

Environmental Management and Policy Research Institute
(Forest, Environmental & Ecology Department, Government of Karnataka)

ANNUAL REPORT -2017-18



**“Hasiru Bhavana”,Doresanipalya Forest Campus, Vinyakanagar Circle,
J.P.Nagar 5th Phase, Bangalore– 560 078**

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CHAPTER 1. ABOUT THE INSTITUTE

1.1. Constitution:

The Environmental Management Policy & Research Institute (EMPRI) is an autonomous institute established by Government of Karnataka on 17th September 2002 under the Department of Forest, Ecology and Environment. The Institute undertakes applied and policy research and also endeavours to provide capacity building trainings on concurrent environmental issues relevant to the society. Services provided by the institute seek to encourage and enable government, industry and civil society to safeguard and manage the natural resources effectively. It is registered under the Karnataka Societies Registration Act, 1960.

1.2. Governance:

EMPRI functions under the direction of a Governing Body chaired by the Additional Chief Secretary, Department of Forest, Ecology & Environment, Government of Karnataka. The Governing Body consists of representatives of various Government departments and Government authorities including Department of Forest, Ecology & Environment, Department of Urban Development, Department of Industries & Commerce, Department of Health & Family Welfare, Department of Finance, Central Pollution Control Board (CPCB) and Karnataka State Pollution Control Board (KSPCB). The Director General (DG), EMPRI is the Member Secretary of the Governing Body. The DG being the Chief Executive of the Institute is responsible for day-to-day administration of the organization, supported by the officers deputed from the Government of Karnataka and personnel contracted for specific purposes.

1.2.1 General Body:

General Body is Chaired by the Additional Chief Secretary, Department of Forest, Ecology & Environment, Government of Karnataka. The members of Governing Body are also the members of General Body. The General Body meeting is convened every year to consider and approve the Annual Administration Report, Audit Report, Income and Expenditure Statement etc. It also approves the budget for the ensuing year.

1.2.2 Governing Body:

The Governing Body (GB) of the EMPRI is constituted by Government of Karnataka, nominating senior level functionaries of various Departments. The list of members of the Governing Body committee is placed in **Annexure - 1**

1.2.3 Committees:

Following committees are constituted to advices and also to take decisions on specific matters.

1. **Executive Committee:** A five member committee constituted by the Governing Body and is chaired by the Director General. The committee advises and takes decisions on administrative and financial matters. The composition of the Executive Committee is placed in **Annexure -2.**

- 2. Research & Training Advisory Committee:** The Committee is constituted as per decision taken in the 28th GB meeting and the Director General, EMPRI is the Chairman of the Committee. The Committee consists of 11 members including Govt. Officers and functionaries from eminent organizations like Institute of Social Economic Change, Karnataka Pollution Control Board, Central Pollution Control Board and University of Agriculture Science. The composition of the committee as per the 48th GB is placed in **Annexure – 3**.
- 3. Selection Committee:** A Selection Committee, for the selection of candidates required to be filled up for various posts in EMPRI, has been constituted as per the decision taken in the 38th Executive committee meeting held on 11-11-2013. This has been confirmed by the 38th Governing body meeting held on 18-12-2013. As per the decision taken in the 50th Governing Body meeting held on 27-09-2017 the word “Recruitment “is replaced by “Selection”. Thus, it is called as “Selection Committee”. The Director General, EMPRI is the Chairman of the committee. The composition of the committee is placed in **Annexure – 4**.
- 4. Performance Review Committee:** As per decision taken in the 39th GB meeting, a three member Performance Review Committee headed by Director General, CCF, Director, EMPRI and CF, Director (Research) as members has been constituted. The committee reviews the performance of the outsourced/manpower and makes recommendation to the Executive Committee and Governing Body.
- 5. Internship Committee:** The committee is constituted as per decision taken in 40th GB meeting to select eligible graduates and post graduate students as interns. The committee is chaired by the Director General, EMPRI and comprises of three other members. The composition of the committee is placed in **Annexure – 5**
- 6. Evaluation Committee:** The EMPRI takes up training activities on various environmental issues and a three member committee has been constituted to evaluate the training programmes conducted by EMPRI. The committee is chaired by the CCF & Director, EMPRI, Shri. T. Mahesh, Environmental Officer, Karnataka Pollution Control Board, Bangalore and Project Development Officer, EMPRI are the members.
- 7. Technical Advisory Panel:** A Technical Advisory Panel (TAP) has been constituted on 12.04.2016 for according approval of configuration of Computer Hardware/Software required to be purchased for EMPRI. The Director General, EMPRI is the Chairman and comprises of five other members. The composition of the committee is placed in **Annexure – 6**

1.3 Vision:

The EMPRI's vision is to become a knowledge centre inspiring and enabling society to create an environment of harmony between man and nature.

1.4 Mission:

1. To carry out research on current policy and environmental issues;
2. To provide world class training and advisory services on environmental management and
3. To enable and encourage the civil society, the government and the industries to safeguard and manage natural resources effectively.

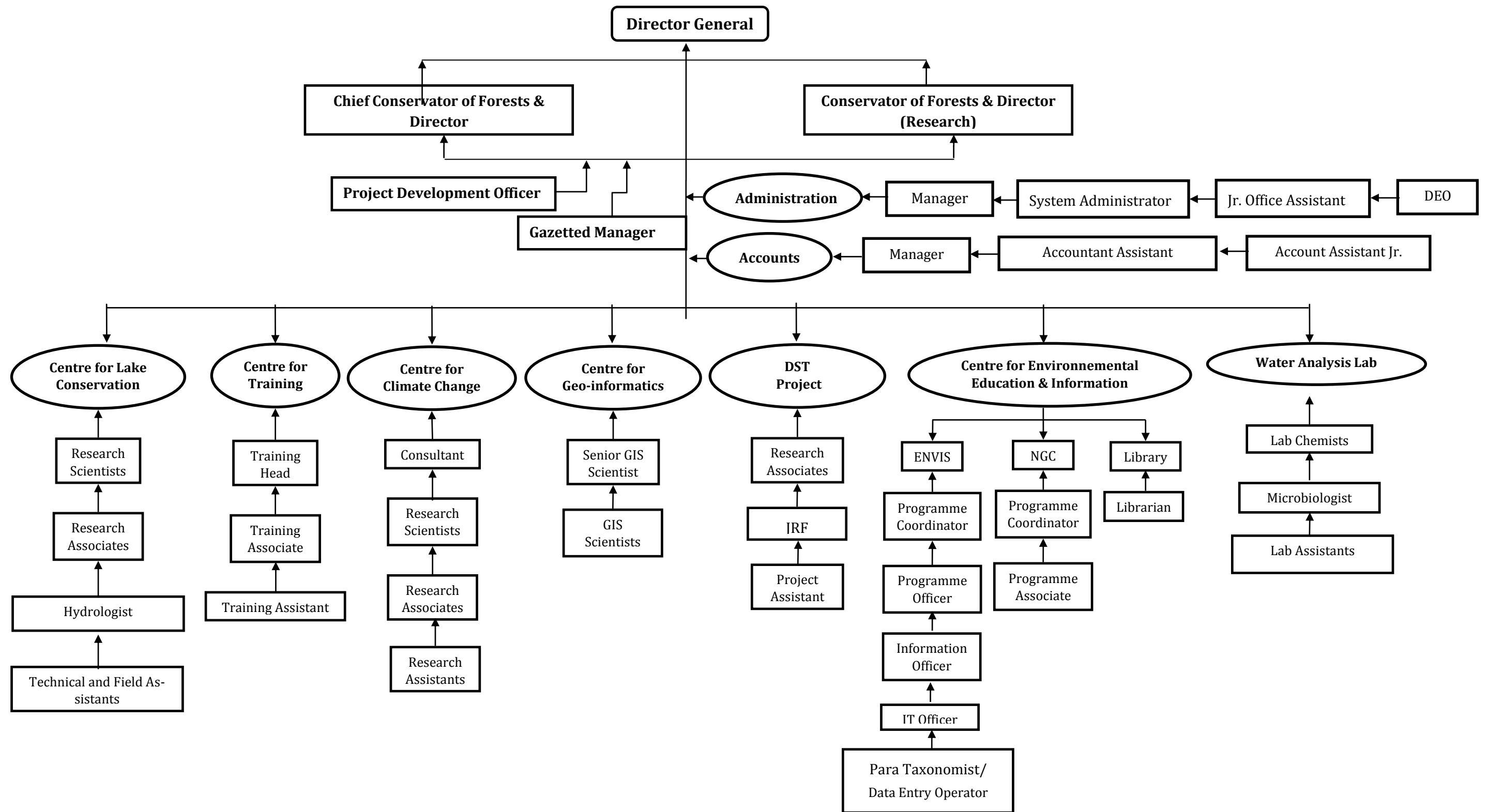
1.5 Objectives:

1. To provide Capacity Building & Technical support to Government, Non-Government & other Institutions in addressing policy and environmental issues;
2. To provide Consultancy Services to Industries, Government Departments and other organizations in the field of Environmental Management and
3. To take up studies and to develop policy documents on various environmental aspects.

1.6 Functions:

1. To contribute towards the protection and management of Environment & Ecology through Scientific, Technical, Policy research & other activities;
2. To assist the Government Departments, NGOs and Public at large in performing the mandatory functions specified in the various environment laws, guidelines and judicial pronouncements from time to time and to assist the concerned agencies in setting up norms;
3. To undertake/develop studies and research in the field of environment protection and conservation for improving the overall quality of environment;
4. To develop expertise in the field of environmental research and to develop into world-class consultants and to act as a referral institute;
5. To interact and/or to seek affiliation with national and international agencies working with similar objectives;
6. To undertake training and human resources development in the field of environment and by organizing seminars/workshops and other programs for stakeholders;
7. To print, publish, exhibit books, pamphlets and periodicals, educative and informative materials that may be considered desirable for promotion of the objectives of the institute and
8. To run an ENVIS (Environmental Information System) Centre and to develop, maintain and run a reference library and data centre with books, periodicals, films, video and other audio-visual materials.

1.7 Organizational structure:-



CHAPTER 2. MAJOR ACTIVITIES

2.1 Training:-

Capacity building is a thrust area in EMPRI. The institute conducts need-based training programmes on various environment related issues.

The Training modules include:

- Environmental Conservation and Management (ECM);
- Bio-Medical Waste Management (BMW);
- Coastal Regulation Zone (CRZ);
- Solid Waste Management (SWM);
- Hazardous Waste Management;
- Rain Water Harvesting (RWH);
- E-waste Management;
- Sustainable Environmental Management; and
- Urban Governance and Administration;
- Climate Change;
- Plastic Ban;
- Water Safety Plan for Bangalore; and
- Need based tailor made programmes.

During the year 2017-18 Total **57** Trainings/Workshops were conducted and **10,531** Participants were trained.

EMPRI has developed linkages with several agencies, industries and NGOs working in related fields and intends to extend the collaboration process with eminent and reputed agencies.

2.1.1. Information, Education and Communication Activities:

Information, Education and Communication activities are essential to spread the message about existing law, environmental protection, and pollution control. EMPRI aims at mass communication to reach thousands of people at a time regarding significant environmental issues in which general public are major stake holders.

The activity for the year 2017-18 includes:

- Dance metaphor video- “**Idolle Vichara**”;
- Documentaries;
- Mass SMS;
- Mass email;
- Social media (face book , blog, you tube);
- Advertisement;
- Recoded message;
- Wall painting;
- Participation in exhibition;
- Banner display on KSRTC and BMTB Buses;
- Standees in Metro station;
- Video inside metro train; and
- TV programs;



**Dance metaphor video in Kannada - idolle vichara
Reached thousands of people and well appreciated**

2.1.2. Accomplished training programmes:

2.1.2.1. IFS Training Cum Workshop sponsored by Ministry of Environment, Forest and Climate Change on Finance opportunities towards establishing climate resilient forests



EMPRI organized the two day training cum workshop on “Finance Opportunities towards Establishing Climate Resilient forest’s” during 12th to 13th October 2017, at Bengaluru as detailed below:

Sl. No	Resource person	Topic
Day 1: Technical Sessions	Prof. Govindasamy Bala, IISc	Climate Change: Science, Impacts and Response,
	Shri. Karthikeyan. S Chief Naturalist	Eco-tourism
	Ms. Aparna Kolte, National Bank For Agricultural and Rural Development	'National and International climate Funding: Introduction, Scope and Opportunity
Day 2: Technical Sessions	Dr. H.S. Suresh, IISc	'Climate variability and resilience of forests: Study from dry forests of peninsular India'
	Dr. O.K. Remadevi, Consultant, EMPRI	Initiatives of EMPRI in the context of Climate Change

2.1.2.2. Training Programme on Climate change;

Climate change is affected by

- Energy ;
- Waste;
- Agricultural *and* Forest Land Use;
- Industry ;and
- Transportation.

Each sector has different stake holders. EMPRI conducted series of training to following stakeholder with respect to mitigation and adaptation:

- Medical and paramedical practitioners;
- Urban local bodies;
- Government departments;
- Self-help group and NGOs; and
- Enterprisers.

The topics deliberated in trainings includes

- Fundamentals of climate change;
- Waste management;
- Health; and
- Plastic Ban.

The details of the training programmes can be seen in **Annexure – 7**.

Snap shots of the Climate change with reference to Karnataka Government Notification on Plastic Ban, Solid Waste Management & Bio-Medical Waste Management Rules 2016





2.2. Research Programmes:-

The EMPRI conducts research on concurrent environmental issues of immediate relevance for the society. In every case, research carried out identifies problems, determines underlying causes and proposes measures to mitigate them. In the year 2017-18 research work carried out at EMPRI included the following:

2.2.1. CENTRE FOR LAKE CONSERVATION AND CENTRE FOR APPLIED RESEARCH.

Lakes are ecologically precious water bodies. Conservation and development of these invaluable, traditional water bodies is of paramount importance. Due to rapid Urbanization and Industrialization, majority of these lakes have now come either under encroachment or have lost their original characteristics. Restoration of these lakes is not only crucial but also a challenging task. The Centre facilitates the conservation and development of these surface water bodies in the state in an environmentally sustainable manner.

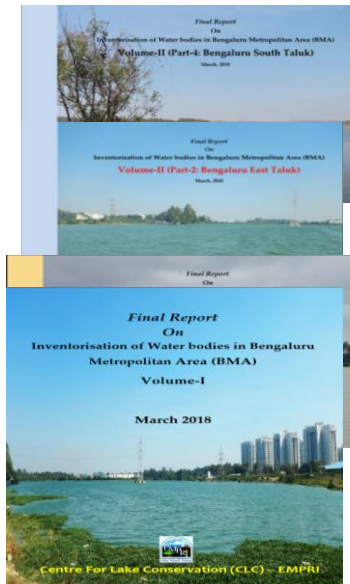
2.2.1.1. Completed Projects:

1. "Assessment Derived Conservation Strategies for the Major Lakes of Bangalore"
2. "Water Safety Plan for Bangalore – A Quality Based Approach to Water Supply Service Delivery"
3. "Comprehensive Assessment of Thippagondanahalli Reservoir Catchment Area and its Preservation Zones" .
4. "Evolving Sustainable Conservation Strategies for WaterBodies of Mysore – Nanjan- gud Local Planning Area"
5. "Assessment of Current Status of Cauvery River in Karnataka and declaration of 300m buffer zone on both sides of the river as Eco-sensitive Zone "
6. "Inventorization of Waterbodies in Bangalore Metropolitan Area"

A. Inventorisation of Waterbodies in the Bengaluru Metropolitan Area (BMA);

Under the financial assistance of Karnataka Lake Conservation and Development Authority (KLCDA), Government of Karnataka, the EMPRI has successfully completed the study entitled as above. The final report was released on March, 2018. The key objective of this study was to identify all the waterbodies (*kere, katte* and *kunte*) along with their status and prepare a comprehensive database.

Study has addressed the present status of the waterbodies; preparation of the waterbodies database (including Kare, Katte & Kunte); Unique Identification Code (UID) for all waterbodies; identification of pollution sources and encroachments; physico-chemical analysis and biodiversity documentation; prioritization of lakes for conservation; preparation of Lake Health Card and finally formulation of conservation strategies with the involvement of stakeholders. During the study an effort has been made to understand the present status of the water bodies in the study area in a holistic manner, for formulating conservation strategies which would help the Policymakers, Administrators and the stakeholders to look into the integrated management of the waterbodies.



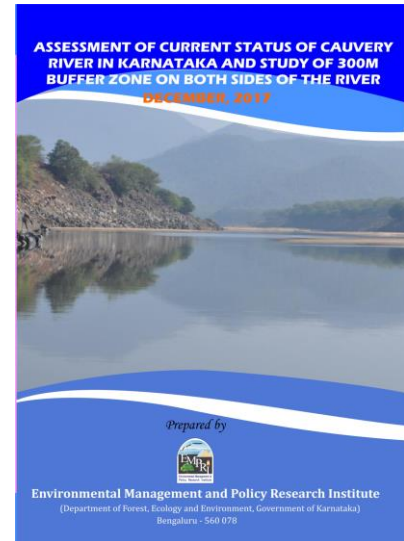
Snap Shots of Report Releasing



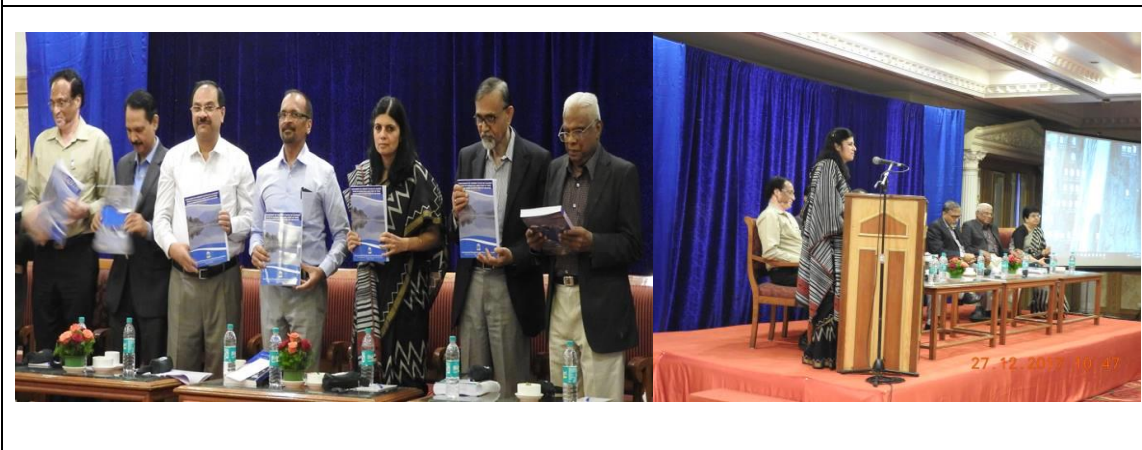
B. Assessment of Current Status of Cauvery River in Karnataka and Study of 300m Buffer Zone on Both Sides of the River;

Under the financial assistance from Centre for Infrastructure, Sustainable Transportation & Urban Planning (CiSTUP), IISc., Bengaluru, the EMPRI has successfully completed the study entitled as above and the final report was released on December, 2017.

The study has addressed the decadal changes in-terms of current land-use and land-cover practices in the study area by using satellite imagery of the year 2004 and 2014; assessed the current status of the Cauvery river; water quality and biodiversity of Cauvery River has been assessed based on the secondary authenticated data collated from the concerned authorities/academic reports/publications/website; analysis of existing legal and policy framework and action plan for sustainable management of the Cauvery river and its buffer zone.



Snap Shots of Report Releasing

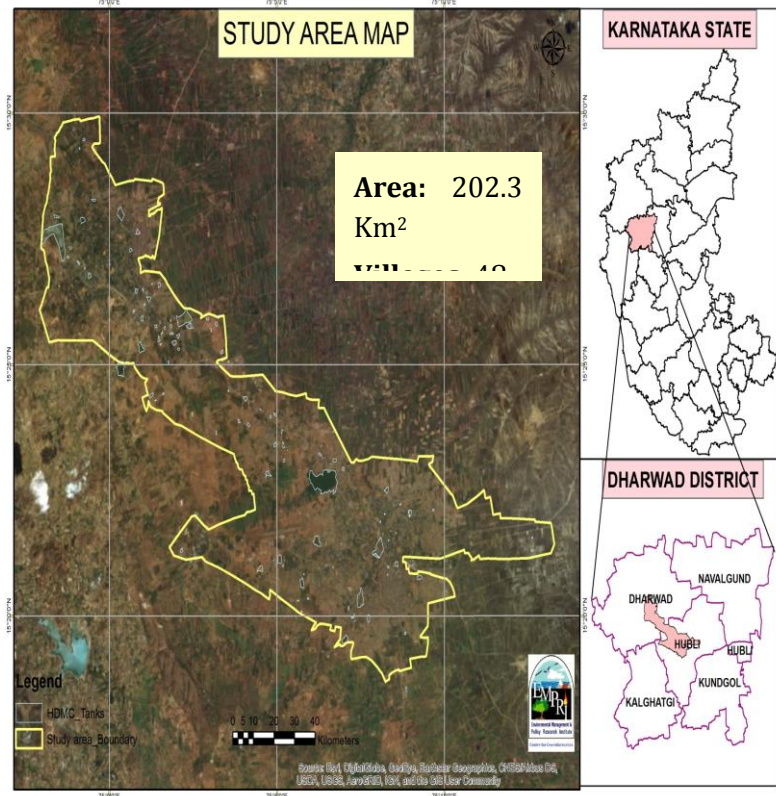


2.2.1.2. Ongoing research programmes:-

1. "Developing Conservation Strategies for the Water bodies in Hubballi-Dharwad Municipal Corporations (HDMC)"
2. " Documentation of the Yettinahole Project sites and assessment of Cumulative Impacts of multiple projects a forested landscape"

1. Developing Conservation Strategies for the Water bodies in Huballi-Dharwad Municipal Corporation (HDMC);

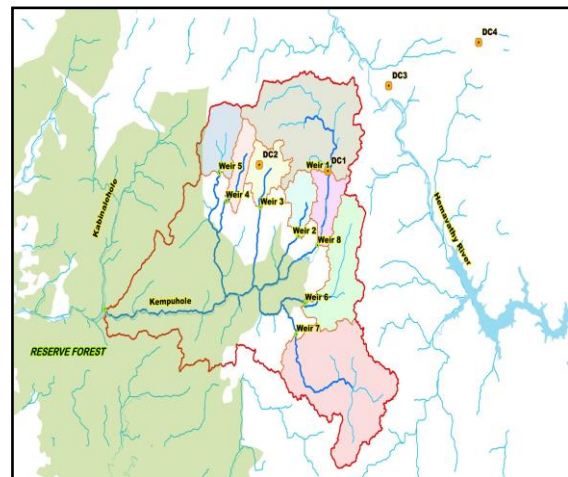
Under the financial assistance from Centre for Infrastructure, Sustainable Transportation & Urban Planning (CiSTUP), IISc., Bengaluru the EMPRI has taken-up the study entitled as above. The key objectives of the study are **a).** Study the Present status of the waterbodies in series, **b).** Prepare database of all water bodies for HDMC area (including Katte & Kunte) with unique coding **c).** Prepare the land use/ land cover map and do the change detection analysis between the year 2005 & 2017 **d).** Analyze the water quality and document the biodiversity for major lakes **e).** Identify the point and non-point source pollutions, dumping, encroachment **f).** Prioritize the lakes that require urgent action **g).** Estimate the economic value of the major lakes **h).** Prepare Water body Health Report Card/Water body Atlas and **i).** Develop conservation strategies for the conservation of water bodies.



The field visits and water analysis have been completed. Further, for seeking suggestions and inputs an Advisory Committee Meeting was conducted on 16th March, 2018 in Dharwad KSPCB Regional Office. Currently preparation of the report is under progress.

2. Documentation of the Yettinahole Project Sites and Assessment of Cumulative Impact of Multiple Projects in a Forested Landscape:

The Government of Karnataka (GoK) through Karnataka Neeravari Nigama Limited (KNNL) has taken up Yettinahole drinking water project in Hassan district, Karnataka. The project envisages lifting excess flood water over the Western Ghats ridge during the monsoon months to the water starved eastern plains districts of Kolar, Chikkaballapura, Ramanagar, Bangalore rural, Tumakuru, parts of Chikmagalur & Hassan for drinking water purpose. Further, the ex-



cess water quantity of 24.01TMC will be lifted during monsoon by constructing 8 weirs cross Yettinahole and its tributaries, Kadumanehole, Hongadahalla, Kerihole streams. The project involves diversion of 13.94 ha forest land in Sakleshpura Taluk for which Stage-I forest clearance under Forest Conservation Act 1980 has been granted by the Ministry of Environment, Forests & Climate Change, Government of India, by imposing certain stipulated conditions. To fulfill the stipulated conditions the Vishweshvaraya Jala Nigama Ltd., Government of Karnataka, has entrusted the study to EMPRI. The following are the two conditions entrusted to EMPRI, which is under progress.

Condition No. 26. In order to benchmark the present status of ecology in the project area and particularly the project work-sites survey and videography based study may be instituted at the cost of user agency. This will facilitate monitoring of project sites and decision making in future.

Condition No. 27. Periodic assessment of cumulative impact of multiple projects in a forested landscape by the regulatory authority. It allows an adaptive management in the landscape and an opportunity to evaluate and realign the mitigation strategies.

As per the scope of the study, EMPRI has completed water monitoring analysis for two seasons; Soil analysis for winter season; noise monitoring for winter season; Air and Meteorological monitoring for winter season. Meantime socio-economic survey, monitoring the environmental aspects for the next season and collation of secondary data are underway. LU/LC changes studies for 2015 imagery has been completed and change detection analysis under progress.

2.3. CENTRE FOR CLIMATE CHANGE;

The Centre for Climate Change was strengthened with funding support of one crore from Govt. of Karnataka under New Scheme on Climate Change operational since 2015-16 and also the DST SPLICE project of Govt. of India sanctioned during 2016. Researchers in the Centre have undertaken research projects independently and also in collaboration with other research institutions working on climate change. The following six projects initiated in 2016-17 were completed by August, 2017 and the reports are prepared.

2.3.1. Completed Projects:

I. Assessing Metro Rail system as a means of Mitigation Strategy to Climate Change.

The study carried out during December 2016 to November 2017 was to understand the commuter perspectives on metro rail as an efficient public transportation system. The objectives of the study were to evaluate the socio-economic and environmental impacts on the commuters of the Metro Rail in Bengaluru city and to assess the last mile connectivity between the metro stations and BMTC bus stations. The field survey was carried out with the help of a structured questionnaire which was administered to around 1079 randomly selected respondents over a period of 12 hours duration across the 17 stations of the East-West Corridor

of the Bengaluru metro. The commuters were surveyed about their satisfaction with various features of metro rail. Aspects such as connectivity, frequency and parking facility were the major areas that required improvement. Study on last mile connectivity was carried out through analysis of metro station wise connected last mile destinations, number of BMTC buses operating in the vicinity of metro stations, total distance covered by BMTC buses, number of wards that have access to metro services and the density of BMTC buses plying in different routes of the city. Geospatial tools related to network analysis and Survey123 for ArcGIS field data collection mobile app were used in achieving the objectives of last mile connectivity analysis. The results revealed that metro rail services were well connected to various wards in East-West corridor. Overlapping of travel routes by metro rail and BMTC buses could be avoided using satellite terminals. The project report was released on 27th December 2017 at Hotel Capitol in the presence of dignitaries such as Smt. Vandita Sharma, IFS, Additional Chief Secretary, Department of Forest, Ecology and Environment, GoK and Shri. Mahendra Jain, IAS, Additional Chief Secretary, Department of Urban Development, GoK.

II. Global climate change & Forest Resources: a Community Primer in Kannada for the use of Field Forestry Staff- in collaboration with Foundation for Revitalisation of Local Health Traditions.

A Community Primer on Climate Change in Kannada was prepared based on the available information drawn from published sources and experts in the field. The Primer is the first of its kind user friendly document on Climate Change in Kannada that provides comprehensive overview of Global Climate Change and related issues, especially Climate Change drivers, its impact on population, regeneration and productivity pattern of forests, response of forest vegetation and Climate change mitigation mechanisms. The specific objective is to build necessary orientation and interest in the readers and to provide Climate Change information specific to Indian forests and biodiversity resources, so as to enable the field forestry staff to relate themselves with the issues and be equipped with specific information, guidelines and field strategies to address the emerging needs of Climate Change mitigation. The prototype is meant for the use of field forestry staff, Village Forest Non-Government Organisation Committees, Biodiversity Management Committees, Local Community groups, Conservation NGOs and School students of Karnataka. This report was released by Smt. Vandita Sharma, IAS, Additional Chief Secretary, Department of Forest, Ecology and Environment Govt. of Karnataka in a function held on 14th March, 2018 at Vikas Soudha, Bangalore.

III. Impacts of Climate Change on Vulnerable sections with special reference to SCs/STs and Women in Karnataka and adaptation strategies - in collaboration with *Institute for Social and Economic Change (ISEC), Bangalore*

Scheduled Caste, Scheduled Tribes and Women are highly vulnerable to climate change in India as well as in Karnataka. The main objective of the project was to assess the vulnerability of these sectors to climate change and its impacts. This study used statistical and econometric tools to measure households' vulnerability to climate change in four districts of Karnataka (Kolar, Mandya, Udupi and Raichur). The determinants of vulnerability to climate change are age, sex, marital status, education, employment, monthly income, family size, caste, total land holding, agriculture production, status of property, adaptation strategy, climate/drought experience and health impacts. 17 socio-economic and biophysical indicators obtained from in-depth interviews of households of SC/ST revealed the climate vulnerability components: adaptive

capacity, exposure and sensitivity. The study revealed that among 305 households, 11 households were moderately vulnerable, 208 households were highly vulnerable and 86 households were less vulnerable to climate change in Karnataka. This study has also found that climate change adaptation and related programmes have reached only at a very low level to the vulnerable section in the study area. The main implication of the study is to emphasise on equal and sustainable resources allocation among various groups in the society and need for more representatives to participate in climate related policy decision at local and national level.

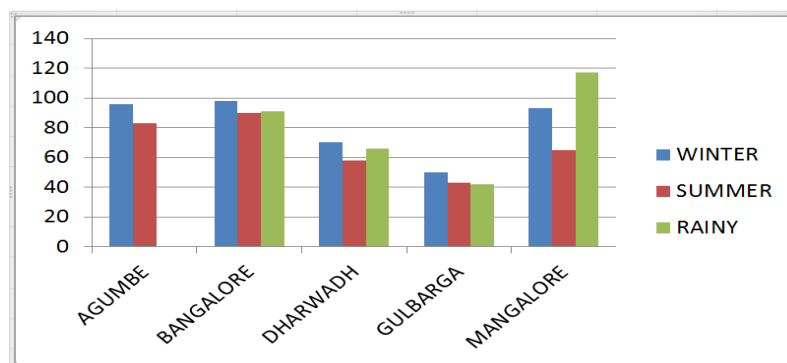
IV. Urban Planning Characteristics to Mitigate Climate Change in context of Urban Heat Island Effect – in collaboration with TERI, Bangalore

The aim of the project included assessing the impact of urban planning aspects of urban geometry and green cover on the formation of UHI within different zones of Bangalore. Three locations were strategically selected for monitoring based on various urban characteristics such as green cover, open lands, water bodies, height to width (H/W) ratios etc. Continuous monitoring of thermal parameters such as air temperature (AT), globe temperature (GT) and relative humidity (RH) was carried out simultaneously in these selected locations. The monitored results confirmed the presence of urban heat island effect in different pockets of the city. The difference in air temperatures was recorded to be about 4 to 5 deg C. The most viable solution is to treat all the roofs with reflective finishes. Shading the roof or greening the roof is also an alternative. Existing hard-pavements can be replaced with permeable pavements wherever possible. Based on this study, the following urban planning interventions are recommended for future urban growth of Bangalore City which will help to prevent Urban Heat Islands. Locations where H/W ratio is higher than 1, it is very important to integrate green cover and water bodies in the planning of the layouts. For every 7 sq. kilometres of development, 1 sq. kilometre of water body with open lands is recommended. When designing new layouts, urban planners should ensure that roads are fully shaded by the canopy of planned vegetation. A high H/W ratio may be useful in commercial building zones as it is effective in providing necessary shade to the horizontal and vertical surfaces of a street canyon, hence helping to reduce the excess daytime heat gains into the buildings.

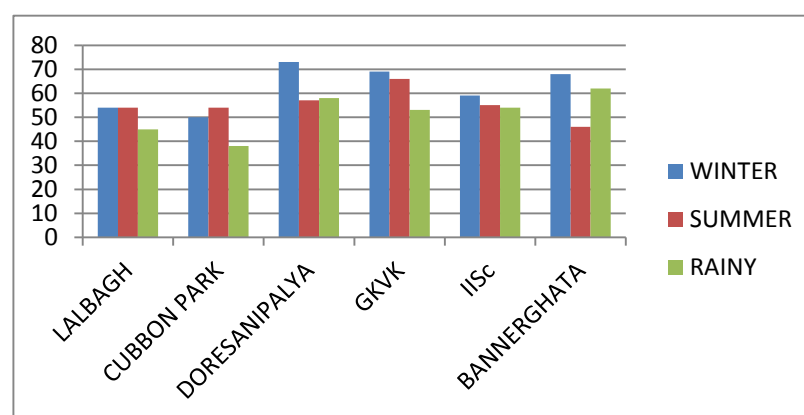
2.3.2. Ongoing projects

4. Butterflies as indicators of climate change-study in different eco-climatic areas of Karnataka

Diversity of butterflies in five eco climatic regions in Karnataka was studied in the 3 different seasons of the year (September, 2016 to August, 2017). The selected areas were Mangalore city representing the coastal belt (14 transects), Agumbe representing rainforest and evergreen part of the Western Ghats (12 transects), Dharwad city representing the dryer and end of Western Ghats range (12 transects), Gulbarga city representing dry and extremely hot climatic conditions in summers (13 transects) and Bengaluru city (30 transects). Bimonthly surveys were carried out to document the extent of the diversity, abundance and richness of butterfly species. The total number of butterfly species recorded in the eco climatic zones during the study period are as follows: Bangalore 116, Agumbe 121, Mangalore 122, Dharwad 78 and Gulbarga 59 species.



Seasonal occurrence of butterflies in 5 ecoclimatic areas in Karnataka



Seasonal occurrence of butterflies in 6 green areas of Bengaluru

Based on the two year study on butterflies of Bangalore city, a field guide entitled, **Bengaluru butterflies- A field guide** (ISBN no. 978-93-86724-52-6) was released by Smt. Vandita Sharma, IFS, Additional Chief Secretary, Department of Forest, Ecology and Environment, GoK , during a function held on 14th March 2018 at Vikas Soudha, Bengaluru

5. Study of the Impact of Climate Change on Incidence of water borne diseases and Vulnerability mapping for Karnataka.

Data for water borne diseases like Cholera, Typhoid, Hepatitis-A&E and Dysentery were collected from Directorate of health for 17 districts in Karnataka and analyzed on a monthly basis to know the onset, peak and fall of these diseases. Temperature, Rainfall and humidity data for these districts were also collected for the last five years and mapped. The time series maps for positive cases for Cholera, Typhoid, Hepatitis-A&E and Dysentery in different districts were mapped by using the data collected from the Directorate. Vulnerability mapping of occurrence of water borne diseases in Karnataka was done by using ArcGIS 10.4 and QGIS software. The report is under preparation.

6. DST Project: Establishment/ strengthening the state climate change center/cell under National Mission on Strategic Knowledge for Climate Change (NMSKCC) scheme in the state of Karnataka

Project duration: Five years :01.10.2016 to 30.09.2021

Principal Investigator (PI): Smt. Ritu kakkar, IFS, Director General, EMPRI

Co-Principal Investigator (Co-PI): Dr. K.H. Vinaya Kumar, IFS, Director, EMPRI

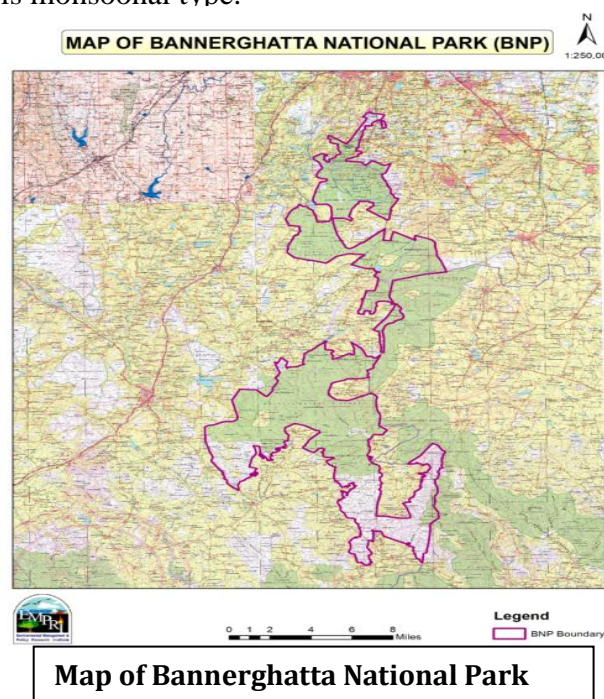
With the funding by DST, Govt of India, the project was initiated in October 2016. As per the major objective of the project, the centre for climate change in EMPRI was strengthened for setting up a Strategic knowledge centre on climate change (KSKCCC) through establishing a State of Art climate change laboratory and developing an interactive knowledge web portal. Long term monitoring of climate change through research projects have been initiated. Training capacity of the institute is also enhanced and capacity building programmes are organised and awareness creation activities are boosted up.

The major activities in Karnataka Strategic Knowledge Centre for Climate Change are:

- a) Establishment of **Permanent Preservation Plots (PPPs)** for long term monitoring studies on climate change
 - b) Creation of a state of art **climate change laboratory** for research studies on climate change
 - c) Development of **Karnataka State Climate Change Strategic knowledge portal** for dissemination of information on climate change pertaining to the state of Karnataka
- a) **Establishing Permanent Preservation Plots in Bannerghatta National Park for long –term ecological studies to monitor climate change.**

Study on Permanent Preservation Plots (PPPs) play a significant role in assessing the impact of climate change. PPPs would help to observe and record the changes in species diversity, composition and growth pattern due to climate change over a period of time.

Area of study: Permanent preservation plot study was initiated in the Bannerghatta National Park (BNP) in the outskirts of Bengaluru city. BNP (12°34'to 12 ° 50' N Lat and 77 ° 31 to 77 ° 38'E Long) comprises mainly dry forests. The total area of the park is 260.51 sq.km. BNP has three wildlife ranges namely Bannerghatta, Harohalli and Anekal. The terrain of the park is undulating with a mean elevation of 850meters ASL (range 700 meters – 1035 meters). Climate of the park is monsoonal type.

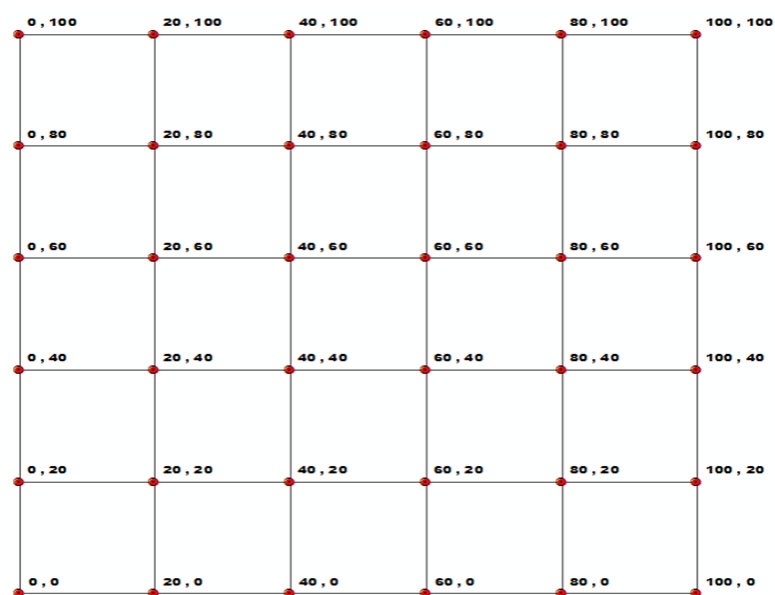


For the preparation of study area the Survey of India Topo sheets have been taken as base maps for referring details of forest boundary, streams, transport, and settlement. There are 05 topo sheets of 1:50,000 scale for the entire Bannerghatta National Park. The topo sheets also aid in geo-referencing the satellite imagery, identification of existing features such as forests, water bodies, scrub regions, sheet rocky areas and so on. The following are the list of topo sheets used in this study.

Sl. No	Survey Of India topo sheets
01	57H_06
02	57H_07
03	57H_09
04	57H_10
05	57H_11

- **Topography and the Mapping Grid (Demarcation of PPP)**

Establishing an accurate and permanent grid system allows trees to be mapped precisely and is also the basis for developing a topographic map of the plot, providing elevation, slope, and aspect information—all of which are crucial for understanding tree distributions. Most of the really interesting data emerging from the large plots is based on accurate spatial positioning, which, in turn, is based on the grid system. Surveying in forest is difficult, more so in vegetation plots because the plants must not be damaged. Methodology for surveying the grid and creating a topographic map of a forest plot includes laying out a 20-m grid over 1 ha area with elevation established and permanent markers placed. The 20x20 m quadrats into which the large plot is surveyed become the units of field, and a simple and consistent numbering system for them is necessary. The most convenient system for field work is to designate a quadrat by column and row, where rows are numbered from south to north, and columns from west to east.



Plots with Coordinates

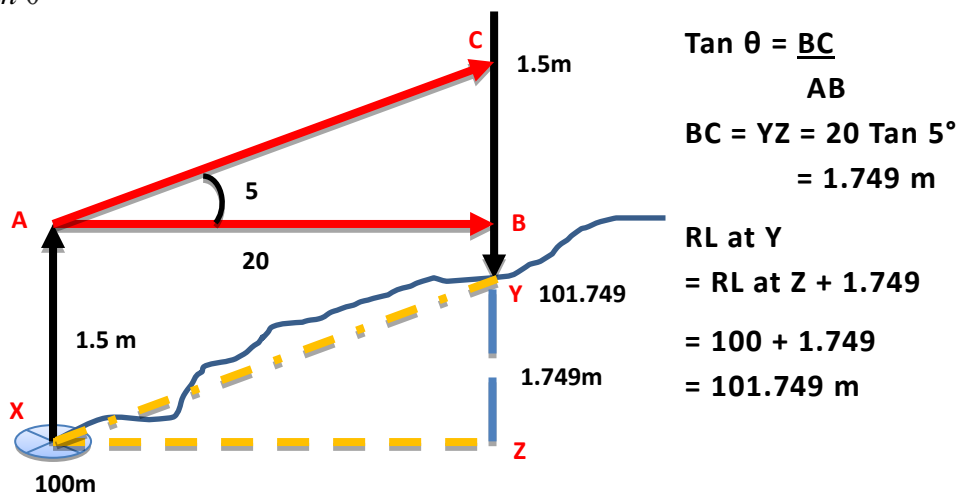
Calculating the Topography and its accuracy - Theodolite survey

A theodolite is a precision instrument for measuring angles in the horizontal and vertical planes. Vertical angle is measured from one point to other point as shown in image.



The first step taken with this data is to convert the inclination (vertical angle) to a change in elevation: if d is the horizontal distance between stakes (usually, $d = 20$) and θ the vertical inclination, the change in elevation is

$$E = d \tan \theta$$

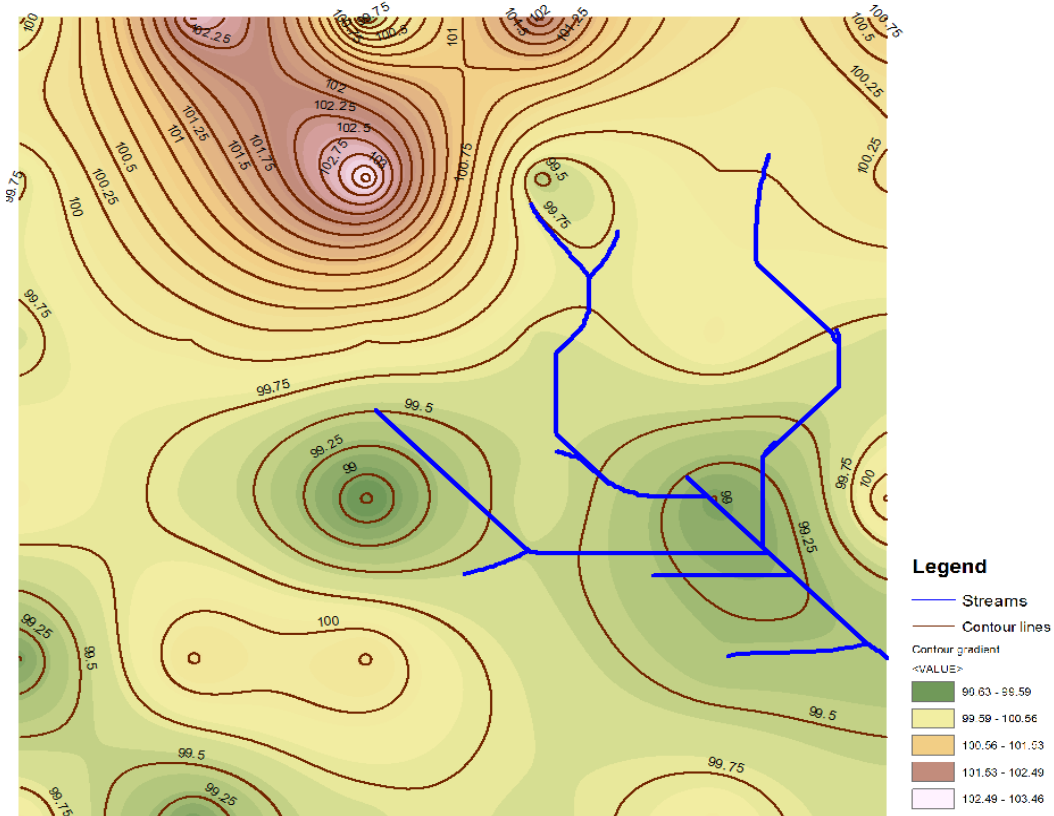


Reduced Level calculation using Theodolite Survey

The above figure shows how the elevation from one point to another point is calculated using the theodolite survey instrument. Theodolite placed over a ground mark at point X and staff is located at point B.

Using surface interpolation method available in 3D analyst tool in ArcGIS software, contour line map is generated as shown in figure 6. Watersheds, also known as basins or catchments are physically delineated digitally in a GIS environment by the area upstream from a specified outlet point. Watersheds can be delineated. Blue line in the figure represents the basins of the plot.

Contour Map of Thalewood house Permanent Preservation Plot



Contour map of Thale wood house PPP

Enumeration of trees

Enumeration includes locating each stem, tagging it and measuring its diameter at breast height (dbh). With a grid already in place, locating and tagging trees is straightforward: small squares of land are mapped one at a time. The rule for all large plots is to include free-standing woody stems with a diameter at breast height, or dbh, > 10 mm. Breast height is 1.3 m above the ground. Mapping teams are often responsible for filling in the 10-m grid markers. After the 10 x 10 m stakes are placed, one sub-quadrat is demarcated with rope. A single piece of rope is wrapped around the four corners to mark the periphery. The rope is moved after each sub-quadrat is finished .



FID	QUAD	SUBQ	TAGNO	LX	LY	SPECIES	FAMILY	HEIGHT	dbh	baslarea
0	1	1.1	1	6	1.7	Cipadessa baccifera	Meliaceae	2	1.7	2.269801
1	1	1.1	2	4.4	2.9	Cipadessa baccifera	Meliaceae	2	1.7	2.269801
2	1	1.1	3	6	1.7	Ixora nigricans	Rubiaceae	4	6.366198	31.83099
3	1	1.1	4	6.4	1.5	Cipadessa baccifera	Meliaceae	2	1.3	1.327323
4	1	1.1	5	7	2.1	Cassia fistula	Fabaceae	9	14.4831	164.7453
5	1	1.2	6	5.1	1.5	Terminalia bellirica	Combretaceae	13	58.31437	2670.798
6	1	1.2	7	3.2	8.7	Syzygium cumini	Myrtaceae	4	4.5	15.90431
7	1	1.2	8	3.4	8.6	Glochidion velutinum	Phyllanthaceae	5	11.77747	108.9416
8	1	1.2	9	3.6	9.3	Glochidion velutinum	Phyllanthaceae	2.5	1.5	1.767146
9	1	1.4	10	1.6	3.5	Terminalia bellirica	Combretaceae	16	88.87212	6203.274
10	2	2.1	11	7	0.3	Glochidion velutinum	Phyllanthaceae	6	9.294649	67.85094
11	2	2.1	12	6.9	1.8	Terminalia arjuna	Combretaceae	16	61.78395	2998.066
12	2	2.2	13	0.2	9.8	Olea dioica	Oleaceae	6	8.435212	55.88328
13	2	2.2	14	7.4	7.7	Olea dioica	Oleaceae	7	14.80141	172.0664
14	2	2.2	15	9.2	5	Glochidion velutinum	Phyllanthaceae	7	15.27887	183.3465
15	2	2.3	16	3.1	8.5	Terminalia bellirica	Combretaceae	12	32.81775	845.8775
16	2	2.3	17	9.8	5.4	Glochidion velutinum	Phyllanthaceae	8	14.00563	154.062
17	2	2.3	18	4.9	4.9	Climber1	.	0	5.729578	25.7831
18	2	2.3	19	8.1	4.2	Terminalia bellirica	Combretaceae	13	33.74085	894.1325
19	2	2.4	20	4.2	7.2	Acacia sp	Leguminosae	4	6.684508	35.09366
20	2	2.4	21	3.5	6.5	Vitex altissima	Lamiaceae	5	9.390142	69.25229

Survey data entered in the MS excel format

After completion of the enumeration of Thalewood house plot, digital data (Table 1) is created and corrected for typological errors.

Thale wood house plot has 1588 individuals above 1cm dbh belonging to 85 different woody species including lianas. Most dominant species is *Olea dioica* (Oleaceae) with 291 individuals that accounts for 18.3% of abundance followed by *Cipadessa baccifera* (Meliaceae), a shrub (157 individuals and 9.8% abundance) and *Ziziphus oenoplea* (Rhmaceae), a liana (138 individuals, 8.6% abundance).

Thales Woodhouse Plot: species Distribution

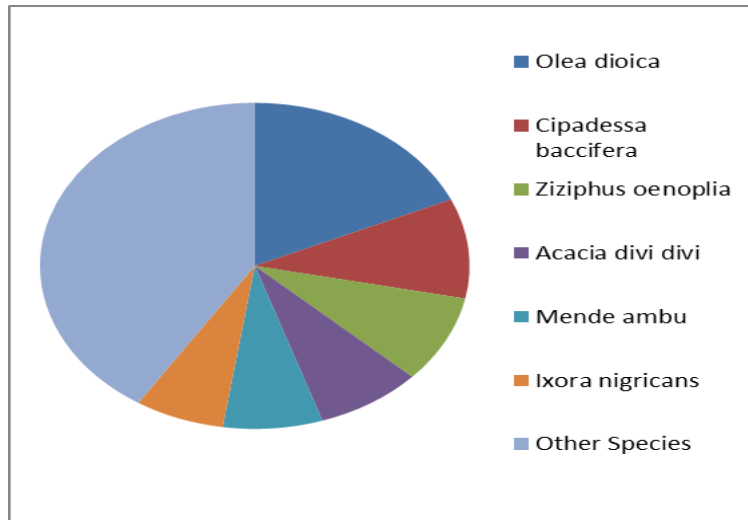
1. Thale woodhouse Plot

- ❖ Work in 25 sub plots have been completed
- ❖ Total individuals - 1588
- ❖ 85 species were recorded
- ❖ Dominant Species-
 1. *Olea dioica* (291)-18.3%
 2. *Cipadessa baccifera* (157)-9.8%
 3. *Ziziphus oenoplea* (138)-8.6%
 - ❖ GBH/DBH-1cm to 397.8cm
 - ❖ Height- 1m to 27m

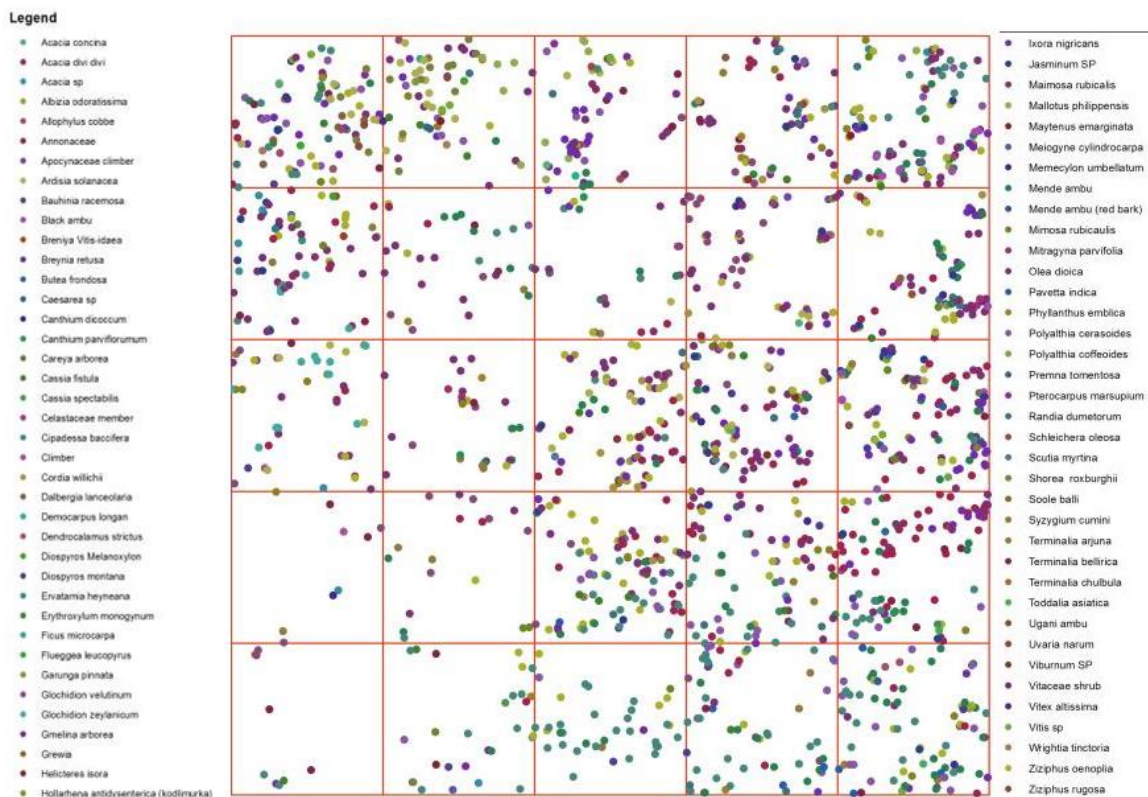
2. Bugurikallu Plot

- ❖ Work in 13 sub plots have been completed
- ❖ Total individuals - 1217
- ❖ 63 species were recorded
- ❖ Dominant Species -

1. *Ixora nigricans* (199)
2. *Anogeissus latifolia* (163)
3. *Erythroxylum monogynum* (135)



Distribution of major species in Thalewood house

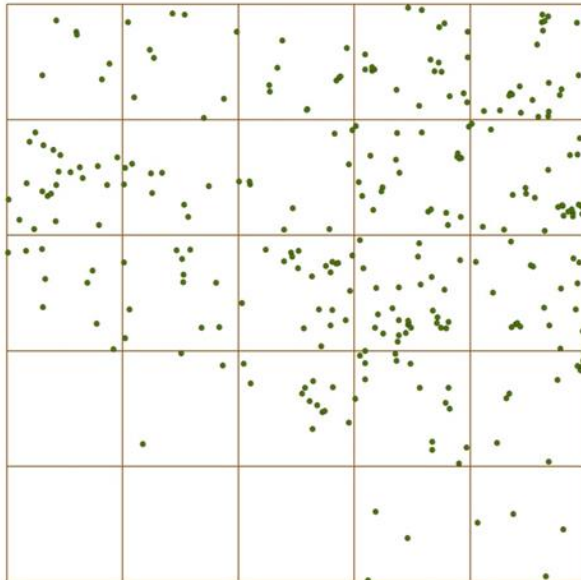


Distribution of different species in Thalewood house

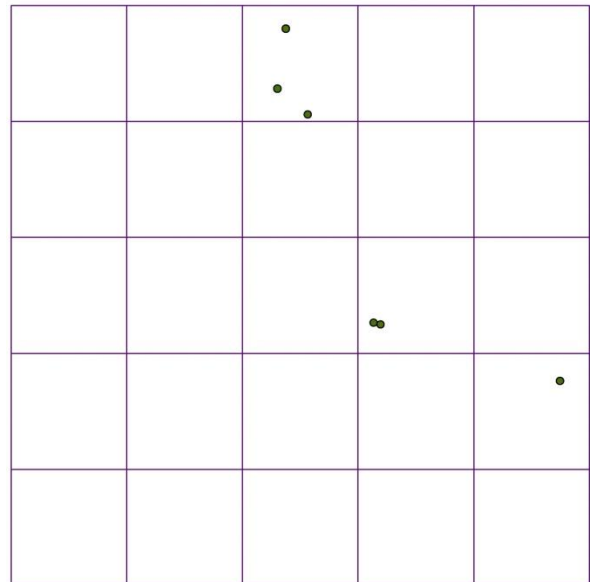
Spatial distribution of several species was analysed. Most species show significant aggregated dispersion suggesting clumping dispersion. Canopy species such as *Olea dioica*,

Schleichera oleosa, *Shorea roxburghii* and *Syzygium cumini* showed significant aggregated dispersion (figure) while species such as *Terminalia arjuna*, *Terminalia bellerica* and *Phyllanthus emblica* showed random dispersion (Figure). Most of the species that showed random dispersion was not statistically significant.

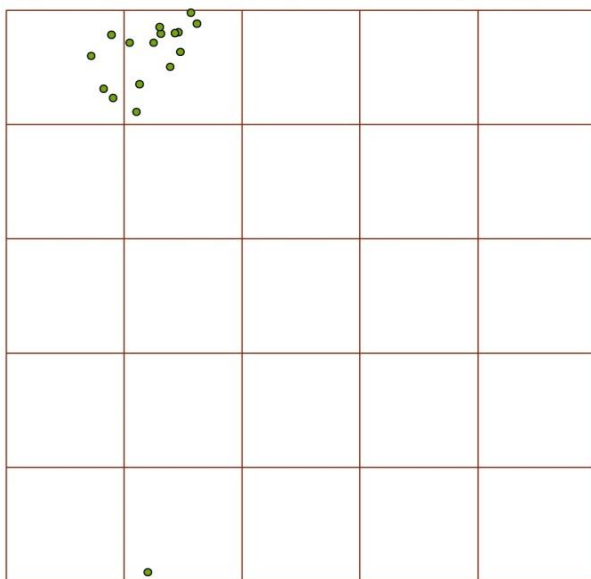
Spatial distribution map of *Olea dioica* species



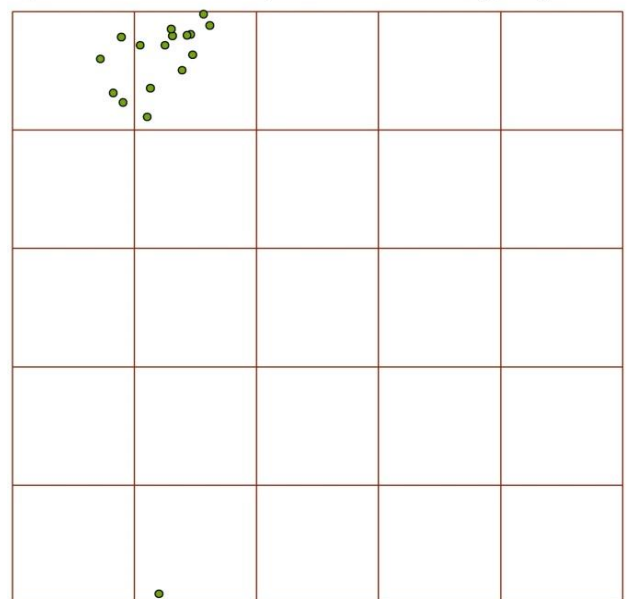
Spatial distribution map of *Schleichera oleosa* species



Spatial distribution map of *Shorea roxburghii* species

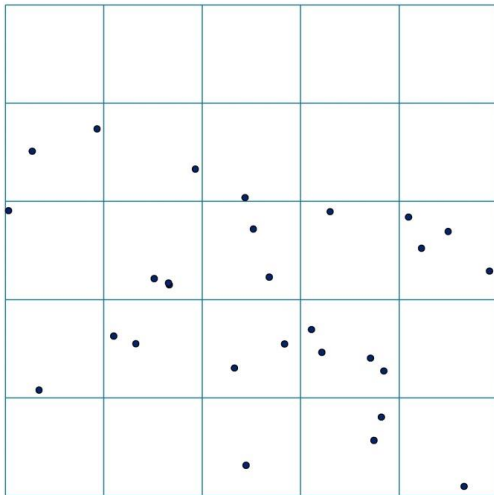


Spatial distribution map of *Shorea roxburghii* species

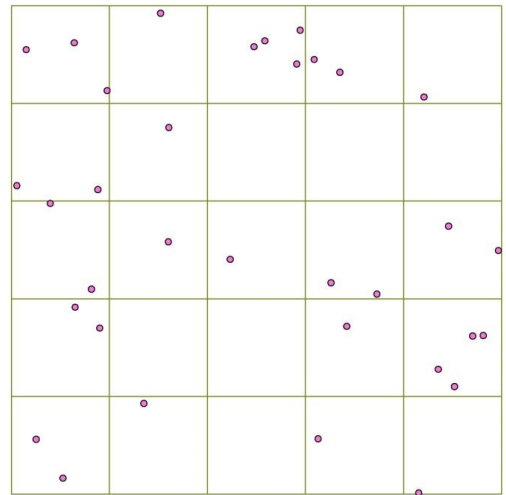


Spatial distribution (clumped) of four Species in Thale woodhouse, BNP

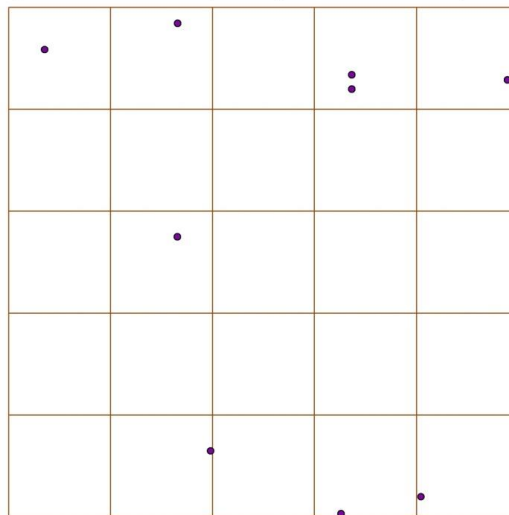
Spatial distribution map of Terminalia arjuna species



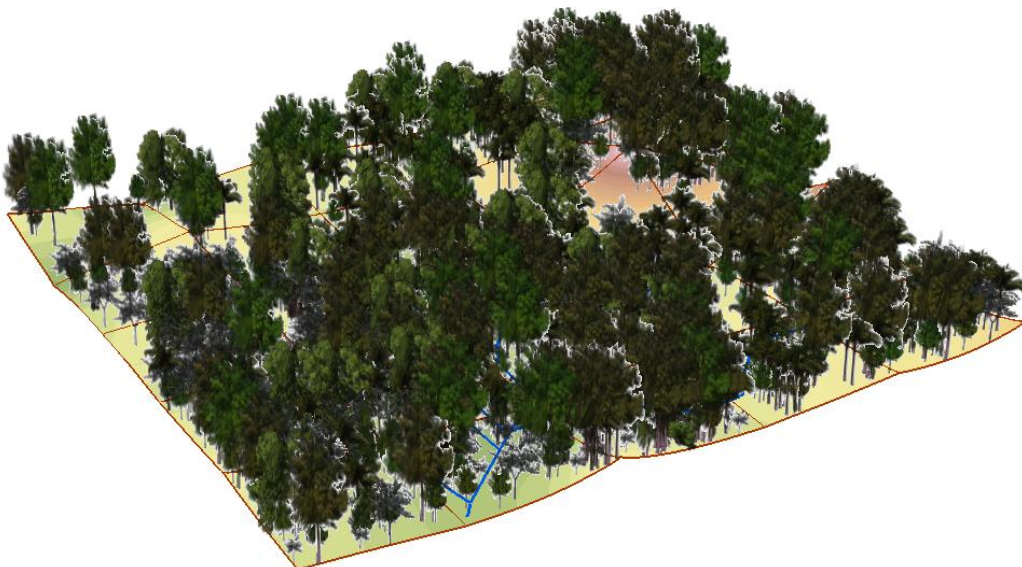
Spatial distribution map of Terminalia bellirica species



Spatial distribution map of Phyllanthus emblica species



Spatial distribution (random) of three Species in Thale woodhouse, BNP



3D map of thalewood house vegetation

Automatic Weather station



Two Automatic Weather Stations (AWS) are installed in Bannerghatta National park and Doresanipalya Reserve Forest. Weather data namely temperature, rainfall, relative humidity, wind speed, wind direction, solar radiation & sunshine data can be accessed once every 15 minute

b) Establishment of the Climate Change Laboratory

The establishment of the climate change laboratory has been completed by Karnataka Rural Infrastructure Development Limited (KRIDL) and all the instruments are being housed in a proper manner. The laboratory will be ISO 9001 & OHSAS 18001 certified for the better management of instruments. The following are the equipments installed.

Sl. No.	Name of the Equipment
1	Automatic weather monitoring stations- 2Nos
2	Compound microscope and Photo Micrography unit
3	GIS (Arc GIS 10.4)
4	GPS
5	CHNS Elemental Analyzer
6	IRGA (Infra-Red Gas Analyzer)
7	COD digester
8	Leaf area analyzer
9	Diameter tape, Measuring Tape, Calipers
10	Laser Hypsometer, Ravi Altimeter, Clinometers, Densitometer
11	GLA Fisheye
12	Digital Weighing Balances-3
13	Digital pH meter
14	Autoclave
15	Distillation unit
16	Laminar air flow
17	Flame Spectrophotometer
18	Conductivity meter

19	Hot air ovens
20	Soxhlet distillation unit
21	Digital electronic Balance
22	Centrifuge
23	Soil moisture meter
24	Rotary Shaker
25	BOD incubators-2
26	Freezer Unit
27	Devices for the development of interactive Web portal, Data Storage, Software for data computing, analysis, and training
28	Video camera and accessories
29	Atomic absorption spectre photometer

c) Karnataka State Climate Change Strategic Knowledge Portal (KSCCSKP)

A web-portal named “Karnataka State Climate Change Strategic knowledge portal” has been developed to disseminate climate change and related activities in an interactive and efficient way throughout the state of Karnataka.

User Interface

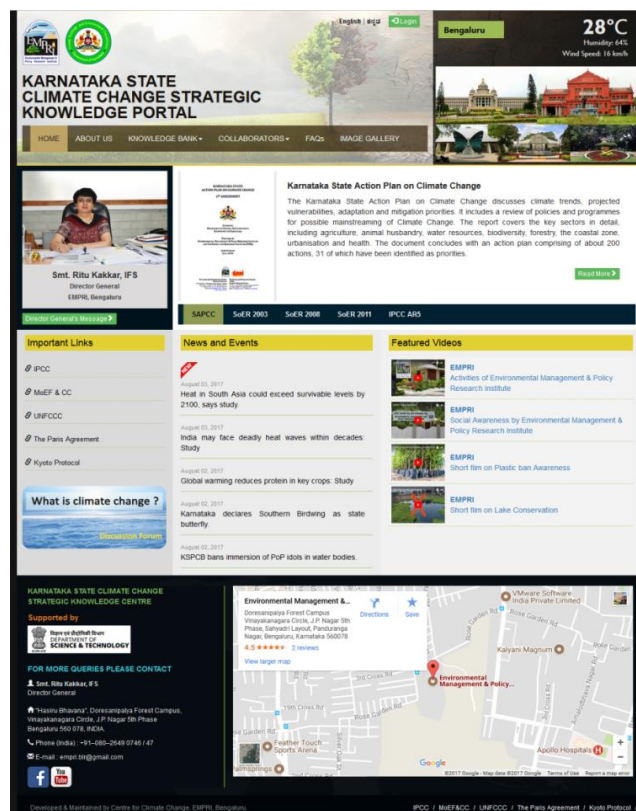
- HTML (Hyper Text Markup Language)
- Bootstrap CSS (Cascading Style Sheet)
- Javascript

Client-Server Interface

- PHP (Hyper Text Pre Processing) (server script)
- MYSQL (database)

Some of the important features include:

- Discussion forum for interacting with the domain experts, researchers, students and public
- Interlinking with all climate change knowledge institutions (IISc., FRLHT, ISEC, TERI, PAC etc.)
- Important publications/reports from EMPRI viz., Karnataka State Action Plan on Climate Change, State Of the Environment Report (2003, 2008 & 2011) and also other publications on Climate Change from MoU institutions, Govt., and other agencies
- Featured videos on environmental awareness and Global news & events on Climate Change
- Dashboard for monitoring the butterflies in Bengaluru/others districts in Karnataka



- Butterfly identification along with date & time, latitude & longitude of the location will be collected using mobile application
- Dashboard will be developed to access the collected data and provide interactive information (eg. Pie charts, graphs & maps)

2. Coordination with Government Departments for Developing Projects under National/International Funding:

As directed by Ministry of Environment Forests and Climate Change (MoEF&CC), Government of India (GoI), EMPRI is also coordinating the state departments to prepare and submit proposals under National Adaptation Fund for climate change (NAFCC). A proposal entitled, "Conservation and Management of Indigenous Cattle and Sheep in the Wake of Climate Change in Karnataka" was sanctioned in 2016 for Rs. 24, 21, 52,632/- by MoEF & CC, New Delhi. The work is under progress.

3. Green Climate Fund projects submitted for consideration.

1. A proposal entitled "Karnataka Farm Tree Support Project" submitted by Karnataka Forest Department with a budget outlay of USD 146 million is submitted to MoEF&CC.
2. A proposal entitled "A watershed partnership approach to deliver end to end solutions to help farmers to cope with climate variability and extreme events" Submitted by Watershed development Department with a budget outlay of USD 338.12 million.
3. A proposal entitled "On Farm Adaptive Demonstration On Drought Mitigation through Solar Powered Micro Irrigation" submitted by University of Agricultural Sciences at the cost of Approximately Rs 4.00 crores

4. CCSAMMN programme of NMSA

EMPRI facilitated the preparation of action plan under CCSAMMN programme of NMSA with the co-ordination of UAS, Bangalore & submitted the proposal to Department of Agriculture, GoK which in turn was forwarded to Additional Commissioner, GoI ("Productivity enhancement through climate smart agricultural practices in four pilot blocks in Karnataka")

2.4. Outreach Activities:-

2.4.1. Environmental Information System (ENVIS) Centre;

The Environmental Information System (ENVIS) of Karnataka with the subject area "State of Environment and Related issues" is operating in Karnataka since December 2002. It was established as ENVIS centre on 1st January 2009. The ENVIS scheme was revamped in April, 2017 with addition of new initiatives to the previously existing one until March, 2020. The ENVIS centre Karnataka carried out the activities in the following areas. The details are as below:

2.4.1.1. ENVIS Website:

The ENVIS centre Karnataka has a dedicated website on the NIC CMS portal - www.karenvis.nic.in. The contents of the website is published and managed by the ENVIS centre Karnataka as per the guidelines given by



MoEF&CC. Recently, the website was redesigned to make information more accessible with more attractive features.

2.4.1.2. Bhuvan Portal:

The centre also creates and disseminates content relating to the themes assigned to ENVIS Centres in geo-spatial platform in Bhuvan portal.



2.4.1.3. Indian State Level Basic Environmental Information Database (ISBEID);

The Indian State-Level Basic Environmental Information Database (ISBEID) is an ambitious programme of the Ministry of Environment and Forests, GoI in order to make environmental status easily available to researchers, students, policy makers, and the general public at large. The data have been classified into 17 modules/sectors. Data for all these sectors have been collected either in full or in partial (year wise). For all the 17 modules and sub-modules data has been collected & uploaded on an average of 10-12 years or more. Number of entries done: **21,359** (April 2017 to March 2018)

State	Year	Module	Value	Link
Andhra Pradesh	2017	Air Quality	1000	View Data
Andhra Pradesh	2017	Water Quality	1000	View Data
Andhra Pradesh	2017	Soil Quality	1000	View Data
Andhra Pradesh	2017	Forest Cover	1000	View Data
Andhra Pradesh	2017	Waste Management	1000	View Data
Andhra Pradesh	2017	Water Resources	1000	View Data
Andhra Pradesh	2017	Climate Change	1000	View Data
Andhra Pradesh	2017	Disaster Management	1000	View Data
Andhra Pradesh	2017	Public Health	1000	View Data
Andhra Pradesh	2017	Energy	1000	View Data
Andhra Pradesh	2017	Transportation	1000	View Data
Andhra Pradesh	2017	Urbanization	1000	View Data
Andhra Pradesh	2017	Water Pollution	1000	View Data
Andhra Pradesh	2017	Soil Pollution	1000	View Data
Andhra Pradesh	2017	Water Conservation	1000	View Data
Andhra Pradesh	2017	Water Quality	1000	View Data
Andhra Pradesh	2017	Water Quantity	1000	View Data
Andhra Pradesh	2017	Water Use	1000	View Data
Andhra Pradesh	2017	Water Pollution	1000	View Data
Andhra Pradesh	2017	Water Quality	1000	View Data
Andhra Pradesh	2017	Water Quantity	1000	View Data
Andhra Pradesh	2017	Water Use	1000	View Data

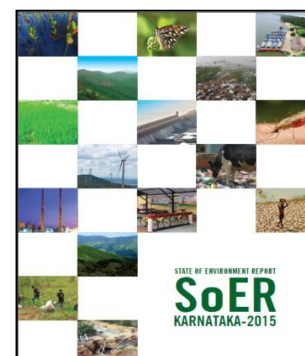
2.4.1.4. ENVIS Newsletter 'PARISARA':

ENVIS centre has been publishing a quarterly newsletter 'PARISARA'. Centre has published 43 issues till 2017, issue 44 on Geographical Indications of Karnataka, issue 45 on Biodiversity Hotspots, issue 46 on Green Transportation and Issue 47 on Watershed Management for the year 2017-2018. Available for download on WWW.KARENVIS.NIC.IN



2.4.1.5. State of Environment Report (SoER)- 2015 Karnataka

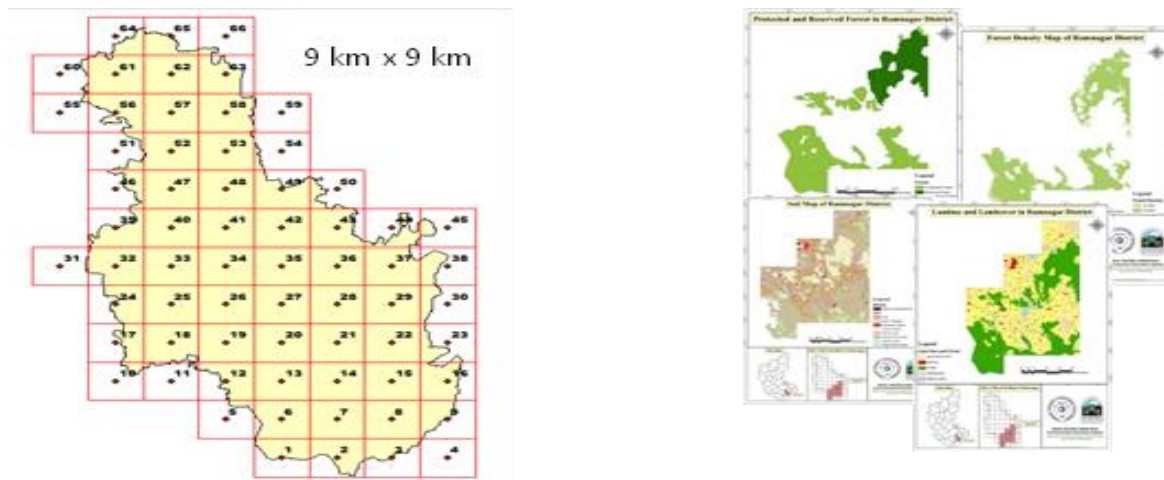
SoER is a Ministry of Environment, Forest and Climate Change (MoEF&CC), GoI funded project to EMPRI in March, 2017. The objective of the status of the environment report was to understand and assess the cause of environmental problems to initiate policies and programme for maintaining the ecological balance. EMPRI has prepared the report involving 16 chapters with the help of multidisciplinary team of subject



experts. All the chapters were peer-reviewed and edited by the editorial team members. The chapters discuss the present status, problems, solutions and the way forward. This has been approved by the Steering Committee and submitted to Government of Karnataka.

2.4.1.6. Grid- Based Decision Support System (GRIDSS)

Under the GRIDSS scheme for Sustainable Management of Natural Resources, Karnataka ENVIS hub (EMPRI) has selected Ramnagar District for case study. District was divided into grids of 9 km x 9 km. Selection of the sample in the grid will be based on bio-diversity rich regions. The baseline data will be collected by following questionnaire pattern. The different thematic maps were created with the support of GIS for the Ramnagar district.



2.4.1.7. EMPRI Library:

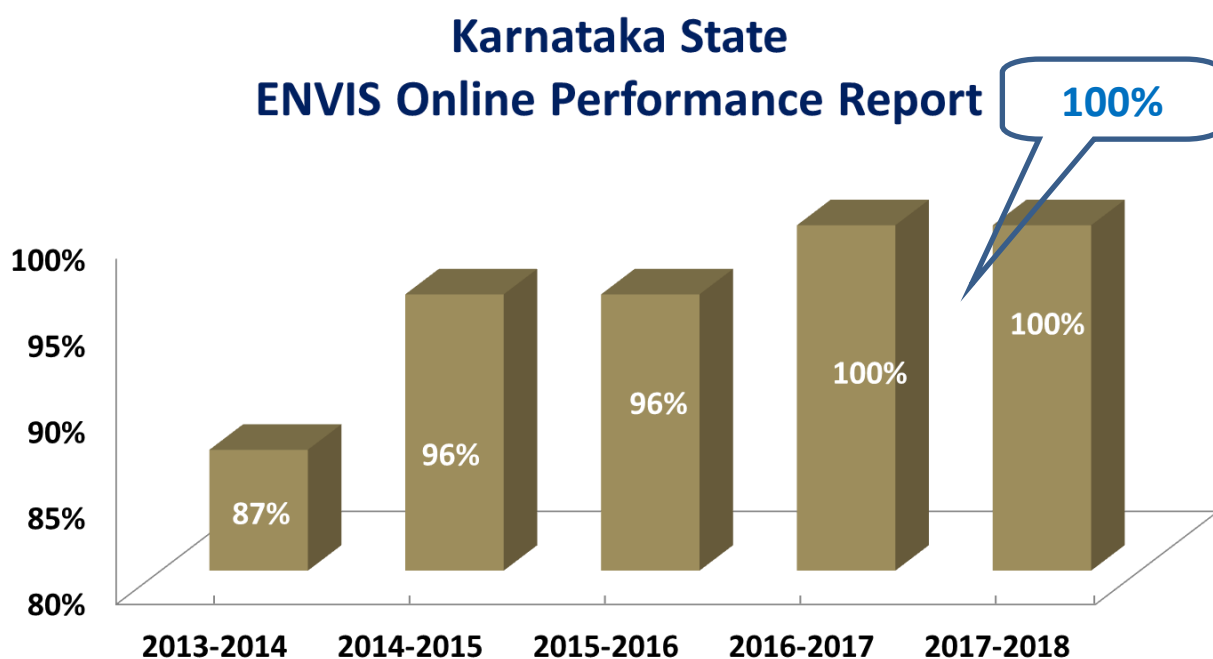
The library is a documented repository of information and it has a collection of over 2800 books. The library also receives more than 27 state/national journals and newsletters covering diverse areas of environment.

Library resources

- EMPRI Library has more than **170** CD-ROM databases ; 04 Newspapers (1 Kannada, 3 English) subscriptions and Toposheets maps- **650**.
- Subscription to the “The Indian Forester” Journal (TIFJ) and archival CD-ROM database (from **1875**)
- EMPRI library has been using the **KOHA** open source software (OSS) for Library automation. The Library has automated 2800 books which includes reference books, text books, reports etc.,

EVALUATION MATRIX FOR FINANCIAL YEAR 2017-18 (01.04.2017 to 31.03.2018)											
Website Updation (Frequency)					Visitors Summary			Query Answer Statistics			Total Marks (Out of 210)
Frequency of Updating (Weightage: 9) (18.37%)	Newsletter/ News/Books (Weightage: 10) (51%)	Subject Area (Weightage: 25) (20.41%)	Reports Read/ Down-loaded (Weightage: 5) (10.20%)	Subtotal Marks (Out of 147)	Visits (Weightage:2) (28.57%)	Visitors (Weightage: 5) (71.43%)	Subtotal Marks (Out of 21)	Total No of Queries received (Weightage: 4) (28.57%)	No of Queries Answered (Weightage: 5) (71.43%)	Subtotal Marks (Out of 42)	
1635	59	0	2061	147 (100%)	231955	20763	21 (14%)	345	88	42 (29%)	210 (100%)

Online Evaluation Outcomes for Last Five Years



2.4.1.8. Other Activities of ENVIS Centre:

1. **Science express climate action special:** Karnataka State ENVIS centre has created awareness by taking part in Science Express Climate Action Special Train at 2 major cities, namely, Bangalore (Whitefield, Kengeri) and Gulbarga in between 6th – 11th June, 2017. The Centre got an overwhelming response of more than 40,000 general public and students / children of different age groups visiting our exhibition stall at the platforms. The centre apart from interacting with the kids also conducted platform activities like quiz competition and playing of videos on environmental issues for all the students.

2. **World Environment Day:** The Centre participated in the World Environment Day conducted on 6th June 2017 with the theme for the year 'Connecting people with Nature'. Sri. Sanjay Mohan, IFS., APCCF, Research & Utilization was the chief guest for the function. The programme commenced with a "Nature Walk". The high school children from three Government High School - Begur, Yediyur and Sarakki participated in the "Nature Walk". For creating awareness on conservation of the flora and fauna with the "Butterflies Identification programme". Drama and Drawing competition were organised for the school children focusing on the environment day theme. School children enthusiastically participated with their innovative ideas by performing Environmental awareness skit. The prizes were also distributed for winners.
3. **International Yoga day:** The centre participated in the International Yoga Day conducted on 21st June 2017 with the theme for the year "Yoga for Health". Mr. N. Prashant (*OJAS YOGA Academy, Bangalore*) was invited to EMPRI to provide the outline on the importance, practice and implementation of Yoga, Meditation, Pranayama and Stress Management in our daily life. The significance of different yoga postures were explained during this program.
4. **International Ozone Day:** The centre conducted and participated in the International Ozone Day on 12th September 2017 for the Preservation of the Ozone Layer with the theme for the year "Caring for all life under the sun". Dr. K.H. Vinaya Kumar, IFS interacted with the students and EMPRI staff about the importance of ozone, climate and other environmental issues. In this programme, 5 different Government High School students from Agara, Beratena Agrahara, Gottigere Sarakki and Puttenahalli, Bangalore were invited to participate. The "slogan writing" and "Painting" competition were organised for school students to create awareness on Ozone day. The celebration concluded with distribution of prizes to winners.
5. **Environmental Protection Day:** The centre took part in Environmental Protection Day and Rastriya Ikyatha Saphaha (National Unity Day) on 25th November 2017. Pledge was taken on the occasion of Rastriya Ikyatha Saphaha Divas. On the occasion, 10th standard students from Dayananda Kannada High School were invited. Essay Competition and Quiz Competition was conducted for the students.
6. **Worlds Wetland Day:** The centre actively conducted and participated in the Wetland Day programme on 2nd February 2018 with the theme of "Wetlands for a Sustainable Urban Future" for the year 2018. Students from Government High School, Sarakki were invited on this occasion. Two naturalists namely Shri. T.S. Srinivasa (Director, Eco Edu) and Shri. Prasad were invited as chief guests to share their valuable knowledge on wetlands and its biodiversity. A "Nature Walk" was organised to the Puttenahalli Lake, Bengaluru. Tips on bird identification and importance of wetlands day were narrated to the participants. The students were able to identify the birds with the help of the subject experts. Painting competition and Quiz competition were organised for the School children on the wet land day theme. School children enthusiastically participated with their innovative ideas.
 - **The centre has created knowledge products and the data bases**
 - **Database updated on Karenvis Website**
 - District wise Thematic Maps of Karnataka

- District wise Raising Plantation of Karnataka
- GRIDSS of Ramnagar District
- Endemic plant species of Karnataka
- Database of Medical Plants
- Agriculture Biodiversity of Karnataka
- State wise Solar Installed Capacity
- **Posters / leaflets prepared**
 - World Wetlands day - Leaflet
 - World Metrological day - Leaflet
 - World Plantation day - Leaflet
 - World ozone day - Leaflet
 - World Sparrow Day - Leaflet
 - World Forestry Day - Leaflet
 - World Health Day - Leaflet
 - Organic framing - Poster
 - Save water - Poster
 - Save energy for Sustainable Development - Poster
 - Green Transportation - Poster

2.4.2. National Green Corps (NGC):

National Green Corps is a national school programme of Ministry of Environment Forests and Climate Change (MoEF&CC) launched in 2001. The main objective of the scheme is to establish "National Green Army" in schools all over the state to spread awareness on environment and carry out action based programmes for protection and improvement of environment. EMPRI is serving as Nodal Agency for NGC in Karnataka, since Jan, 2009. As per guidelines of MoEF&CC, in Karnataka, 8500 eco-clubs have been established covering all the 34 educational districts of the State. The details of eco-clubs are as follows:

Sl.No	Category of School	No. of Eco-clubs formed
1	Government High School	4423
2	Government Aided High School	2546
3	Government Higher Primary School	1531
Total		8,500

2.4.2.1. NGC Programme during 2017-18:

MoEF&CC had approved an Annual Work Programme (AWP) for the financial year 2017-18, for an amount of Rs.4,55,17,500/- (Rupees Four crore fifty five lakhs seventeen thousand and five hundred only) under National Green Corps Programme, vide MoEF & CC sanction letter No. 3/140/2001-EE, dated 23th October, 2017. So far MoEF&CC was releasing a financial assistance Rs-2500/- per school per year but from the current year it has enhanced the financial assistance to Rs-5000/- per Eco-Club school.

On receipt of funds from Ministry of Environment Forests and Climate Change (MoEF&CC), Government of India (GoI). EMPRI released the funds to Rashtriya Madhyamika Shiksha Abhiyan (RMSA) and Sarva Shiksha Abhiyan (SSA) of the Education Department. An amount of Rs. 3,57, 20,000/- (Three crore fifty seven lakh twenty thousand only) was transferred to RMSA vide letter no. NGC/GoI/FD_CERT_ RMSA/CR-8/2017-18/1529/dated 3-01-2018 and an amount of Rs. 76,30,000/- (Seventy six lakh thirty thousand only) was transferred to SSA vide letter no. NGC/GoI/FD_SSA/CR-9/2017-18/1540, dated 5-01-2018 for further disbursement to 8500 schools, and an assistance of Rs.25,000/- was provided to all the districts for strengthening, monitoring and implementation of NGC programme.

2.4.2.2. World Environment Day Celebration

World Environment Day, on 5th June 2017 was celebrated at EMPRI. The programme commenced with a “Nature Walk” at Doresanipalya Forest Campus, JP Nagar 5th Phase. The EMPRI office staff, officers of National Tiger Conservation Authority (NTCA), The Additional Principal Chief Conservator of Forests, Research and Utilisation staff and officers participated in the “Nature Walk”. Further a programme was conducted for world environment day at the EMPRI office focusing on the theme – Go Wild for Life.



World Environment Day



Drawing competition conducted during World Environment Day

2.4.2.3. Ozone Day Celebration

Environmental Management & Policy Research Institute (EMPRI) celebrated the World Ozone Day on 12th September 2017 as per the instructions from MoEF & CC. The function commenced with the inaugural session Chaired by Smt Ritu Kakkar, IFS, Director General of EMPRI. The ozone day celebration also included the Lecture on "Importance of Ozone Day" by Shri K H Vinaya Kumar, IFS Director of EMPRI. Posters regarding the Ozone day was displayed on notice board. The celebration concluded with distribution of prizes to winners.



2.4.2.4. Environmental Protection Day - Rashtriya Ikyatha Saphaha

Environmental Protection Day of Rastriya Ikyatha Saphaha was celebrated on 25.11.17 at Environmental Management & Policy Research Institute as per the orders of Karnataka Government order. The programme was held in the Chairmanship of Director of EMPRI. On the occasion of this programme Dayananda Kannada High School which is an Eco-club school was invited. Essay Competition as well as Quiz Competition was conducted for the School Children. Books and Brochure on 23 Environmental Days was distributed for the prize winners. Pledge was also taken on behalf of Rastriya Ikyatha Saphaha



Rashtriya Ikyatha Saphaha pledge taken from EMPRI staff and School Students



Quiz Competition and Drawing Competition

2.4.2.5. Prakriti Khoj-Online Environment Quiz

Prakriti Khoj-Online Environment Quiz is a National level Online Quiz Programme which had been launched by MoEF & CC under NGC Programme. Prakriti Khoj quiz programme consists of 5 Rounds. Schools have sent the list of nominations of students to EMPRI. EMPRI consolidated the list of students further sent to MoEF & CC for the generation of Password and User Id. The students who had received the Password and User Id were eligible for participation in the quiz. A total of 2931 students had registered from Karnataka state. The first round of quiz was held between 25.09.17 till 27.10.17 and 908 students had been qualified for second round which was held on 06.11.17 till 14.11.17. A total of 279 students had been qualified for third round quiz and had been held on 20.11.17 till 24.11.17. As per the schedule the fourth round quiz 4.12.17 till 06.12.17 in which 43 students from Karnataka were qualified and the fifth round which was to be held on 18.12.17 till 20.12.17 was not conducted as the fourth round was declared as the final round and the winners list would be sent from MoEF & CC. All participants would get the e-certificate and the winners would get cash prize & e-certificate.

PRIZES						
S.No	Age group	1st prize	2nd Prize	3 prize	Consolation prize	Total
1	8-12	Rs 50,000/- (1)	Rs 40,000/- (2)	Rs 25,000/- (5)	Rs 10,000/- (10)	18 prizes
2	13-15	Rs 50,000/- (1)	Rs 40,000/- (2)	Rs 25,000/- (5)	Rs 10,000/- (10)	18 prizes
3	16-18	Rs 50,000/- (1)	Rs 40,000/- (2)	Rs 25,000/- (5)	Rs 10,000/- (10)	18 prizes
					Total	54 prizes

Age group and Prize Distribution.

2.4.2.6. World Ozone Day Prize Distribution.

Environmental Management and Policy Research Institute (EMPRI) had arranged prize distribution ceremony on 21-02-2018, at the office of Hon'ble Minister of Forest, Environment and Ecology at Vidhana Soudha, Ambedkar Veedhi Bengaluru-1. Smt. Vandita Sharma, IAS Addl. Chief Secretary, Dept. of Forests, Ecology & Environment gave away the prizes to all the Prize winners



World Ozone Day Prize Distribution

Ozone Day Prize Winners list

Sl No.	Students Name	Name of the School	Competition	Prize No.	Prize Amount
1	Akshatha B P	GHS, Chikkamagaluru	Painting	I	10,000
2	Darshan	Vidyayinee HS, Dakshina Kannada	Painting	II	7,000
3	Mrunalini N Kulkarni	Divine Providence HS, Belagavi	Painting	III	5,000
4	Sachin	GPUC, Belthangady, Dakshina Kannada	Painting	IV	2,000
5	Bharath M G	Sri Ramakrishna HS, Puttur, Dakshina Kannada	Painting	V	2,000
6	Bhagyashree	GHS, Baikampady, Dakshina Kannada	Slogan Writing	I	10,000
7	Vittala K	GHS, Maliikatte, mangalore	Slogan Writing	II	7,000
8	Keerthana	GHS, Gundmi, Udupi	Slogan Writing	III	5,000
9	Suhas A	Sri Ramakrishna HS, Puttur, Dakshina Kannada	Slogan Writing	IV	2,000
10	Namratha N Mukri	Gibbs Girls HS, Kumta, Uttara Kannada	Slogan Writing	V	2,000

2.4.2.7. World Wetlands Day

World Wetlands Day was celebrated on 02.02.18 to commemorate the signing of international treaty “Ramsar Convention on Wetlands” in 1971 for conservation of wetland at the global level. This day was celebrated at Environmental Management & Policy Research Institute as per the orders of MoEF and CC. On that occasion Sarakki Government High School which was an Eco-club school was invited. Students were taken to a nearby wetland visit to Puttenahalli Lake for bringing awareness on the day. Importance of wetlands was explained to students. Bird identification activity was taken up by naturalists like Sri. T. S.Srinivasa and Sri.Prasad. Painting Competition and Quiz Competition was conducted for the Children. Prizes in the form of Books and Certificates were distributed for the winners.



2.4.2.8. NGC Team’s Visit to Schools

NGC team was supposed to conduct school visits as suggested and approved by the chairman of State Steering Committee.

In order to disseminate information about NGC Programme and review the activities taken up by the Eco-clubs, NGC team of EMPRI visited a total of 44 schools as against the 40 schools target fixed in State Steering Committee. During the school visit, the format of eco club report, utilization certificate and basic information in detail was explained to the in charge teachers. NGC team also addressed the eco club members in each school visited and noted the problems faced by the teachers while conducting the eco club activities and suggested easy methodology to implement the same. The details of the school visits can be seen in **Annexure-12**.

MDS, Hebballi, DharwadGHS, Navalgunda, DharwadGHPS, Laksmeshvara, GadagGHS, Belawadi, mysore

2.4.2.9. Training Programmes conducted under the NGC programme during 2017-2018

EMPRI Successfully conducted trainings in the financial year 2017-18 at the state and taluk level. The details are as follows.

a) State Level training

This training was conducted at EMPRI in 4 phases for the selected Head Masters and In charge teachers who are also part of the DIMC committees. It was a two days training which concluded with participation from 34 districts of Karnataka. School annual report which has been prescribed by MoEF&CC was discussed in detail. There were question and answer sessions and also feedback was collected from the participants. The participants were also given participation certificates. Apart from this resource materials mentioned below were also given during the workshop.

Materials given at the state level trainings:

- Write up on National Green Corps (NGC)
- National Green Corps (NGC) Brochure
- Reporting format of DIMC and Annual school report
- Journey from grey to green both in English & Kannada
- Calendar of activities for eco club
- INEP HAND OUTS
- Hand book on significant Environment days
- Nimma Shale Hasiragideye – A Kannada manual
- A copy of the GO(Govt. Order) – Re-constitution of SSC & DIMC

The details of the trainings conducted are mentioned below:

Details of State level Training Programme

Sl. No.	Date	No. of Districts	No. of participants
1	29-01-2018	15	36
2	30-01-2018	19	36
Total		34	72



State level training

b) Taluk level training

SATCOM (Satellite Communication) teleconference training was conducted on 28th February 2018 at DSERT (Department of State Educational Research & Training) in which 3598 participants had participated from 34 Educational districts. **The details of participants in training can be seen in Annexure - 13.**

SATCOM (Satellite Communication) teleconference training



2.5. Water Analysis Laboratory:

Physico-chemical Laboratory and Micro biology laboratory is well equipped to carry out following parameters of water analysis.

Physico chemical parameters

- Acidity
- Alkalinity
- Ammonia
- Biochemical Oxygen Demand
- Boron
- Chemical Oxygen Demand
- Chloride
- Dissolved Oxygen
- Electrical Conductivity
- Fluoride
- Free chlorine
- Hardness (Ca & Mg)
- Oil and grease
- pH
- Phosphate
- Sludge volume Index (S.V.I)
- Sulphide
- Total Dissolved Solid
- Total Kjeldahl Nitrogen
- Total Solids
- Total Suspended Solids
- Turbidity

Microbial parameters

- Bio-assay
- Fecal coliform
- Total coliform

Period/Year	No of water sample analysed
April 2016 – March 2017	393
April 2017 – March 2018	473

Setting up of air quality monitoring laboratory has been initiated. Stack monitoring and Respirable suspended particulate matter sampler (RSPM) and Portable generator set 2.4 KVA equipments have been procured during the year



Stack monitoring kit



Respirable suspended particulate matter (RSPM)



2.4 KVA portable generator set matter

Environmental Management Policy Research Institute Water analysis laboratory is accredited by OHSAS 18001:2007 and ISO 9001:2015 during Jan 2018.



Following trainings have been conducted during the year 2017-18

Sl.No	Title	Date
1.	Training on IMS, 09-05-2017	09-05-2017
2.	Training on Verbal communication, June 2017	June 2017
3.	Training on Written communication, June 2017	June 2017
4.	Training on Mindfulness and Delivering workshop, July 2017	July 2017
5.	Training on first aid training, St. Johns ambulance, October 2017	October 2017
6.	Training on Lab practices, 28 th October 2017	28 th October 2017
7.	Training on Lab practices, 4th November 2017	4th November 2017
8.	Training on Lab practices, 10th November 2017	10th November 2017
9.	Training on Lab practices, 18th November 2017	18th November 2017
10.	Training on Climate change (online), 17th to 24 th February 2018	17th to 24 th February 2018
11.	Training on Integrated Management System (IMS) (online) 7 th to 26 th March 2018	7 th to 26 th March 2018

CHAPTER 3

HUMAN RESOURCES

3.1 Officers on Deputation from Government of Karnataka

Sl.	Name	Designation	Date of joining	Date of leaving
1	Smt. Ritu Kakkar, IFS.,	Director General	02.01.2013	--
2	Shri. K. H. Vinaya Kumar, IFS	CCF & Director	13.09.2011	--
3	Shri. V. Ganesh	Range Forest Officer	13-10-2017	09-01-2018
4	Shri. Ramesha C.	Project Development Officer	31.08.2017	--
5	Smt. Nausheen Jabeen	Gazetted Manager	22.05.2017	--

3.2 Employees;

3.2.1. Employees have been outsourced through manpower agency for carrying out various projects as on 31st March, 2018.

Sl. No.	Positions	Climate Change	Centre for Lake Conservation	GIS Centre	NGC	ENVIS	Total
1	Consultant	1	-	-	-	-	1
2	Research Scientist	3	2	-	-	-	5
3	Research Associates	3	4	-	-	-	7
4	GIS Scientist/Expert	-	-	1	-	-	1
5	Junior Research Fellow	1	-	-	-	-	1
6	Project Assistant	1	-	-	-	-	1
7	Lab Chemist	-	2	-	-	-	2
8	Microbiologist	-	1	-	-	-	1
9	Hydrologist	-	1	-	-	-	1
10	Training Head	1	-	-	-	-	1
11	Training Associates	2	-	-	-	-	2
12	Training Assistant	2	-	-	-	-	2
13	Programme Officer	-	-	-	-	1	1

Sl. No.	Positions	Climate Change	Centre for Lake Conservation	GIS Centre	NGC	ENVIS	Total
14	Information Officer	-	-	-	-	1	1
15	I T Officer	-	-	-	-	1	1
16	Programme Coordinator	-	-	-	1	-	1
17	Programme Associate	-	-	-	1	-	1
18	Technical Assistant	-	1	-	-	-	1
19	Field Assistants	-	4	-	-	-	4
20	Para Taxonomist	-	-	-	-	1	1
21	Lab Attender		2		-		2
	Total	14	17	1	2	4	38

3.2.2. Employees have been outsourced through manpower agency for the office management as on 31st March, 2018.

Sl. No.	Positions	Administration	Accounts	Library	Total
1	Manager	1	1	-	2
2	System Administrator	1	-	-	1
3	Librarian	-	-	1	1
4	Computer Operator	1	-	-	1
5	Account Assistants	-	2	-	2
6	Jr. Account Assistant	-	1	-	1
7	Jr. Office Assistant	1	-	-	1
9	Drivers	4	-	-	4
10	Dalayaths	3	-	-	3
11	Housekeeping	3	-	-	3
15	Security	3	-	-	3
	Total	17	4	1	22

3.2.3. No. of employees who have resigned from the service of EMPRI (2017-18).

Sl. No.	Positions	ENVIS	NGC	Climate Change & DST	Centre for Lake conservation	Admin/Accounts	Total
1	Research Scientist	-	-	1		-	1
2	Sr. GIS Scientist	-	-		1	-	1
3	Programme Officer	1	-	-	-	-	1
4	Research Associate	-	-	3	-	-	3
5	Jr. Research Fellow	-	-	1	-	-	1
6	Lab Chemist	-	-	-	1	-	1
7	Programme Associate	-	1	-	-		1
8	Training Assistant	-	-	1	-		1
9	Project Assistant	-	-	3	-	-	3
10	Accounts Assistant	-	-	-	-	1	1
11	Date Entry Operator	1	-	-	-	-	1
12	Lab Attender	-	-	-	1	-	1
13	Driver	-	-	-	-	1	1
	Total	2	1	9	3	2	17

3.3 Auditors

Following are the Auditors for the EMPRI

1. Statutory Auditor

M/s. N N R & Co.

Chartered Accountants

No. 163, II Floor, Rajeshwari Complex

Above Karnataka Bank Ltd., R.V. Road

Bengaluru – 560 004.

2. Internal Auditor

M/s. Mahesh & Nagaraj

Chartered Accountants

No - 892/A, 9th Cross,

WOC Road, Modi Hospital Main Road,

Bangalore – 560086

Annexure - 1: Members of the Governing Body committee.

Sl No	Name and Address	Designation	From	To
1	Shri. P. Ravi Kumar, IAS, Addl. Chief Secretary Forest, Ecology & Environment Dept. Government of Karnataka, Room No. 448, 4 th Floor, Bengaluru – 560 001	Chairperson	23.02.2017	27.11.2017
	Smt. Vandita Sharma, IAS, Addl. Chief Secretary Forest, Ecology & Environment Dept. Government of Karnataka, Room No. 448, 4 th Floor, Bengaluru – 560 001	Chairman	29.11.2017	Till Date
2	Shri Ramachandra, IFS, Principal Secretary Ecology & Environment Dept. Government of Karnataka Room No. 709, 7 th Floor, 4 th Gate M.S. Building, Bengaluru – 560 001.	Co-Chairman	14.08.2013	Till Date
3	Shri Lakshman, Chairman, Karnataka State Pollution Control Board, Parisara Bhavan, 5 th Floor, Church Street, Bengaluru – 1	Member	21.12.2015	Till Date
4	Shri Mahendra Jain, IAS, Addl. Chief Secretary Urban Development Dept. Government of Karnataka, Room No. 436, 4 th Floor Vikasa Soudha, Bengaluru – 560 001	Member	15.04.2016	Till Date
5	Shri Darpan Jain, IAS, Commissioner for Indl. Development & Director of Industries & Commerce, Government of Karnataka, No. 49, 2 nd Floor, Khanija Bhavana, Bengaluru	Member	01.03.2017	Till Date
6	Shri Subodh Yadav , IAS Commissioner for Health & Family Welfare Services, Government of Karnataka, Ananda Rao Circle, Bengaluru – 560 009	Member	21.12.2016	21.12.2017
	Shri Manoj Kumar Meena, IAS Commissioner for Health & Family Welfare Services, Government of Karnataka, Ananda Rao Circle, Bengaluru – 560 009	Member	14.08.2017	31.01.2018
	Dr. Rathan Kelkar, IAS Commissioner for Health & Family Welfare Services, Government of Karnataka,	Member	31.01.2018	Till Date

Sl No	Name and Address	Designation	From	To
	Ananda Rao Circle, Bengaluru - 560 009			
7	Shri. Arvind Srivastava, IAS, Secretary Finance (Budget & Resource), Government of Karnataka Room No. 250, 2 nd Floor, Vidhana Soudha, Bengaluru - 560 001.	Member	15.04.2013	16-06-2017
	Shri Ritvik Ranjanam Pandey, IAS, Secretary, Finance (Budget & Resource), Government of Karnataka Room No. 250, 2 nd Floor, Vidhana Soudha, Bengaluru - 560 001.	Member	16-06-2017	Till Date
8	Shri. Shanthappa, IFS, Member Secretary Karnataka State Pollution Control Board, No. 49, 5 th Floor, Parisara Bhavan,, Bengaluru - 560 001	Member	07.09.2015	08.05.2017
	Shri. Vijaya Kumar, IFS, Special Director(Tech) I/c Member Secretary Karnataka State Pollution Control Board, No. 49, 5 th Floor, Parisara Bhavan,, Bengaluru - 560 001	Member	08.05.2017	10.07.2017
	Shri. G.V. Ranga Rao, IFS, Member Secretary Karnataka State Pollution Control Board, No. 49, 5 th Floor, Parisara Bhavan,, Bengaluru - 560 001	Member	10.07.2017	Till Date
9	Shri Suresh Additional Director & Zonal Officer, South Zone Office Central Pollution Control Board Nisarga Bhavan, 7 th D Cross Shivanagar, Bengaluru.	Member	01.04.2014	Till Date
10	Smt. Ritu Kakkar, IFS, Director General Environmental Management & Policy Research Institute (EMPRI) Hasiru Bhavana, Doresanipalya Forest Campus, JP Nagar 5 th Phase Bengaluru - 560 078.	Member Secretary	02.01.2013	Till Date

Annexure - 2: Executive committee members

Sl. No	Members	Designation
1.	Smt. Ritu Kakkar, IFS, Director General, Environmental Management and Policy Research Institute, "Hasiru Bhavana" Doresanipalya Forest Campus, J. P. Nagar 5 th Phase, Bangalore .	Chairperson
2	Shri. Dilip Kumar Das, IFS, Addl. Principal Chief Conservator of Forests, Research and Utilization, Karnataka Forests Department, Bangalore	Member
3	Shri. Vijay Kumar, IFS, Special Director, Dept. of Environment & Ecology, M. S. Building, Bangalore.	Member
4	Internal Financial Advisor & Joint Secretary, Forest, Ecology and Environment, GoK, M.S. Building, Bangalore.	Member
5	Dr. K.H. Vinaya Kumar, IFS, Chief Conservator of Forests, and Director, EMPRI, Bangalore.	Member Secretary

Annexure - 3: Research & Training Advisory Committee

Sl. No	Member	Designation
1	Smt. Ritu Kakkar , IFS, Director General	Chairperson
2	Shri Ranga Rao G.V. , IFS, Member Secretary, KSPCB, Bangalore	Member
3	Shri. Dilip Kumar Das , IFS, Addl. Principal Chief Conservator of Forests, Research and Utilization, Karnataka Forests Department, Bangalore	Member
4	Shri. R.M.N. Sahai , IFS (Retd.), ID, 1 st 'A' Main, 14 th Cross, HSR Layout, Sector-6, Bangalore.	Member
5	Shri Vijaya Kumar , IFS, , Special Director (Tech), E&E Dept., M.S. Bldg., Bangalore.	Member
6	Dr. M.K. Ramesh , Professor of Law, National Law School of India University, Nagarbhavi, Bangalore	Member
7	Prof. Abdul Rawoof Pinjari , Chairman, CISTUP, IISc, Bangalore	Member
8	Prof. M. G. Chandrakanth , Director, Institute for Social & Economic Change, Nagarbhavi post, Bangalore	Member
9	Shri S. Suresh , Additional Director & Zonal Officer, Central Pollution Central Board(South) NisaragaBhavan, 'A' Block , 1&2 nd floor, Thimaiah Road, 7 th 'D' Main Shivanagar, Bangalore.	Member
10	Dr. Mohan Karnat , IFS., Group Co-ordinator (Research), Institute of Wood Science and Technology (Indian Council of Forestry Re- search and Education) P.O, Malleswaram, Bangalore	Member
11	Dr. Sridhar Babu. M. N. , Fellow (Centre of Environmental Studies), Southern Regional Centre (TERI), 4 th Main, Domlur, IInd Stage, Bangalore.	Member
12.	Dr. K.H. Vinaya Kumar , IFS, Chief Conservator of Forests, and Director, EMPRI, Bangalore	Convener

Annexure - 4: Selection Committee

Sl. No.	Members	Designation
1	Smt. Ritu Kakkar , IFS., Director General, EMPRI, Bangalore	Chairperson
2	Shri. Jagmohan Sharma , IFS, Forest Conservation, Aranya Bhavan, Bangalore.	Member
3	Shri Ranga Rao G.V. , IFS., Member Secretary , Karnataka State Pollution Control Board, Bangalore	Member
4	Dr. M. K. Ramesh , Professor, National Law School of India University, Bangalore	Member
5.	Dr. K.H. Vinaya Kumar , IFS, Chief Conservator of Forests and Director, EMPRI, Bangalore	Convener

Annexure-5: Composition of Internship Committee.

Sl. No.	Members	Designation
1	Smt. Ritu Kakkar , IFS., Director General, EMPRI, Bangalore	Chairperson
2	Dr. K.H. Vinaya Kumar , IFS, Chief Conservator of Forests, and Director, EMPRI, Bangalore	Member
3	Dr. M. K. Ramesh , Professor, National Law School of India University, Bangalore	Member

Annexure-6: Composition of Technical Advisory Panel

Sl. No.	Members	Designation
1	Smt. Ritu Kakkar , IFS., Director General, EMPRI, Bangalore	Chairperson
2	Shivakumar Talwar , System Analyst, DPAR (e-Governance), Bangalore	Member
3	Prof. Chandrashekar Ramanathan , IIT, Bangalore	Member
4	Prof. D. Krishna Sundar , IIMB, Bangalore	Member
5	Dr. K.H. Vinaya Kumar , IFS, Chief Conservator of Forests and Director, EMPRI, Bangalore	Convener

Annexure – 7: Number of Trainings /Workshops conducted during the year 2017-18 on Climate change with reference to “Karnataka Government Notification on Plastic Ban, Solid Waste Management & Bio-Medical Waste Management Rules 2016”

Sl No.	Date of The Training/ Workshops	Details of Trainings/Workshops	Target Participants	No. of Participants	Venue
1.	10.05.2017	Training on climate change with reference to Plastic ban.	Officers and staff of BBMP & Members of Hoteliers association	50	BBMP Puttenahally ward no-187
2.	11.05.2017	Training on Climate Change with reference to Plastic ban through KSWAN	Officers and staff of Food and civil supply department.	900	Vikasa soudha
3.	05.06.2017	Speedy awareness through Exhibition at GKVK to showcase the activities of EMPRI on Plastic Ban	Officers from various departments people representatives, NGO's & General Public at large	1000	GKVK
4.	24.06.2017	Training on Climate Change with reference to Plastic ban through SATCOM	Officers from RDPR department, People representatives.	1100	SATCOM
5.	17.08.2017 Forenoon	Training on Climate Change with reference to Plastic Ban and Solid Waste	Officers, staff of BBMP, members of hoteliers association, road side vendors association, Asha workers & members of SHG's	72	BBMP south zone.
6.	17.08.2017 Afternoon	Training on Climate Change with reference to Plastic Ban and Solid Waste	Officers, staff of BBMP, members of hoteliers association, road side vendors association, Asha workers & members of SHG's	63	BBMP south zone.
7.	18.08.2017	Training on Climate Change with reference to Plastic Ban and Solid Waste Management.	Officers, staff of BBMP, members of hoteliers association, road side vendors association, Asha workers & members of SHG's	22	BBMP south zone.

8.	21.08.2017	Training on Climate Change with reference to Plastic Ban and Solid Waste Management.	Officers, staff of BBMP, members of hoteliers association, road side vendors association & members of SHG's	23	Bommanahally zone.
9.	22.08.2017	Training on Climate Change with reference to Plastic Ban and Solid Waste Management.	Officers, staff of BBMP, members of hoteliers association, road side vendors association & members of SHG's	21	Bommanahally zone.
10.	29.08.2017	Training on Climate Change with reference to Plastic Ban and Solid Waste Management.	Officers, staff of BBMP, members of hoteliers association, road side vendors association	40	Mahadevapura zone.
11.	29.08.2017	Training on Climate Change with reference to Plastic Ban and Solid Waste Management.	Officers, staff of BBMP, members of hoteliers association, road side vendors association	30	Mahadevapura zone.
12.	30.08.2017	Training on Climate Change with reference to Plastic Ban and Solid Waste Management.	Officers, staff of BBMP, members of hoteliers association, road side vendors association & members of SHG's	30	Mahadevapura zone .
13.	05.09.2017	Training on Climate Change with reference to Plastic Ban and Solid Waste Management.	Officers, staff of BBMP, members of hoteliers association, road side vendors association	50	RR nagar
14.	05.09.2017	Training on Climate Change with reference to Plastic Ban and Solid Waste Management.	Officers, staff of BBMP, members of hoteliers association, road side vendors association	20	RR nagar
15.	06.09.2017	Training on Climate Change with reference to Plastic Ban and Solid Waste Management.	Officers, staff of BBMP, members of hoteliers association, road side vendors association & members of SHG's	25	RR nagar
16.	12.09.2017	Training on Climate Change with reference to Plastic Ban and Solid Waste Management.	Officers, staff of BBMP, members of hoteliers association, road side vendors association & members of SHG's	37	BBMP office Meeting Hall , Dasarahally
17.	12.09.2017	Training on Climate Change with reference to Plastic Ban and Solid Waste Management.	Officers, staff of BBMP, members of hoteliers association, road side vendors association & members of SHG's	37	BBMP office Meeting Hall Dasarahally
18.	13.09.2017	Training on Climate Change with reference to Plastic Ban and Solid Waste Management.	Officers, staff of BBMP, members of hoteliers association, road side vendors association & members of SHG's	55	BBMP office Meeting Hall Dasarahally

19.	14.09.2017	Training on Climate Change with reference to Plastic Ban and Solid Waste Management.	Officers, staff of BBMP, members of hoteliers association, road side vendors association & members of SHG's	49	BBMP office Meeting Hall Yelahanka
20.	21.09.2017	Training on Climate Change with reference to Plastic Ban and Solid Waste Management.	Officers, staff of BBMP, members of hoteliers association, road side vendors association	53	BBMP office Meeting Hall East zone
21.	21.09.2017	Training on Climate Change with reference to Plastic Ban and Solid Waste Management.	Officers, staff of BBMP, members of hoteliers association, road side vendors association	50	BBMP office Meeting Hall , East zone
22.	22.09.2017	Training on Climate Change with reference to Plastic Ban and Solid Waste Management.	Officers, staff of BBMP, members of hoteliers association, road side vendors association	15	East zone
23.	26.09.2017	Training on Climate Change with reference to Plastic Ban and Solid Waste Management.	Officers, staff of BBMP, members of hoteliers association, road side vendors association	53	West zone
24.	26.09.2017	Training on Climate Change with reference to Plastic Ban and Solid Waste Management.	Officers, staff of BBMP, members of hoteliers association, road side vendors association	37	West zone
25.	27.09.2017	Training on Climate Change with reference to Plastic Ban and Solid Waste Management.	Officers, staff of BBMP, members of hoteliers association, road side vendors association	37	West zone
26.	07.10.2017 Forenoon	Training on Climate Change with reference to Plastic Ban and Solid Waste Management.	Officers, staff of Urban local body	23	Meeting hall , DC office, Chickamagaluru
27.	17.11.2017	Training on Climate Change with reference to Plastic Ban and Solid Waste Management.	Officers, staff of Urban local bodies and Rural Development and Panchayat raj department officers and staff	92	Hubli -Dharawad coporation meeting hall, Dhara-wad
28.	06-12-2017	Training on Climate Change with reference to Plastic Ban and Solid Waste Management.	Officers, staff of Urban local bodies and Rural Development and Panchayat raj department officers and staff	34	Chickaballapur
29.	14-03-2018	Training Program on Plastic Ban	Officers from Commercial Tax, Food and Civil Supply, Legal Metrology, Mujarayi dept. Officers from KSRTC and Walkf board & Revenue officers, Health officers,	200	Room.No.318,3 rd Floor, Vikasa soudha.

			Health Inspectors and Engineers of BBMP		
30.	03.08.2017	Training on Climate Change with reference to Bio medical waste management.	Medical officers, Para medical staff of health care establishments.	114	Mysore
31.	11.08.2017	Training on Climate Change with reference to Bio medical waste management.	Medical officers, Para medical staff of health care establishments.	64	Tumkur
32.	16.08.2017	Training on Climate Change with reference to Bio -medical waste management	Medical officers, Para medical staff of health care establishments.	78	Ramanagara
33.	07.10.2017 Afternoon	Training on Climate Change with reference to Bio medical waste management.	Medical officers, Para medical staff of health care establishments.	109	Meeting Hall DHO office , Chickamagaluru
34.	17.11.2017	Training on Climate Change with reference to Bio medical waste management.	Medical officers, Para medical staff of health care establishments.	91	Hubli -Dharawad coperation meet- ing hall, Dhara- wad
35.	06-12-2017	Training on Climate Change with reference to Bio medical waste management.	Medical officers, Para medical staff of health care establishments	58	Chickaballapur
Total 35 trainings				4732 participants	

Annexure-8: Seminar workshops attended by Staff of Centre for Climate change

1. Smt. O.K. Remadevi presented an invited paper on 'Insect pests in Mangrove ecosystems in India' during the National conference on "Current status of Faunal diversity of Mangrove ecosystem in India" held at Zoological Survey of India, Kolkata on July 1-2, 2017.
2. Smt. O.K. Remadevi and Smt. B.Saritha attended the training on Project Formulation - Climate Change Mitigation and Adaptation conducted by NABARD at Vijayawada, Andhra Pradesh, 18-22, December 2017
3. Shri. Manjunatha M, Research Scientist Centre for Climate Change, EMPRI participated in workshop on Bengaluru Regional Dialogue on Sustainable Development organised by The Energy and Resources Institute (TERI)-Southern Regional Centre on December 22, 2017.
4. Smt. N. Hema presented a paper on "**Evaluating the Socio-economic and Environmental perspectives of the Metro Rail commuters of Bengaluru city**, 9th International Congress of Environmental Research (ICER-2018), entitled February 8-10, 2018, Amity University, Gwalior, Madhya Pradesh.
5. Shri. Cruz antony and Shri. Kiranraddi Morab participated in Indo- US workshop on High-resolution Climate Projections and analysis for India held on 12th, 13th February, 2018 at Environment Protection Training and Research Institute [EPTRI], Hyderabad, Telangana, India
6. Smt. O.K. Remadevi presented a paper on "organic agriculture with bio-intensive pest management to adapt/mitigate climate Change" at 9th international Integrated Pest Management held at Baltimore, Maryland USA from 19th to 22nd March, 2018.

Annexure-9: Research Publications (Communicated/Published)

1. Smt. Saritha et al (2017). Organic farming for climate change adaptation – A case study in Karnataka. In: Climate Change, Impacts, Adaptation and mitigation. K.Durga Prasad, V. Chandramouli, K.S. Shaji, B. Ravi Prasad (Eds). Proceedings of National Conference on Climate Adoption. ISBN-978-93-82829-13-3. pp. 187-191.
2. Smt. O.K. Remadevi, Chaturved.S, Sooraj.S, Vinayakumar KH, Ritu Kakkar. 2018. Bengaluru Butterflies: A Field guide, 70pp. Excel publishers, New Del ISBN 978-93-86724-52-6.
3. Smt. Ritu Kakkar, IFS, Director General, Shri. K.H. Vinaya Kumar, IFS, Director, Smt. O.K. Remadevi, Smt. Hema N, and Shri. Antony, C. 2018 Climate Change: Challenges and Solutions, Allied Publishers, New Delhi (in press)
4. Smt. Ritu Kakkar, IFS, Director General, Shri. K.H. Vinaya Kumar, IFS, Director, Smt. O.K. Remadevi, Shri. M. Manjunatha, Smt. B.Saritha, Shri. Balasubramanya Sharma, Shri. Kiranraddi M., H. S. Dattaraja and |Shri. H.S. Suresh 2018, Establishing Permanent Preservation Plots in Bannerghatta National Park for long-term ecological studies to monitor climate change, Myforest (In Press)
5. Shri. Muniyandi Balasubramanian, Smt. Remadevi, O.K, and Shri. Manjunath. M, 2018. Climate Change and Impacts on Vulnerable Communities in India, International Journal of Environmental management. Springer Publication (In Press)
6. Smt. Remadevi OK, Smt. Papiya Roy, Smt. Hema N and Smt. Saritha B. 2018. Climate Change: Impacts, Adaptation and Mitigation. In: SoER-2015: State of Environment Report, 2015, Karnataka. Environmental Management and Policy Research Institute (EMPRI), Department of Forest, Ecology and Environment (FEE), GoK. (In press).
7. Smt. Susarla S.K., Shri. Murthy C.K and Smt. Hema N. 2018. Coastal Environment. In SoER-2015: State of Environment Report, 2015. Environmental Management and Policy Research Institute EMPRI, Department of Forest, Ecology and Environment (FEE), GoK. (In press).

Annexure-10: District-wise release of funds to the NGC schools

Sl.No	District	No. of Gov- ernment High Schools	No. of Gov- ernment Aided High Schools	No. of Gov- ernment Higher Primary Schools	Total No. of Schools	Amount re- leased to NGC schools (Rs.)
1	Bagalkot	180	70	-	250	12,50,000
2	Bangalore North	54	118	78	250	12,50,000
3	Bangalore Rural	63	37	150	250	12,50,000
4	Bangalore South	85	146	19	250	12,50,000
5	Belgaum	129	121	-	250	12,50,000
6	Bellary	161	83	6	250	12,50,000
7	Bidar	160	90	-	250	12,50,000
8	Bijapur	121	129	-	250	12,50,000
9	Chikkaballapura	107	32	111	250	12,50,000
10	Chamarajanaga- ra	82	51	117	250	12,50,000
11	Chikkodi	158	92	-	250	12,50,000
12	Chikamagaluru	116	110	24	250	12,50,000
13	Chitradurga	109	141	-	250	12,50,000
14	Dakshina Kan- nada	161	89	-	250	12,50,000
15	Davangere	152	98	-	250	12,50,000
16	Dharwad	100	128	22	250	12,50,000
17	Gadag	108	89	53	250	12,50,000
18	Gulbarga	250	0	-	250	12,50,000
19	Hassan	240	10	-	250	12,50,000
20	Haveri	136	114	-	250	12,50,000
21	Kodagu	47	48	155	250	12,50,000
22	Kolar	120	43	87	250	12,50,000
23	Koppal	128	27	95	250	12,50,000

Sl.No	District	No. of Gov- ernment High Schools	No. of Gov- ernment Aided High Schools	No. of Gov- ernment Higher Primary Schools	Total No. of Schools	Amount re- leased to NGC schools (Rs.)
24	Madhugiri	94	98	58	250	12,50,000
25	Mandya	215	35	-	250	12,50,000
26	Mysore	216	34	-	250	12,50,000
27	Raichur	181	30	39	250	12,50,000
28	Ramanagara	106	58	86	250	12,50,000
29	Shimoga	164	86	-	250	12,50,000
30	Sirsi	73	55	122	250	12,50,000
31	Tumkur	133	117	-	250	12,50,000
32	Udupi	106	71	73	250	12,50,000
33	Uttara Kannada	49	87	114	250	12,50,000
34	Yadgir	119	9	122	250	12,50,000
	Total	4423	2546	1531	8500	42,500,000

Annexure-11: District-wise total funds released to the NGC schools, as well as to the DDPI.

Sl. No	District Name	No. of schools	Amount dis- bursed to schools in each district (Rs.)	Financial assistance to district (Rs.)	Total amount disbursed (Rs.)
1	Bagalkot	250	12,50,000	25,000	12,75,000
2	Bangalore North	250	12,50,000	25,000	12,75,000
3	Bangalore Rural	250	12,50,000	25,000	12,75,000
4	Bangalore South	250	12,50,000	25,000	12,75,000
5	Belgaum	250	12,50,000	25,000	12,75,000
6	Bellary	250	12,50,000	25,000	12,75,000
7	Bidar	250	12,50,000	25,000	12,75,000
8	Bijapur	250	12,50,000	25,000	12,75,000
9	Chikkaballapura	250	12,50,000	25,000	12,75,000

Sl. No	District Name	No. of schools	Amount disbursed to schools in each district (Rs.)	Financial assistance to district (Rs.)	Total amount disbursed (Rs.)
10	Chamarajanagara	250	12,50,000	25,000	12,75,000
11	Chikkodi	250	12,50,000	25,000	12,75,000
12	Chikmagalur	250	12,50,000	25,000	12,75,000
13	Chitradurga	250	12,50,000	25,000	12,75,000
14	Dakshina Kannada	250	12,50,000	25,000	12,75,000
15	Davangere	250	12,50,000	25,000	12,75,000
16	Dharwad	250	12,50,000	25,000	12,75,000
17	Gadag	250	12,50,000	25,000	12,75,000
18	Gulbarga	250	12,50,000	25,000	12,75,000
19	Hassan	250	12,50,000	25,000	12,75,000
20	Haveri	250	12,50,000	25,000	12,75,000
21	Kodagu	250	12,50,000	25,000	12,75,000
22	Kolar	250	12,50,000	25,000	12,75,000
23	Koppal	250	12,50,000	25,000	12,75,000
24	Madhugiri	250	12,50,000	25,000	12,75,000
25	Mandya	250	12,50,000	25,000	12,75,000
26	Mysore	250	12,50,000	25,000	12,75,000
27	Raichur	250	12,50,000	25,000	12,75,000
28	Ramanagara	250	12,50,000	25,000	12,75,000
29	Shimoga	250	12,50,000	25,000	12,75,000
30	Sirsi	250	12,50,000	25,000	12,75,000
31	Tumkur	250	12,50,000	25,000	12,75,000
32	Udupi	250	12,50,000	25,000	12,75,000
33	UttaraKannada	250	12,50,000	25,000	12,75,000
34	Yadgir	250	12,50,000	25,000	12,75,000
	Total	8,500	4,25,00,000	8,50,000	4,33,50,000

Annexure-12: Details of School visited by NGC team during 2017-18

Sl. No.	District	Block/ Taluk	Name of the School	Date of visit
1	Koppal	Koppal	MHPS, MRB, TEP	14.03.18
2			Govt High School Hosalingapura	
3			GMHPS, Hulagi	
4			GMHPS, Agalakere	
5		Gangavathi	Govt High School Anegundi	
6			GMHPS Anegundi	
7	Gadag	Gadag Rural	KMPS Asundi	15.03.18
8			Govt Girls High School	
9			SKVP Govt High School Anthur Benthur	
10		Shirahatti	Govt High School Gojanur	
11		Lakshmishwar	HPS Lakshmishwar	
12	Dharwad	Navalgund	NGB Govt High School	16.03.18 & 17.03.18
13		Dharwad Rural	Nehru composite PU college and Govt High School	
14			Moraji Desai School	
15			Govt High School, Maradagi	
16			Sri. Namm Police children's Residential School	
17		Dharwad Urban	Presentation Girls High School	
18		Kalagatagi	Govt High School Kuruvinakoppa	
19			Govt High School Chalamatti	
20	Hubli	Hubli Rural	Govt High School Anchatagiri	17.03.18
21	Mysore	Mysore	Govt High School Devalapura	22.03.18
22			Govt High School Belawadi	
23			Govt High School Ilawala	
24			Govt High School Hootagalli	
25			Govt High School Koppala	
26			Govt High School Metagalli	
27	Kodagu	Somwarpete	Govt Higher Primary School Doddamalathe	23.03.18 &
28			Govt Higher Primary School Gonimarooru	
29			Govt High School Gonimarooru	
30			Govt Higher Primary School Somwarpete	
31		Madikeri	Govt High School kadagadalu	24.03.18
32			Govt Higher Primary School Chettalli	
33			Govt High School Abyatmangala	
34	Kolar	Araleri	Govt Higher Primary School Araleri	26.03.18
35		Huralagere	Govt Higher Primary School Huralagere	
36		Malur	GMHPS	
37			Govt Higher Primary School Hab-	26.03.18

			benahalli	
38	Ramanagara	Bidadi	Shri Basaveswara Swamy Rural high School	
29		Ramanagara	GKMPS	27.03.18
40			Govt High School Bilagumba	
41			Govt High School Kailancha	
42			Govt Higher Primary School Kailancha	
43			Girls Govt Junior College	
44			Boys Govt Junior College	

Annexure-13: Details of district wise participants in SATCOM teleconference training under NGC programme

Sl No.	Districts	No. of participants
1	Bagalkote	59
2	Bangalore Rural	150
3	Bangalore South	46
4	Belgaum	248
5	Bellary	20
6	Bidar	40
7	Bijapur	16
8	Chamarajnar	35
9	Chikballapur	119
10	Chikmagalur	233
11	Chikkodi	72
12	Chitradurga	56
13	Dakshina Kannada	92
14	Davanagere	195
15	Dharwad	26
16	Gadag	60
17	Gulbarga	143
18	Hassan	110
19	Haveri	285
20	Kodagu	157
21	Kolar	164
22	Koppal	50
23	Madhugiri	47
24	Mandya	86
25	Mysore	142
26	Raichur	42
26	Shimoga	57
27	Sirsi	250
28	Tumkur	105
29	Udupi	217
30	Uttara Kannada	239
31	Yadgiri	37
	Total	3598