	High
Land	High	High	Low	High	High	Medium	Low	High	High
Forests	Medium	High	Low	Low	Low	Low	High	High	Medium
Air	Medium	Low	High	Medium	Low	Medium	Medium	Low	Medium
Bio diversity	Medium	High	Low	Low	Low	Low	Low	High	Medium
Coast	High	High	Low	High	High	High	Medium	Medium	Low
Health	High	High	Medium	Medium	High	High	High	Low	Low

Resource - Region Impact Matrix

Region / Resource	Western Ghats	Northern Maidan	Southern Maidan	Coast	Bangalore
Air	Low	Medium	Medium	Low	High
Water	Low	Very High	Very High	High	High
Biodiversity and forests	Very High	Medium	Medium	Very High	Low
Land	High	Medium	High	Very High	Medium

resources in the five regions of the state, namely Western ghats, Northern maidan, Southern maidan, Coast and Bangalore were analyzed. The degree / severity of impact was either low, medium, high, or very high.

Water as a resource has been severely impacted in the Northern maidan and Southern maidan, Coastal and Bangalore region. Except for Bangalore, biodiversity and forests have been impacted in all the other four regions. Land has been impacted highly in the Western ghats, southern maidan and coast while there has been a medium impact on it in Northern maidan and Bangalore. The problem of air pollution in Bangalore region is acute and needs to be addressed.

Action Plan and Environmental Indicators

Based on the identified issues, a set of indicators have been developed for the state of environment report to help in policy making. Since there is no standard formula for the formulation of indicators there is, therefore, an element of subjectivity in the formulation. However very broadly, the composite prioritisation matrix has been followed. Even in the composite prioritisation matrix, the problem has been the lack of scientific or empirical evidence to accurately assign weightages. In addition, these weightages are dynamic and can vary with time due to improvements and changes in the environment. The number of environment indicators are also critical. The inherent purpose of the indicators require that the number of indicators should be limited.

However, in spite of the constraints mentioned, the set of indicators brought out in the state of environment report are reliable. They largely reflect the existing status of the environment and the strategies required to address and ameliorate the identified problems. The set of indicators also reflect the priority issues for the sector.

Issues pertaining to natural resource sustainability focus on the primary concern of resource depletion. This is inevitable with non renewable resources. But the rate of depletion can be mitigated with efficient use, recycling and adoption of cleaner production technologies. Degradation of the ecosystem is reflected in the decline of biodiversity and damage to critical ecosystems. Environmental degradation leads to human health effects from pollution. Toxic compounds in the environment gain easy accesses into human systems.

Most of strategies already stated as the objectives of the concerned Government Departments (as mentioned in their Departmental Medium Term Fiscal Plans) have been incorporated here in the Issue-Indicator-Strategy charts for the four agendas.

The environmental concerns could now be conveniently integrated with the programs of various Departments. Simple indicators have been formulated which would help in understanding the impact of certain activities on the environment.

Blue Agenda

Issues	Indicators	Strategies
Overexploitation of groundwater.	Reduction in critical and semi critical areas.	Recharge of ground water through rainwater harvesting; encourage Village Panchayats to take up harvest measures in common areas, mandatory rain water harvest measures for households, community areas and institutions. **RDPR/UD**
		For extraction of ground water prior permission and license with consent fee be made mandatory. **DMG\KSPCB**
Inadequate quantity of safe water supply	Percentage of habitations receiving 55 lpcd	Habitations receiving less than 55 lpcd to be upgraded to the supply level of minimum 55 lpcd by 2006. **RDPR [DMTFP]**
Wastage of water due to over application in agriculture and seepage.	Reduction in loss of water due to seepage.	Improvement and modernization of canals, to reduce losses and seepage. **Water Resources [DMTFP]**
Wastage of water due to pilferage.	Reduction in pilferage.	Punitive action to be taken to check pilferage. **Water Resources**
Violation of cropping pattern		Strict implementation of cropping pattern. **A&H.**
Degradation of irrigation tanks	Number of tanks rejuvenated.	2000 tanks to be rejuvenated by the year 2006-07 through Participatory Management of Water Resources and tank regeneration programs. **Water Resources [DMTFP]**
Water quality issues in rural areas	Percentage of areas supplied with safe drinking water.	To provide safe drinking water to all habitations affected with fluoride, brackish, contaminated water by treatment or from alternate sources. **RDPR**
		Set quality standards for drinking water**.**
Lack of rural household sanitation	Percentage of rural population with access to household sanitary latrines	To cover 30 percent of rural population with household sanitary latrines by 06-07. **RDPR [DMTFP]**
Pollution of water bodies, groundwater with industrial effluent/ municipal sewage.	Improvement in surface and ground water quality in vicinity of industrial areas and within Municipal limits.	Monitoring of ground water quality, parameters on bulk organic and heavy metals to be area specific. **DMG &KSPCB**
		Water polluting industries to have Effluent Treatment Plants or Common Effluent Treatment Plants in industrial areas. **DEE**
		Underground Drainage systems and sewage treatment plants to be set up in all Urban Local Bodies. **UD/DEE**
Deterioration of Urban lakes.	Number of urban lakes\ tanks rejuvenated.	Strengthening lake restoration programmes. **DEE**
		Encourage more public-private partnership for lake development. **DEE\UD**
Ground water issues in urban areas	Rise in groundwater table.	Water charges being currently charged by municipalities, to be credited into Water Revenue Fund for maintenance of water supply system **UD**
	Percentage of structures implementing rainwater harvesting measures.	Local authorities should exercise regulatory powers to ensure good quality of water supply from tankers; special approval/license should be made mandatory especially for drinking water supply. **KSPCB/UD**
	Extend of underground drainage coverage and sewage treatment plants in operation	
Over exploitation of groundwater in coastal areas		Regulate exploitation of groundwater in coastal areas. **DMG**
		Promote measures for recharge of groundwater. **DMG, Water Resources**
Health impacts due to inadequate sanitation.	Access to individual and community toilets.	Promote programs for individual and community toilets. **RDPR**
		Strengthen awareness campaign for use of toilets. **RDPR**

Brown Agenda

Issues	Indicators	Strategy
Problem of mixed waste	Number of households having facility of door to door collection.	Design waste management policy: Promote segregation, recycling, privatization of waste management Take back system, and Deposit Refund System. **UD**
	Percentage of solid waste recycled.	Comprehensive Development Plan / Outline Development Plan to statutorily provide land for treatment facilities for all wastes. **UD**
Illegal dumping of Municipal Solid Waste and disposal of Biomedical waste	Percent of wastes disposed scientifically	Providing treatment facilities for biomedical wastes. **UD\ HEALTH**.
		Encourage private participation in handling solid waste and bio medical waste. **UD**
Onsite storage/disposal of hazardous waste	Percent of wastes disposed in landfills.	Provide landfill sites for disposal of hazardous wastes
Suspended particulate matter and respirable Suspended particulate matter higher than the permissible limits for outdoor air.	Reduction in RSPM and SPM levels.	Promote biofuels like Pongemia oil, use of ethanol in transport vehicles. **DEE/TRANSPORT/ENERGY**
		Non renewal of fitness certificate for vehicles older than 15 years. **TRANSPORT**
		Use of sprinklers in loading and unloading areas of mines to reduce suspended particulate matter. **DMG/KSPCB**
	Reduction in incidence of respiratory diseases.	Clusterwise monitoring for industries and online ambient air quality monitoring system to be set up. **KSPCB**
		Introduce tradable permit system as an incentive to reduce pollution from small industries. **DEE/INDUSTRIES**
		Introduction of more one way traffic roads. **UD/TRAFFIC POLICE.**
Indoor air quality affected by suspended particulate matter and respirable suspended particulate matter higher than permissible limits.	Reduction in incidence of respiratory diseases.	Studies to be taken up on indoor air quality. **DEE**
		Promote use of energy efficient chulahs, LPG. **RDPR**
Excessive water use leading to soil degradation.	Percent of irrigated land affected by salinity	Bringing in water efficient cropping system by use of drip irrigation and sprinkler system. **A&H**
		Rehabilitation of land affected by salinity. **A&H**
Unsustainable agricultural practices\ excessive use of chemicals and pesticides.	Increase in use of bio fertilizers and bio pesticides.	Promote integrated nutrient and pest management. **A&H**
		Encourage organic farming. **A&H**
		Encourage use of bio technology.
Environment degradation due to mining activities	Mining area rehabilitated.	Identify common areas for dumping overburden from cluster of mines. **DMG**
		Simultaneous rehabilitation and reclamation during and after mining. **DMG**
	Number of mines implementing cleaner production techniques.	Allocation of 50 per cent of royalty and dead rent collected by Department of Mines and Geology to the Environment Fund for restoration and reclamation works. **DMG**
		Promote cleaner production techniques. **DMG**
		Detailed EIA and EMP for small mines. **DFEE**

Green Agenda

Issues	Indicators	Strategies
Increasing fuel wood removal	Increase in forest/tree cover.	Use of energy efficient fuel stoves, chulahs and alternate fuels to be promoted. **RDPR\ENERGY**
Forest degradation due to livestock grazing.		Increase in pasture lands, management of *Gomals* and pasturelands, encourage stall feeding. **DFEE/ REVENUE /AH&F**
Encroachment/ diversion of forest area.	Extent of forest land encroached/ diverted.	Environmental cost-benefit analysis to be done to arrive at alternative locations for realignment of development projects. Environment Impact Assessment for projects located close to forests and sensitive areas to be done in a scientific manner. **DFEE**
Man animal conflict, fragmentation of forest and habitat destruction	Reduction in injury to people, animals and damage to property	Consolidation of boundaries. **DFEE**
Loss of biodiversity	Reduction in number of species under Rare, Endangered and Threatened category.	Sustainable management of medicinal plants by developing techniques for proper regeneration, collection and value addition. **DFEE**
		Preparing Peoples' Biodiversity Register as per the Biological Diversity Act. **DFEE**
		Strengthen and promote traditional and community based conservation practices to protect and sustain Biodiversity. **DFEE**
		Protection of mangroves, sacred groves and eco sensitive areas. **DFEE**
Loss of tree cover outside forest areas.	Percentage of urban and rural area under green cover.	Encourage participatory management for protection of environment: private lands to be brought under tree cover. **DFEE**
		Protection of urban green spaces from encroachment, allocation of adequate green space as per outline development plan and comprehensive development plan. **UD**
		Plan and implement a sustainable afforestation program. **DFEE**
Invasion of exotic species.		Sustainable management of crop land and scrublands. **A&H**
		Degraded forest and open lands to be brought under forest cover. **DFEE**

Purple Agenda

Issues	Indicators	Strategies
Urban sprawl, unplanned layouts, proliferation of slums	Accesses to safe water and sanitation facilities for urban areas.	Legislative action to reduce time for finalization of Comprehensive Development Plans. **UD**
		Integrate environment issues into urban planning process. **UD**
		Environmental Management Plans for all Class-1 cities. **UD**
		Permission from KSPCB to be made necessary for setting up new layouts.
Damage to heritage structures/sites by encroachment/ slums	Number of heritage structures/sites free from encroachments and implementing restoration measures.	Setting up of heritage development committees under the Environment Protection Act. **DEE**
Depletion of non-renewable resources	Increase in use of alternate and renewable energy	Promote cost effective renewable and non-conventional energy sources **ENERGY/RDPR**
		Encourage industries to use solar heating devices **C&I**

Common Strategies

Certain strategies are not sector specific but common across sectors. Such strategies would help in developmental planning.

- Allocate 50 per cent of royalty and dead rent collected by Department of Mines and Geology to the environment fund for restoration and reclamation works.
- Legislative action to reduce time for finalization of Comprehensive Development Plans.
- Comprehensive Development Plan / Outline Development Plan to statutorily provide land for Sewage Treatment Plants, Under Ground Drainages, landfills etc.
- Adequate measures to protect heritage sites.
- Initiatives to set up eco corridors/villages in the State.
- Environmental Management Plans for all Class-1 cities should be developed.
- Establish Environmental Cells in all departments dealing with projects using /affecting resources and environment including municipalities.
- Introduce Environment Audit to conserve resources and cleaner production systems.
- Environmental Fund be created in Ecology and Environment Department as a common fund to address issues of ecological restoration.
- Just as economic planning is undertaken by the planning department, it is essential to do an input - output plan for natural resources also. The Department of Ecology and Environment be strengthened considerably to enable preparation and monitoring of natural resources plan for the state.
- Awareness creation for good practices and eco-friendly, clean technologies, low waste technologies, etc. through popular media, demonstration centers, training programs, prototyping units, trial usages, service support centers etc. Training modules to be developed and programs organized on a large scale to train planners, implementers and policy makers.

Conclusion

Existing pressures on the environment will persist and fresh challenges will emerge as increasingly heavy demands are placed upon resources, that in many cases are already in a fragile state.

Certain key areas have been identified in this report for urgent and immediate action. Institutions would need to rethink and strengthen their role to adapt to and confront new environmental challenges. Policies should be developed to value environmental goods and services and promote voluntary initiatives. Environmental costs need to be factored into policy measures and regulatory frameworks and planning processes. Cheap and reliable information in appropriate forms, integrated data bases would need to be provided to all the stakeholders in the environment, decision makers, local communities and the general public. This would enable them to participate meaningfully in decisions and action that have a bearing on the environment.

Above all, good governance and funding for the environment needs to be ensured to move towards sustainable development.

वृक्षांश्छित्वा तरून् हत्वा कृत्वा रुधिरकर्दमम् ।
यद्येवं गम्यते स्वर्गं नरकं केन गम्यते ॥
(पंचतन्त्र)

If one were to attain heaven even after cutting trees,
uprooting plants
and thus shedding blood, who else will go to hell!
(Panchatantra)

GEOLOGICAL MAP