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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 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.

1.3 Mission

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

1.4 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.
3. To take up studies and to develop policy documents on various environmental aspects.

1.5 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, Non-Government Organisation (NGO) 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.
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.

1.6 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/outsourced for specific purposes.

1.6.1 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.

1.6.2 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**

1.6.3 Committees

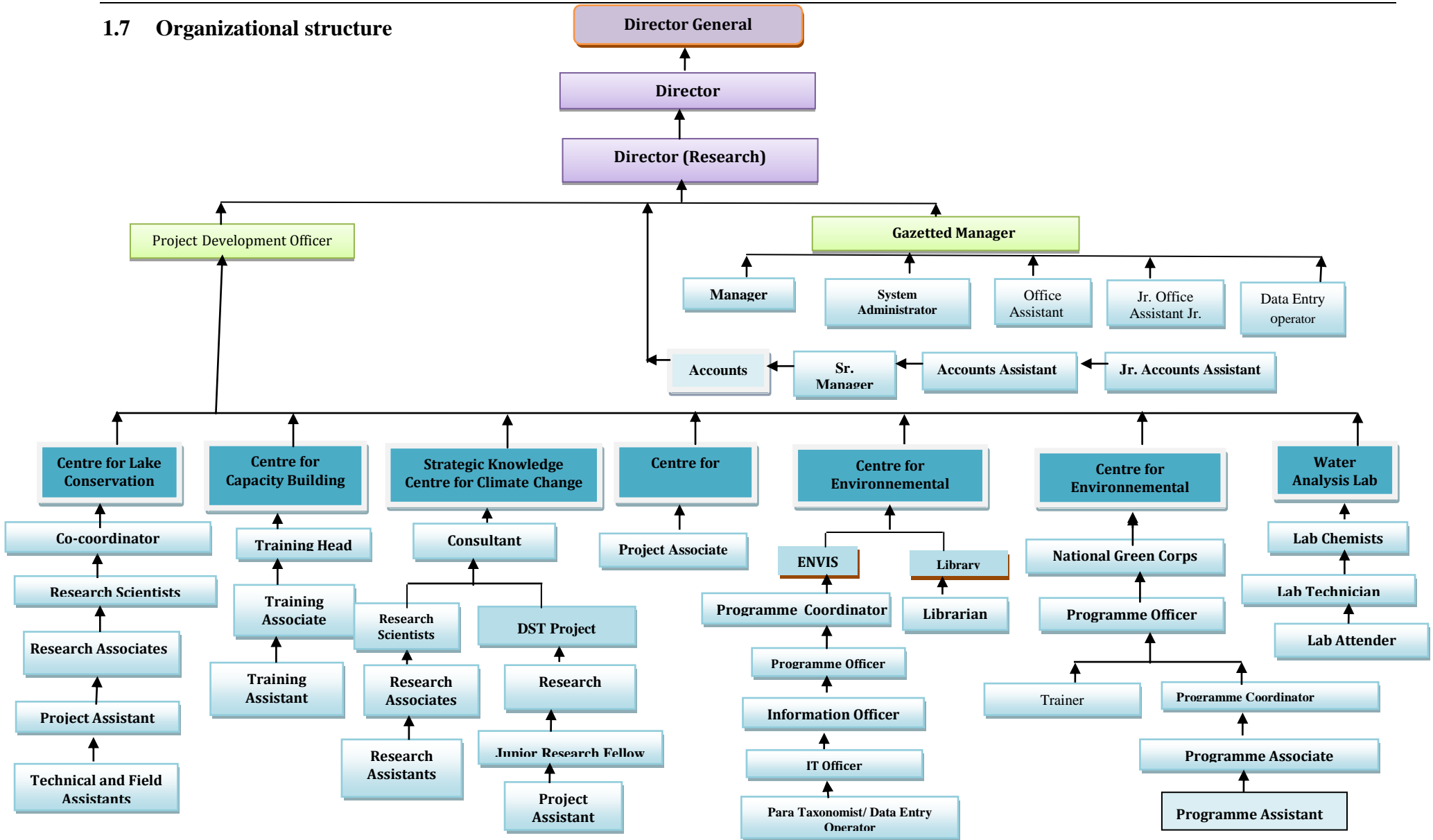
Following committees are constituted to advices and also to take decisions on specific matters.

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, The 23rd Executive Committee of EMPRI held on 19.09.2019 modified the composition of the selection 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, Director, EMPRI and Director (Research) as members have 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. **Training Evaluation Committee:** The EMPRI takes up training activities on various environmental issues and a four member committee has been constituted to evaluate the training programmes conducted by EMPRI. The committee is chaired by the Director, EMPRI and Director (Research) 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 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**

1.7 Organizational structure



CHAPTER 2. MAJOR ACTIVITIES

2.1 Centre for Capacity Building – Training/Workshop

Government of Karnataka has nominated EMPRI as the Nodal Agency and accorded permission to establish a Climate Change Cell in the Institute during 2015. With the financial assistance of Government of Karnataka EMPRI has taken up Research studies and Capacity Building Programs in Climate Change for officers of various departments.

EMPRI organized 103 trainings attended by 8,402 Participants in the year 2019-20 on concurrent environmental issues such as Waste Management Rules 2016, Environmental Laws & Compliance, Climate Change & Plastic Ban Notification – 2016 of Government of Karnataka. In addition, District Level & Taluk level trainings have been organized in all districts for Eco-Club Teachers under NGC and trainings on Wastewater Treatment Plant (WWTP)- Technician under Chief Minister's Kaushalya Karnataka Yojane (CMKKY). The details are given in **Annexure-7**.

2.1.1 Awareness Creation

Following activities were carried out during the year 2019-20 to create environmental awareness:

1. Participated in Exhibition Organized by Bruhat Bengaluru Mahanagara Palike (BBMP) for creation of Awareness on ill effects of Plastic on environment & living beings. Suggested to use eco-friendly products in place of banned plastic products.
2. Recorded message on Plastic ban was replayed in Karnataka State Road Transport Corporation Bus stands all over Karnataka.
3. World Environment Day Celebration 2019
4. Exhibition on Sustainable development goals Organized by: Planning and Statistics department

The details are given in **Annexure-8**.

2.1.2 Environmental Audit

1. M/s Medicare Environmental Management (P) Ltd, Plot No.39, K.I.A.D.B, Industrial Area, Dabaspeta, Nelamangala TQ, Bengaluru - 562123
2. M/s Maridi Eco Industries Pvt Ltd, Plot No: 312-A2 & 312-A2 (Part), 2nd Phase, KIADB Harohalli Industrial Area, Harohalli Village & Hobli Kanakapura TQ, Ramnagar.

The details are given in **Annexure-9**.

2.1.3 Other Activities

EMPRI Submitted draft report entitled Implementation Status of Plastic Ban Notification – 2016 to Government of Karnataka after completion of sample survey in all eight zones of Bruhat Bengaluru Mahanagara Palike.

2.1.4 Photo Gallery-Training Programmes



Plastic Ban Training at Leo Lions Club



Plastic Ban Training at Sai ram College



Training for Staff of Eco-Club School Teachers



Training for Staff of Eco-Club School Teachers



Training on Wastewater Treatment Plant



Training on Climate Change

**IFS Training/ Workshop on
“Eco-System Services: Valuation and Policy Issues”
2019-2020**

Venue: New Kumara Krupa Guest House, Sheshadripuram, Bengaluru-560001

Date: 15th to 16th May, 2019



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 2018-19 research work carried out at EMPRI included the following:

2.2.1. Centre for Lake Conservation

(1) Strategies for the Water Bodies in Huballi Dharwad Municipal Corporation (HDMC)

Environmental Management and Policy Research Institute (EMPRI), Bengaluru, under the financial assistance from Centre for Infrastructure, Sustainable Transportation & Urban Planning (CiSTUP), IISc., Bengaluru, has completed the above entitled study and has prepared the report both in English and Kannada. Further, the same report will be shortly submitted to the concerned Government departments/authorities as well as funding agency.

The above study has addressed the present status of the 101 inventorized water bodies (54 existing and 47 disused); preparation of the water bodies database (including Kere, Katte & Kunte); land use and land cover changes analysis over the time period using Geographic Information System application; Unique Identification Code (UID) for all water bodies; Identification of pollution sources, encroachments; Physico-chemical analysis and biodiversity documentation, Estimated economic value of the major lakes; preparation of Lake Health Card. 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 water bodies.



(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 main aim of the Yettinahole drinking project is to lift 24.01 TMC of water during rainy season from Yettinahole, a west flowing stream near Sakleshpura in Hassan District by constructing eight weirs across its tributaries and conveying water to the eastern plains districts of the Karnataka State such as Kolar, Chikkaballapura, Ramanagar, Bangalore rural, Tumakuru, parts of Chikkamagaluru and Hassan for drinking water purpose. The project is designed to quench the thirst of nearly 7 million people. Out of 24.01 TMC lifted water, 15.029 TMC will be utilized for the drinking water supply and the remaining 8.967 TMC will be used for filling up the Minor Irrigation tanks for ensuring ground water recharge.

The said project involves diversion of 13.93 Ha of forest land in Sakleshpura forest area, in respect of which the predecessor of Visvesvaraya Jala Nigam Limited (VJNL), Karnataka Neeravari Nigam Limited (KNNL), has obtained the stage-1 Forest clearance from Ministry of Environment, Forests and Climate Change, Government of India (MoEF&CC) by imposing certain stipulated conditions. For accomplishing the imposed stipulated conditions the Visvesvaraya Jala Nigam Limited, Government of Karnataka, approached Environmental Management and Policy Research Institute, Bengaluru, to take-up study on two following conditions and submit a report in regard to environmental aspects.

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.

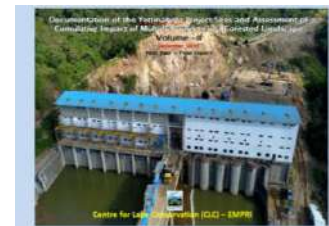
As per the above conditions, EMPRI has completed first year periodic study and has submitted the report to the concerned Government departments/authorities as well as to funding Department. Based on the collection of baseline environmental data, secondary data, project DPR report and also visual observations made during the field visits, the report has been prepared confined to the two conditions. The entire report has been compiled into two Volumes. The Volume-I outlines the findings of the Condition No.27 *i.e.* impacts assessment of the individual project that are

contributed to the cumulative effect on forested landscape ecosystems in the combined catchment area of Kempuhole. Whereas, Volume-II outlines the Condition No.26 *i.e.* present ecological status of Yettinahole project working sites which has been documented through DRONE photography and videography.

Besides, the second year periodic assessment study is under progress. As per the scope of the study monitoring/collection of first season (Winter season) baseline data with respect to various components of environment viz. air, noise, water, soil; socio-economic survey in the project affected villages is completed and in terms of assessing the landuse/landcover changes in the combined catchment area of Kempuhole the satellite imageries for the year 2019 has been procured from NRSC, Hyderabad. Interpretation of these baseline data and preparation of interim report is under progress.

(3) Assisting Bruhat Bengaluru Mahanagara Palike (BBMP) to Make Application for Prime Ministers Award for Excellence in Public Administration

Government of India has instituted an above scheme to acknowledge, recognize and reward the extraordinary and innovative work done by District/organization of the Central and State Governments. In this context under the financial assistance of Bruhat Bengaluru Mahanagara Palike (BBMP), EMPRI has taken-up the project. The key objective of the project is to showcase the BBMP Lake division, which is working towards conservation and restoration of lakes coming under the custody of BBMP in Bengaluru City. As per the scope of the study videography based documentary of few lakes coming under BBMP custody; analysis of 23 water samples collected in major lakes and collation of supporting documents for uploading in the prescribed portal are completed. Presently preparation of report is under progress.



2.3 Centre for Climate Change

EMPRI, the nodal agency for climate change in Karnataka, boosted its research activities and programs on climate change in 2019-20 with the support of Government of Karnataka, in addition to the ongoing research activities under the DST project. Independently and also in collaboration with other research institutions like IISc., ISEC, CSTEP, UAS and KSSRDI many research projects were undertaken some of which are completed and others are ongoing in the Centre for Climate Change.

2.3.1. Research Activities

A. Completed Projects

1) Green Index Development for Government Programmes of Karnataka (June 2019-January 2020)

This project is carried out by EMPRI in collaboration with Indian Institute of Science, Bengaluru. Green Index is a composite measure of the environmental performance of a programme or a scheme or a project. A **Toolkit for Green Index Development** was prepared for the pilot testing of governmental schemes. The toolkit provides guidelines and methods to assess Environmental Performance or Greenness of Developmental and Infrastructural programmes of State Government programs at design stage, using a Green Index concept. It provides a preliminary approach to prioritize and promote Green developmental programmes, to reduce environmental degradation and to conserve and regenerate the environment and ultimately promote sustainable development. The tool kit for Green index has a set of indicators and sub-indicators which reflects the environmental concerns such as: Adoption of Energy Efficiency and Renewable Energy systems, Water Conservation and Recycling, Waste Treatment and Recycling and Air Pollution control measures, Biodiversity conservation, Carbon dioxide Emission Reduction or Sequestration, and Adaptation to Disasters and Climate Change. A score value has been assigned to each of the indicators and sub-indicators and using a colour scheme of Green (indicator value of 4), Light Green (3), Orange (2), and Red (1) the programs can be screened and given an index. The Green Index tool kit and the Green Index report were submitted to ACS, FEE for approval.

2) Green Auditing of Different Schemes in Government Departments of Karnataka And Development of Software

The Green auditing has been carried out by EMPRI and IISc for the approved and ongoing programmes and schemes that are being implemented by Departments of the Government of Karnataka. Both the Central and State sponsored schemes that have implications for environment and natural resources have been considered for green auditing. Green index has been developed for 192 programmes that have implications for the environment, from 20 major departments of the Government of Karnataka. The screening of the programmes was achieved by providing a value to each of the indicators and sub-indicators and using a colour scheme of Green (indicator value of 4) – Mandatory provision or requirement for adopting the respective indicator, Light Green (3) – No mandatory provision or requirement but includes some measures or equipment or appliance is related to the indicator, Orange (2) - Marginal or limited inclusion of the technologies or measures which are incidental to the program, and Red (1) – The respective indicators/standards or measures are required but are not included. The green index for the audited schemes with colour coding of various schemes/programmes is shown in the table given below.

Green index - Colour coding of schemes/programmes of various departments

Sl. No.	Name of the department	Number of schemes/programmes	Colour code			
			Dark Green	Light Green	Orange	Red
1	Forest, Ecology & Environment	15	01	03	11	-
2	Energy	12	-	06	04	02
3	Agriculture	08	-	01	04	03
4	Horticulture	08	-	04	02	02
5	Fisheries	10	-	-	03	07
6	Animal Husbandry	09	-	01	-	08
7	Watershed Development	02	-	-	02	-
8	Transport	11	-	01	08	02
9	Housing	04	-	-	-	04
10	Rural Development & Panchayath Raj (RDPR)	13	-	-	05	08
11	Urban Development	18	-	12	04	02
12	Food & Civil Supplies	04	-	-	01	03
13	Infrastructure & Development	05	-	01	04	-
14	Tourism	11	-	-	05	06
15	Primary & Secondary Education	05	-	-	02	03
16	Industry & Commerce	10	-	01	02	07
17	Mines & Geology	04	-	-	-	04
18	Public Works	11	01	09	01	-
19	Water Resources	17	-	-	17	-
20	Health & Family Welfare	15	-	-	-	15
	Total		02	39	75	76

The green index tool kit is being developed into a software by the E governance (GoK) for use by the administrators and executives of the departments for monitoring and managing the various schemes of the departments to achieve better environmental performance.

3) Historical Climate Trends and Climate Change Projections for Karnataka (July 2019-March 2020)

This project was conducted by the Centre for Sustainable Technologies, Indian Institute of Science, Bengaluru. The climate trend analysis is conducted at the district level for Karnataka, considering a 30-year period. Climate change projections are made using a bias-corrected 15-model ensemble of CORDEX models for the short term (2030s) and long term (2080s) periods for RCP 4.5 and RCP 8.5 scenarios, at the district level. The temperature projections for the short term (2021-2050) and long term (2071-2100) periods are calculated relative to the historical period (1985-2015). Changes in Kharif season rainfall and its variability, number of rainy days, high intensity rainfall events, and number of 'Drought' years for the short term period (2021-2050) are also calculated relative to the historical period (1987-2016).

4) Estimation of Forest and Tree Cover to Create an Additional Carbon Sink of 2.5 to 3 Billion Tones of CO₂ Equivalent by 2030 in India

As required by Karnataka Forest Department for providing inputs to National Action Plan on Climate Change (NAPCC), EMPRI was assigned with the task of preparing Strategy and Action plan for meeting forest and tree cover under Nationally Determined Contributions (NDC) targets for the State of Karnataka. The study attempted to take the stock of the action taken in improving the tree cover of Karnataka state in the recent past five years and to assess the carbon stock improvement from these tree planting programs. The objective of this study is to estimate the carbon stock accrued through tree planting in Karnataka over the past fifteen years. The larger purpose of this study is to evaluate the target set to create an additional carbon sink of 2.5 to 3.0 billion tonnes of CO₂ equivalent through additional forest and tree cover by 2030 in the entire country. The data for estimating the carbon stock in the trees planted over the past fifteen years is provided by the Karnataka Forest Department.

The area of the tree planting over the years from 2015 to 2020 has been decreased. The total area planted in five years is 9,23,509 hectares and the total number of seedlings planted is 19,56,58,000. The area planted during 2015-16 was 71,148 hectares, which decreased to 41,432 hectares by 2019-20. Total carbon sequestered over five years from 19,56,58,000 seedlings planted across the forested and non-forested land area in Karnataka state is found to be 11,76,852 tonnes. An average of 23,5,370 tonnes of carbon is found to accumulate in a year. A total of 34,07,278 tonnes of CO₂ (4.3 million ton) is found to be removed from the atmosphere and stored in the trees in the form of standing biomass at the end of five years. It is found that, about 30 percent of forested land and 45 percent of non-forested land area may have to be planted on a yearly basis from year 2021 onwards till 2030.

B. On-Going Projects

1) DST Project: Establishing/Strengthening the State Climate Change Centre/Cell Under NMSKCC (SCCC-NMSKCC) in the State of Karnataka.

a) Sub Projects

• Sub Project 1: Microbiological Studies on Forest Soils of Permanent Preservation Plots (PPPs)

A study on microbial analysis to understand the bacterial/fungal population and vesicular arbuscular mycorrhizal (VAM) fungal spore distribution was conducted in three Permanent preservation plots established in Bannerghatta forest and Doresanipalya forest in Bengaluru, Karnataka. In Bannerghatta forest, two PPPs were established based on two vegetation types viz, moist deciduous (Thalewood house plot) and dry deciduous (Bugarikallu plot) whereas the Doresanipalya plot is a dry deciduous and disturbed forest. The soil samples were collected from 25 sub-plots (@15-30cm depth) of each one hectare plot of Thalewoodhouse, Bugarikallu and Doresaniplaya.

Microbial population analysis was made by adopting the serial dilution technique of soil samples. The soil samples were tested for the presence of general bacteria, actinobacteria, fungi, *Pseudomonas* sp., *Azotobacter* sp. and phosphate solubilizing bacteria (PSB) on respective growth media. The results indicated that the general bacterial count recorded the highest number followed by *Pseudomonas* sp., Actinobacteria, Fungi, *Azotobacter* sp. and PSB as shown in the table below.

Microbial population in forest soils

Sl. No.	Soil Sample	Microbial Population					
		Bacteria (cfu x10 ⁶)	Fungi (cfu x10 ³)	Pseudomonas sp. (cfu x 10 ³)	Actinobacteria (cfu x 10 ³)	Azotobacter sp. (cfu x 10 ³)	PSB (cfu x 10 ²)
1.	Thalewood house, BNP	≥300	≤30	≤30	33.54	≤30	≤30
2.	Bugarikallu Plot, BNP	≥300	≤30	≤30	92.02	≤30	≤30
3.	Doresanipalya Plot	≥300	≤30	≥300	63.06	≤30	≤30

Note: BNP- Bannerghatta National Park ; PSB-Phosphate Solubilising Bacteria ; cfu- colony forming units; TFTC- Too Few To Count (≤30); TMTC- Too Many To Count (≥300)

The predominant VAM fungal spores in the forest soils were identified based on the morphology, spore size, hyphal attachment and thickness. The PPP soils were found to have the predominant VAM spores belonging to the genera of Glomus, Gigaspora, Sclerocystis and Acaulospora species. The VAM spore number in different PPPs revealed that the soil samples collected from Thalewoodhouse, Bugarikallu and Doresaniplaya plots recorded 7.2-41.6, 15.2-67.2 and 12.8-76.8 spores per ml respectively. The results on average VAM spore count of each one hectare plot indicated that the Doresanipalya plot had higher VAM spore number with 41.2 spores per ml followed by Bugarikallu plot (36.71 spores per ml) and Thalewood house plot (21.5 spores per ml),

- **Sub Project 2: Assessment of Carbon Stock in Permanent Preservation Plots of Bannerghatta National Park and Doresanipalya Forest, Karnataka India**

Quantifying carbon stock in natural forests is crucial in planning the management of such ecosystems for their conservation and studying their role in the mitigation of the effects of climate change. Above and belowground carbon storage potential in different vegetation types of Permanent Preservation Plots (PPP) established in 2017 at Bannerghatta National Park and Doresanipalya forest were assessed. Thalewood house represents moist deciduous forest, Bugarikallu PPP represents drier forest with thorny scrub stunted trees and Doresanipalya PPP represents a dry deciduous disturbed forest. Allometric equations are used to estimate the amount of carbon in above-ground biomass, taking the total height (H) and the diameter at breast height (DBH) of trees whose DBH is equal to or greater than 1 cm. Carbon content in soil collected at 0-30cm depth was estimated using CHNS elemental analyser. Above ground biomass/carbon of trees was 352.66Mgha⁻¹ biomass and 176.35MgCha⁻¹ carbon, 69.27Mgha⁻¹ biomass and 34.63MgCha⁻¹ carbon and 377.0Mgha⁻¹ biomass and 188.50MgCha⁻¹ carbon in Thalewood house, Bugarikallu and Doresanipalya PPP respectively. The soil carbon concentrations were 1.79% (±0.54), 1.21% (±0.67), and 0.75% (±0.26), respectively. Our study has shown that plant biomass and soils are the potential pools of carbon storage in protected forests of Bannerghatta national park and Doresanipalya forest.

- **Sub Project 3: Leaf Area Analysis for Selected Species at Permanent Preservation Plots**

The leaf area directly relates to the process of photosynthesis which in turn has a great impact on the growth of plant, respiration, evapotranspiration, carbon accumulation and biomass production. Specific leaf area is the ratio of leaf area to the leaf dry mass, the reverse of which gives the leaf mass

per area. The correlation of specific leaf area with the photosynthetic activity of plants helps in understanding the biomass production capability of particular species.

Leaf area analysis of six species namely *Pterocarpus marsupium*, *Cassia fistula*, *Diospyrus melanoxylon*, *Santalum album*, *Shorea talura* and *Ochna obtusata* were at Doresanipalya forest and five species each at Thalewood house (*Olea dioica*, *Syzygium cumini*, *Cassia fistula*, *Ciphadesa basifera* and *Glochidion velutinum*) and Bugarikallu plot (*Ochna obtusata*, *Maytenus marginata*, *Ixora nigricans*, *Stereospermum suaveolens* and *Soymida febrifuga*) were conducted in winter of 2019. It was found that the highest SLA was recorded by *Cassia fistula* 244.57cm²/g, *Ciphadesa basifera* 264.31cm²/g and *Stereospermum suaveolens* 123.64cm²/g at Doresanipalya, Thalewood house and Bugarikallu respectively.

Sl No.	Species	Sample	Specific Leaf Area (SLA) cm ² /g	Average SLA cm ² /g
THALEWOOD HOUSE				
1	<i>Olea dioica</i>	TWH S1T1	131.45	131.45
2	<i>Syzygium cumini</i>	TWH S2T1	90.13	77.91
		TWH S2T2	65.41	
		TWH S2T3	78.20	
3	<i>Cassia fistula</i>	TWH S3T1	198.63	181.76
		TWH S3T2	164.89	
4	<i>Ciphadesa basifera</i>	TWH S4T1	226.21	264.31
		TWH S4T2	302.52	
5	<i>Glochidion velutinum</i>	TWH S5T1	143.77	135.93
		TWH S5T2	128.09	
DORESANIPALYA FOREST				
1	<i>Pterocarpus marsupium</i>	DPF S1T1	132.66	165.01
		DPF S1T2	189.35	
2	<i>Cassia fistula</i>	DPF S2T1	237.71	244.57
		DPF S2T2	251.43	
3	<i>Diospyrus melanoxylon</i>	DPF S3T1	134.16	133.78
		DPF S3T2	133.40	
4	<i>Santalum album</i>	DPF S4T1	135.82	143.24
		DPF S4T2	150.65	
5	<i>Shorea talura</i>	DPF S5T1	116.26	120.02
		DPF S5T2	123.77	
6	<i>Ochna obtusata</i>	DPF S6T1	138.61	127.09
		DPF S6T2	115.56	
BUGURIKALLU				
1	<i>Ochna obtusata</i>	BK S1T1	101.16	99.35
		BK S1T2	97.53	
2	<i>Maytenus emarginata</i>	BK S2T1	67.38	72.34
		BK S2T2	77.30	

Sl No.	Species	Sample	Specific Leaf Area (SLA) cm ² /g	Average SLA cm ² /g
3	<i>Ixora nigricans</i>	BK S3T1	80.88	67.99
		BK S3T2	55.10	
4	<i>Stereospermum suaveolens</i>	BK S4T1	114.01	123.64
		BK S4T2	133.27	
5	<i>Soymida febrifuga</i>	BK S5T1	80.20	79.97
		BK S5T2	79.73	

- **Sub Project 4: Phenological Studies on Selected Tree Species of Thalewood House, Bugurikallu and Doresanipalya Permanent Preservation Plots at Bannerghatta National Park**

For conducting the phenological studies, 500 trees, 250 each in two localities around the two permanent preservation plots at BNP and 50 trees around the Doresanipalya permanent preservation plot were tagged. The trees so tagged were representative of the plants at the permanent preservation plots. Phenological monitoring of the tagged trees from July 2019 until February 2020 (8 months) has been completed. In addition to the phenological observations, soil samples have also been collected for estimating the soil moisture content. The Phenological observations along with the data obtained from the automatic weather monitoring stations (temperature, rainfall, humidity, sunshine, wind speed & direction) will help us in a) Understanding the timing of ecosystem processes b) Assessing the vulnerability of species to climatic variations and c) Relating phenological changes with the climatic factors to establish the effect of climate change on trees.

- **Sub Project 5: Photosynthetic Potential of Some Important Tree Species in Permanent Preservation Plots Of Bannerghatta National Park and Doresanipalya Forest**

Tropical forests are experiencing unprecedented high temperature conditions due to climate change that could limit their photosynthetic functions. The study of changes in the carbon assimilation and gaseous exchange of trees is important for understanding the effect of climate change on the trees. The main parameters related to changing climate are CO₂ and temperature but other important variables may be light, humidity, pollutants, ozone, aerosols etc.

We determined the Leaf CO₂ assimilation (A)/ photosynthetic characteristics of 9 important tree species in different vegetation types of Permanent Preservation Plots (PPP) established at Bannerghatta National Park (BNP) and Doresanipalya forest. In BNP two PPPs were established based on two vegetation types viz, Thalewood house PPP represents moist deciduous forest (with species like *Olea dioica*, *Glochidion velutinum*, *Cassia fistula*) and Bugurikallu PPP represents drier thorny scrub forest. (with species like *Ixora nigricans*, *Maytenus emarginata*, *Ochna obtusata*,) and Doresanipalya PPP represents moist deciduous and disturbed forest (with species like *Cassia fistula*, *Diospyros montana*, *Shorea roxburghii*). The measurements of Leaf CO₂ assimilation (A) were made between 08:30 and 13:30hr, during which period the ambient air temperature generally increased from 25^oC to 34^oC in all three Permanent Preservation Plots. The Leaf CO₂ assimilation/photosynthetic characteristics of *Cassia fistula* and *Shorea roxburghii* were significantly higher and ranging from 2.4-21.8 μmol photon m⁻²s⁻¹ in moist deciduous forest and dry deciduous forest of Thalewoodhouse PPP and Doresanipalya PPP. Whereas, in the species of *Ixora nigricans*, *Maytenus emarginata*, *Olea dioica* and *Glochidion velutinum*, it ranged from 1.7-16.5 μmol photon m⁻²s⁻¹. Photosynthesis of above

mentioned species appears to be more strongly affected by stomatal conductance in relation to temperature in the dry forest of PPP than in the moist forest of PPP.

- **Sub Project 6: Nutrient Analysis of the Forest Soil in PPPs**

The nutrient analysis of the forest soil of Permanent Preservation Plot at Doresanipalya forest (dry deciduous and disturbed) and Bannerghatta National Park i.e., Thalewood house (moist deciduous) and Bugarikallu (dry deciduous) was carried out. The soil samples were collected from the 25 subplots of each of the 1-hectare plots and the physico-chemical parameters of the soil was estimated using various techniques. The BIS/APHA standard was followed for estimation of most of the parameters. Carbon, Hydrogen, Nitrogen, and Sulphur were estimated using the CHNS analyser. Estimation of nutrients were done for all the samples (totally 75 samples, 25 from each plot) from the three permanent preservation plots. The average of each parameter from 25 subplot samples from the PPPs is tabulated below.

Soil Parameters	Doresanipalya	Thalewoodhouse	Bugurikallu
Moisture content (%)	2.2	7.2	6.5
Bulk density (gm/cm ³)	1.73	1.51	1.59
pH	5.7	5.6	6.0
Electrical Conductivity (EC) (µS/cm)	65.7	222.1	105.1
Calcium (mg/kg)	339.1	759.2	390.7
Magnesium (mg/kg)	178.7	201.2	151.9
Potassium (mg/kg)	3.60	2.02	3.24
Sodium (mg/kg)	2.46	3.26	0.62
Phosphorus (ppm)	15.92	13.36	11.28
Carbon (%)	0.7	1.8	1.2
Hydrogen (%)	n.d	n.d	n.d
Nitrogen (%)	0.1	0.7	0.5
Sulphur (%)	0.1	0.03	0.1

Note: n.d – Not Detectable

The moisture content and the electrical conductivity are more in Thalewood house plot (moist deciduous) compared to the other two plots. The bulk density is more in Doresanipalya plot compared to the other two plots indicating the presence of sandy soil with low moisture retention.

Thalewood house soil samples recorded the highest calcium, magnesium, and sodium content of 759.2 mg/kg, 201.2mg/kg and 3.26 mg/kg, respectively in comparison with the other two plots; whereas Doresanipalya plot recorded highest potassium content of 3.6 mg/kg and phosphorus content of 15.92 ppm. The higher concentration of carbon content in Thalewood house plot implies better water retention and nutrient holding capacity.

- **Sub Project 7: Re-Enumeration and Biometrics of the Flora in the Permanent Preservation Plots at Bannerghatta National Park**

All the flora in PPPs had been identified and the data comprising the scientific name of the plant, the spatial arrangement of each tagged plant, diameter at breast height (DBH) and height were compiled into a database in 2017. As per the census data of the Thalewood house permanent preservation plot, a total of 1586 individuals of 68 different species were recorded and tagged.

A recensus was undertaken after 2 years at Thalewood house PPP. The recensus comprised of recording the mortality and recruitment – checking for mortality in tagged trees and tagging of new plants (recruitment) over 1 cm DBH that have come up after 2 years and re measurement – measuring the DBH of tagged trees after 2 years. During the mortality studies, it was found that quite a few tagged trees were dead or the top branches broken. During the recruitment studies, new species were found that were over 1 cm DBH and these were newly tagged. Compilation and analysis of the recensus data obtained are underway and recensus at the other two plots will be undertaken soon.

- **Sub Project 8: BIA Enabled Butterfly Monitoring Program for Karnataka**

Insects especially butterflies, very sensitive to the floral characteristics and climatic conditions in an area, get impacted faster to the climate changes. Hence butterflies serve as flagship organisms to indicate climate change and environmental health. Monitoring the diversity and distribution of butterflies in an area is very important in this context. Though there are butterfly monitoring programs in European countries enabled through public participation, there are no such unified efforts in any state in India to utilize citizen science into processed information to monitor the butterfly populations. As a pioneering effort, the Strategic Knowledge Centre for Climate Change in EMPRI initiated this program for the state of Karnataka. Monitoring involves the identification and reporting of butterflies in different districts of the state. This can be facilitated through colourful field guides and hand books. We have prepared simple easy to use field guides for Bengaluru/ Karnataka butterflies. But concerted efforts of knowledgeable researchers are required in all the districts of the state and the information is to be collected and maintained and processed by one agency to have a centralised database. To solve this issue, a mobile App (**BIA- Butterfly Identification APP**) is developed by EMPRI for the double purpose of helping in field identification of butterflies and sending the information to EMPRI. BIA helps in easy identification of butterflies by anyone from anywhere in Karnataka. The APP can be downloaded in any Android mobile and the information on identification submitted reaches through the internet to the dashboard developed for the purpose. Planning to use the services of the NGC school children and forest department officials, the BMP program in Karnataka is launched by EMPRI in 2018-19. Trainings of school teachers and students were also conducted and publicised to NGC schools through SATCOM programs. Pilot tests were conducted in 2019 in selected green spaces of Bangalore to prove the utility of the BIA. BIA is linked to EMPRI website and also the Karnataka Climate Change Strategic knowledge portal. The dashboard developed for processing the butterfly data is hosted in Karnataka State Data centre (KSDC) and shall be accessible to everyone interested to know the details. The program is to be promoted across all districts of Karnataka through identified nodal agencies (NGC schools and Range Forest Offices) so that the information received from same areas across months, seasons and years will form a reliable data source to understand the variations in diversity and distribution of butterflies in relation to the climatic conditions in different areas. Concerted efforts are planned to publicise the program implemented as a NGC activity for specified areas in urban and rural areas of districts and as a forest department program in forest ranges all across the state. If executed meticulously, this will be the first of its kind in the country to monitor the diversity of butterflies and to use them as bio indicators of climate change.

A study is also initiated to monitor the diversity of butterflies in 5 eco climatic areas in Karnataka. This is a phase 2 study in the same areas (Bengaluru, Dharwar, Mangalore, Kalaburgi and Shimoga) and in the same transects as done in 2016-17. BIA will also be used for the study.

b) Case Studies

Under the theme adaptation/mitigation strategies for climate change case studies were undertaken for evaluating the departmental schemes. Presently, two schemes each from Karnataka state department of agriculture (KSDA) and watershed development department (WDD) were selected. The schemes of Krishi Bhagya from KSDA and Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) were evaluated and their success stories were documented.

c) Internship Program

Ms. Bhuvaneshwari Karamudi from Karnataka State Rural Development and Panchayat Raj University, Gadag completed her internship in June, 2019 by associating in the DST funded project on Permanent Preservation Plots. The study was to analyse with the aid of GIS tools, the species distribution pattern and directional trends of some dominant tree species in the Permanent Preservation Plot established by EMPRI at Bugarikallu area of Bannerghatta National Park. Of the 12 dominant species in the PPP, clustered distribution is shown by 7 species- *Ixora nigricans*, *Pterolobium hexapetalum*, *Grewia orbiculata*, *Anogeissus latifolia*, *Erythroxylum monogynum*, *Canthium dicoccum* and *Tarenna asiatica*. 5 Randomly distributed species are *Maytenus emarginata*, *Ochna obtusata*, *Acacia chundra*, *Jasminum* sp. and *Diospyros melanoxylon*. The directional trend analysis showed that 3 species are spreading towards South west to north east, 6 species from South to North. *Ixora nigricans* is spreading from West to East and *Diospyros melanoxylon* species from South to west. *Acacia chundra* is spreading from North West to South East. Overall analysis of the 2165 species in terms of their size class indicated that the size class 1- 4.99 had the highest number of individuals (719) the other classes are lesser in number (≥ 100).

d) NABL Accreditation for EMPRI Climate Change Laboratory

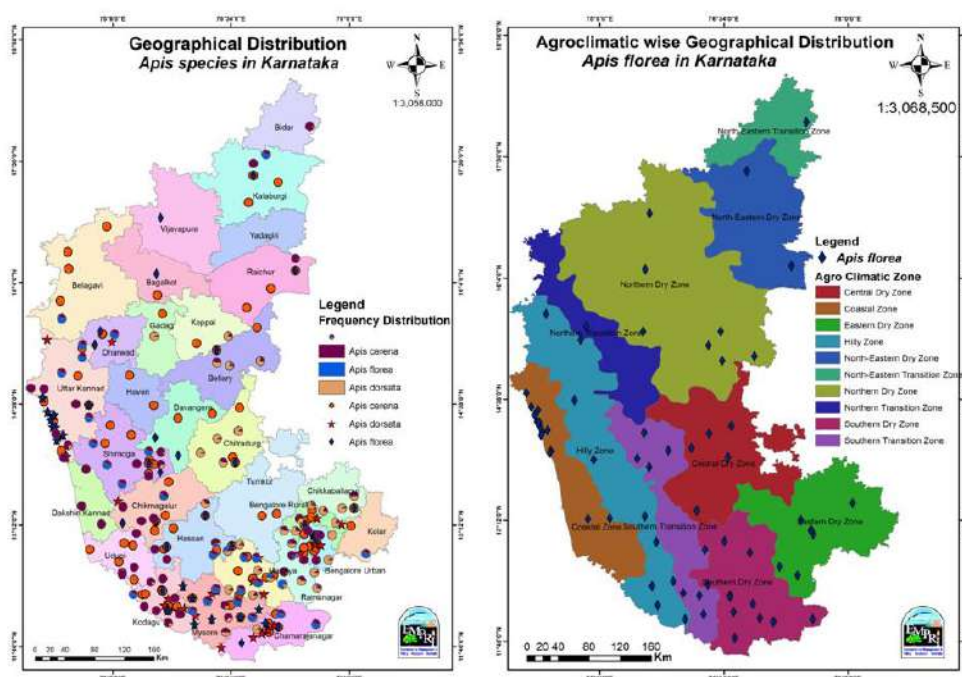
EMPRI lab is under the process of getting recognition for the National Accreditation Board for Testing and Calibration Laboratories (NABL). A total of 19 parameters for water analysis are approved under the NABL scope. A committee is constituted with analysts, technical manager, quality manager for lab analysis. The analysts from the centre for climate change (CCC) section and water analysis laboratory have been given NABL training by the experts from Central Pollution Control Board (CPCB) and Karnataka State Pollution Control Board KSPCB, Bangalore. Four members have undergone training on Laboratory Quality Management System and Internal Audit conducted by Bureau of Indian Standards (BIS) at Bangalore during Feb 17-20, 2020. Standard chemicals such as certified reference materials (CRMs) and the national institute for standards and technology (NIST) chemicals have been procured. EMPRI applied for participation in proficiency tests for water and waste water analysis which is scheduled to be held during July and October 2020. The application procedures for NABL accreditation are under progress.

II. GoK Funded Projects Initiated in 2019-20

i. Understanding and Projecting the Effect of Climate Change On Native Bee Species and its Implication on Crop Production (June 2019-August 2020)

This study is aimed to assess the impact of climate change on native bees and its implication on crop production. Secondary data of native bee species belonging to few genus namely, *Apis* (*A. dorsata*, *A. florea* and *A. cerana*), *Halictus* (*H. latisignatus*, *H. propinquus*, *H. lucidipennis*), *Amegilla zonata*, *Tetragonula iridipennis*, *Megachile* (*M. lanata* *M. hera*, *M. disjuncta*, *M. cephalotes*),

Ceratina (*C. hieroglyphica*, *C. binghami*, *C. smaragdula*, *C. unimaculata*) were collected from publicly available records, thesis, published articles, India biodiversity portal, global biodiversity information facility (GBIF), etc. These will help us to answer 1) if bees are undergoing any decline? 2) How bee species are spatially distributed? Whether any specific geographic distributional patterns for native bees exist in Karnataka? A database was created to include, 1) family, genus, species of bees; 2) year of study, 3) location of the study area (State /District /Taluk/ Place), 4) Co-ordinates and altitude of the study location, 5) Type of habitat 6). Substratum to build the species nest, 7) Number of colonies observed, 8) Direction/orientation of colonies, and 9) Reason of decline. Decadal analyses for few species under the genus *Apis* for 1961 to 2020 were carried out. The distributional maps were prepared for few species under the genus, *Apis*, *Halictus*, *Ceratina*, *Megachile* at the district level and agroclimatic zone wise for the state of Karnataka. This is mainly based on the prevalence of the specific bee species to the particular geographic area.



District wise and Agro climatic zone wise distribution maps for *Apis* species in Karnataka

ii. Studies on Plastic Degrading Microbes Isolated From Soil (June 2019-August, 2020)

The specific objectives of the project are to isolate the plastic degrading microbes viz., Bacteria and Fungi, from soil samples, to characterize the microbes for their efficiency in the degradation of one time use grade plastic, to study the effect of biodegradation of plastic under *in vitro* and *in vivo* conditions and to develop a microbial control package to degrade plastic in the dumping sites. A survey was conducted in South Bangalore for the collection of soil samples from three different sources viz., Garden, Forest and Plastic dumping sites. Accordingly, the soil was collected from EMPRI garden, Bannerghatta forest and Puttenahalli lake in Bangalore.

A total of 43 microbial isolates (bacteria and fungi) were isolated from the soil samples, among which 16 isolates have shown growth on minimal agar media containing polyethylene glycol (PEG) as a carbon source. Further, these 16 isolates were tested for plastic degradation capability on

the minimal agar medium (with 1% PEG) by the zone of clearance method. The isolates showing larger zone of clearance were selected as the efficient microbes for biodegradation of plastic. Among 16 isolates, six isolates have shown the highest zone of clearance ranging between 80mm to 240mm. These six isolates were selected for further characterization and the future line of work for three months on determination of the rate of plastic degradation by weight loss method. The study is under progress.

iii. Mapping of Important Green House Gases (GHGs) in Selected BBMP Areas of Bengaluru City (June 2019-August 2020)

The objectives of the project are to create a baseline data of GHGs within the selected BBMP areas of Bengaluru city, assess the spatial variation in concentration of the GHGs in relation to temperature and the variation in concentration of GHGs during different times of the day. GHG analyser has been procured and its testing has been done to standardize the operation and testing protocol. The work plan for the summer months (March-May, 2020) has been prepared selecting sites in CPCB and KSPCB air quality monitoring areas and getting required permission. The quotations for hiring a more precise GHG analyser is also under processing.

iv. Promoting Green Buildings to Combat Climate Change: A Study of Bengaluru - By ISEC (Feb 2020–Jan 2021)

The objectives of the project are to document and create a data base on green buildings/typology in Bengaluru and analyse the role of institutions in promoting green buildings/architecture, develop a conceptual framework to analyse economic and ecological efficiency and a set of indicators to measure the reduction in carbon emissions with/without adoption of green architecture in Bengaluru, capture people's perceptions across types of buildings (government buildings, commercial buildings, houses) to analyse the socio-economic aspects, knowledge, access and acceptance of green features and implications, conduct case studies and comparative analysis of GRIHA, LEED certified and Biome constructed buildings and capture people's perceptions/experiences, analyse the implementation and working challenges of green buildings. Currently, a checklist is prepared for architects and residents and is submitted to EMPRI for review and comments.

v. Vulnerability of Diverse Communities to Climate Change in Different Districts of Karnataka” - by ISEC (Feb 2020 to Jan 2021)

The main aim of the study is to assess the vulnerability to climate change of diverse communities and to study the current adaptation to climate change of various social categories of Karnataka. This study will use both the primary and secondary data for assessing vulnerability to climate change. This study has also focus on socio-economic impacts through the new Intergovernmental Panel on Climate Change (IPCC) indicators such as sensitivity and adaptation to climate change in the selected districts in Karnataka. This study will be more useful for local policy makers for allocating resources for better adaptation to climate change at the local level in Karnataka. Review of literature has been made on economics, poverty, gender, education and various social groups' perspective on climate change at the regional, national and international level. The survey questionnaire has been prepared for field work.

vi. Impact of Climate Change on Sericulture in Karnataka and Implementation of Adaptation and Mitigation Technologies at Farmers Level -By KSSRDI (Feb 2020 to Jan 2021)

Mulberry cultivation and silkworm rearing are highly influenced by climatic parameters like temperature, humidity and rainfall. The productivity of silk is also affected by the climate change during the past 20-30 years. There is no data on the impact of climate change on sericulture. The project aims to study the impact of climate change on sericulture in Karnataka through a historic data analysis and to assess the adaptation/mitigation technologies being practiced in the mulberry sericulture to combat the climatic changes. Data collection on silk productivity vis-a vis climatic factors in the past 30 years from reliable sources and farmer level surveys through structured questionnaires is planned. As per the plan of activity, baseline survey work has been conducted in two villages during March, 2020 in Ramanagara district. Collected proforma based information about their knowledge and experience on effects of climatic factors in the field of mulberry cultivation and silkworm rearing practices. Recent information on sericulture production area in Karnataka has been collected from the Department of Sericulture.

C. Assignments By MoEF&CC Govt. of India

• **Revision of Karnataka State Action Plan on Climate Change**

As per the directives of the Ministry of Environment, Forest and Climate Change, Karnataka State is in the process of revising the 1st State Action Plan on Climate Change (SAPCC). The Core group was formed under the Chairmanship of Additional Chief Secretary and Development Commissioner, Government of Karnataka for revision of the action plan. Chapter-wise discussion meetings were held to discuss the broad outline of each of the chapters and representatives from various research and academic institutes were involved in chapter writing for the action plan. Four modelling projects have been assigned to experts in other institutes so that the revised SAPCC will have projections for the future which can help in the planning of climate actions in different sectors. The projects are as follows:

- i. Climate change impact assessment and projections in agriculture through crop modelling - Dr.H.S.Shivaramu, Professor & Head, Agrometeorology Section, University of Agricultural Sciences, GKVK, Bengaluru.
- ii. Technical support for the revision of SAPCC (Climate Change Strategy-Mitigation) - Dr.Anshu Bharadwaj, Executive Director, Centre for Science, Technology and Policy (CSTEP), Bengaluru.
- iii. Impact of climate change on water resources in Karnataka- Prof.P.P.Majumdar, Chairman, Interdisciplinary Centre for Water Resources, Indian Institute of Science, Bengaluru.
- iv. Climate Change and Karnataka: Input to State Action Plan on Climate Change-SAPCC II - Prof.N.H.Ravindranath, Centre for Sustainable Technologies, Indian Institute of Science, Bengaluru.

List of meetings held for revision of SAPCC

Meetings	Date	Agenda	Participants
Core group meeting	19.06.2019	Framing the chapters of SAPCC and the authorship for chapters	All core group members
1 st Chapter-wise discussion	02.07.2019	Discussion on chapters 1 - Introduction 2 - State Profile 3 - Climate profile	Representatives from EMPRI, KSNDMC & IISc
2 nd Chapter wise discussion	12.07.2019	Discussion on chapter 4 - Vulnerability Assessment	Representatives from EMPRI, ISEC, IISc, UAS, GKVK, UASD, KSNDMC, KFD, KUWSDB MSRIMS
3 rd Chapter wise discussion	03.08.2019	Discussion on chapters on 5-Climate Change Strategy - Mitigation 6-Climate Change Strategy - Adaptation	Representatives from concerned line depts, CSTEP, EMPRI
4 th Chapter wise discussion	04.09.2019	Discussion on chapters 7-Financing SAPCC 8-Institutional Mechanism 9-Monitoring & Evaluation	Representatives from concerned line depts, ISEC & EMPRI
Training program cum 1 st Stakeholder meeting	21.09.2019	Training to nodal officers Interaction among authors/experts on the revision of SAPCC	Nodal officers of line depts., authors/experts, other stakeholders
State Level Steering Committee on Climate Change (SLSCC)	26.09.2019	Approval of allocation of funds for revision of SAPCC	SLSC members
1 st Review meeting	10.02.2020	Review the progress of authors on drafting of the chapters	Authors of all chapters

Names of the nodal officers from different line departments

Sl.No.	Name of the nodal person & designation	Department
1	Mr.M.Manjappa , Deputy Director	Directorate of Town & Country Planning
2	Mr.A.Padmaya Naik , Director	Watershed Development Department
3	Mr.G.K.Ravikumar , Scientific Officer	Department of Forest, Ecology &

Sl.No.	Name of the nodal person & designation	Department
		Environment
4	Dr.T.Sreenivasa Reddy , Additional Director	Animal Husbandry & Veterinary Services
5	Mr.Nagaraj.R , Deputy Secretary	Dept. of Tourism
6	Mr.Venkatesh , Under Secretary	Housing Development Dept.
7	Mrs.Pushpa , Deputy Secretary	Dept. of Health & Family Welfare
8	Mr.Krishnamurthy.B. Kulkarni Additional Secretary	Public Works Dept.
9	Ms.Kavitha , Deputy Director	Urban Development Dept.
10	Mr.Antony Maria Emanuel , Director	Agriculture Dept.
11	Mr.Shripada.V.Hegde , Director	Department of Planning
12	Mr.Shivraj B.Patil , Addl. Commissioner	Transport Dept.
13	Mr.Raj Kumar Biradar , Joint Director	Energy Dept.
14	Mr.Dilip Kumar Das , APCCF (R & U)	Karnataka Forest Dept.
15	Dr.C.N.Prabhu , Senior Scientific Officer	KSNDMC
16	Dr.M.Srinivas Chief Engineer (PM&B)	BMRCL
17	Dr.H.Lokeshwari , Chief Scientific Officer	KSPCB

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

- **Monitor the NAFCC Project Undertaken by AH&VS**

A project entitled, “Conservation and Management of Indigenous varieties of livestock (Cattle and Sheep) in the Wake of Climate Change in Karnataka” sanctioned in 2016 for Rs.24, 21,52,632/- by MoEF&CC, New Delhi is being undertaken by Karnataka livestock Development Agency (KLDA), Animal Husbandry and Veterinary Services (AH&VS). The total sanctioned amount of Rs.9.34 crores (2016-2019), an amount of 499 crore (Second installment) has been released on 23rd August 2019 to the implementing agencies- KVAFSU/NDRI/KSWDC. An amount of Rs.493.60 lakh was spent up to 30/10/2019 and the balance amount is Rs.450.67 lakhs. As on date a total amount of Rs 496.60 lakh has been utilized by the implementing agencies. The work is under progress with change of Deoni breed to Amrithamahar breed and extension of one year project duration.

- **The Following NAFCC Fund Projects have been Submitted to NABARD**

1. **Building Resilience to Climate Change Through Revival of Traditional Agro-Fishery System in Coastal Karnataka** By Environmental Management And Policy Research Institute (EMPRI)

The proposal was presented by Dr. K. H. Vinaya Kumar IFS, Director, EMPRI during Technical Scrutiny Committee (TSC) meeting held on 23/12/2019 at MoEF&CC, New Delhi. The Project Concept Note (PCN) was accepted and it is under consideration.

2. **Climate Smart Village program** by the Department of Agriculture, Government of Karnataka.

The proposal was presented by the Joint Director, Department of Agriculture, during the Technical Scrutiny Committee (TSC) meeting held on 23/12/2019 at MoEF&CC, New Delhi. The Project Concept Note (PCN) was accepted and it is under consideration.

The Communication with Regard to the Approval of Projects Listed Below Submitted by Various Departments of Karnataka is yet to be Received

3. “**Karnataka Farmer Tree Support Project (for Bidar and Chitradurga Districts)**” by Karnataka Forest department
4. “**Karnataka State Action plan for Climate Change and Human Health (KSAPCCHH)**” by the Department of Health and Family Welfare
5. “**Bio-fuel Programme at KSRTC-blending of biodiesel with Diesel**” and “**Construction, Supply, Installation, commissioning, Operation and Maintenance of 20K LD and capacity effluent treatment plants in KSRTC bus depots at 40 locations**” by Karnataka Road Transport Corporation (KSRTC)
6. **Drought Monitoring forecasting and Agro-Meteorological advisories for adaptation to climate smart agriculture at Micro Level in Karnataka**” by Karnataka Natural Disaster Monitoring Centre (KSNDMC).

2.3.3. Capacity Building on Climate Change and Environmental Issues - Details of the Talks Scheduled on 2nd and 4th Friday of Every Month (September, 2019 to March, 2020)





Sl. No.	Date and Time	Resource person, Designation and Institute	Title	No. of participants
SEPTEMBER, 2019				
1	13.09.2019 Time: 4.00 PM to 5.30 PM	Prof. Govinda Samy Bala Center for Atmospheric and Oceanic Sciences, Indian Institute of Science	What is the ultimate fate of anthropogenic CO ₂ in the atmosphere?	29
2	27.09.2019 Time: 3.00 PM to 4.30 PM	Prof. P.P. Nageswara Rao Outstanding Scientist, ISRO (Retd), Faculty Member, VTU-EC/KSRSAC, GOK	Geoinformatics Applications in natural resources and climate change management	23
OCTOBER, 2019				
3	11.10.2019 Time: 3.30 PM to 5.00 PM	Dr. Mahesh Kashyap Former faculty, CiSTUP, Indian Institute of Science Bangalore - 560 012	Environmental protection –learning from others	27
4	25.10.2019 Time: 3.30 PM to 5.00 PM	Dr. Ulka Kelkar and her Team , Director, Climate, WRI India, Basavanagudi, Bengaluru -560 004	Tools and methodologies to integrate climate and sustainability considerations into development	21

Sl. No.	Date and Time	Resource person, Designation and Institute	Title	No. of participants
NOVEMBER, 2019				
5	08.11.2019 Time: 3.30 PM to 5.00 PM	Professor K. S. Bhat D-1101 Laburnum Brigade Millennium J. P. Nagar 7th phase Bengaluru 560078	Paradigm shifts in our environment and priorities for action research to protect climate changes	25
6	21.11.2019 Time: 3.30 PM to 5.00 PM	Dr. P.V.R. Reddy Principal Scientist, Division of Entomology and Nematology Indian Institute of Horticultural Research Hesaraghatta Lake Post, Bangalore -560 089	Plant-Pollinator interactions in relation to climate change: Potential shifts and mitigation strategies	49
DECEMBER, 2019				
7	13.12.2019 Time: 3.30 PM to 5.00 PM	Dr. Ganeshiah K N Dean Post Graduate Studies (Retired), University of Agricultural Sciences GKVK, Bangalore-560 065	Effect of Climate Change on forest ecosystems: What can we do?	28
8	27.12.2019 Time: 3.30 PM to 5.00 PM	Mr. S.Vishwanath Biome Environmental Trust, Bangalore	Managing local waters Rainwater, groundwater, surface water and wastewater The tyranny of small decisions Experience from the Field	47
JANUARY, 2020				
9	10.1.2020 Time: 3.30 PM to 5.00 PM	Dr. G. Ravikanth Senior Fellow Ashoka Trust for Research in Ecology and the Environment (ATREE), Bangalore	Climate change and species distribution: Predicting species range shifts using Ecological Niche Modelling tools	20
10	24.1.2020 Time: 3.30 PM to 5.00 PM	Dr. H. S. Suresh, Divecha Center for Climate Change and Center for ecological studies, Indian Institute of Science, Bangalore	Climatic variability, responses of tree community: Long-term study in a tropical dry forest.	27
FEBRUARY, 2020				
11	17.02.2020 ime: 3.30 PM to 5.00 PM	Dr. M.K. Ramesh Professor, NLSIU	Enquiries On Climate Change, For Research and Policy-Making	21

Sl. No.	Date and Time	Resource person, Designation and Institute	Title	No. of participants
12	28.02.2020 Time: 3.30 PM to 5.00 PM	Dr. Monto Mani Associate Professor Centre for Sustainable Technologies, Indian Institute of Science,	Sustainability Challenges Ahead: Human Settlements	55
MARCH, 2020				
13	13.03.2020 .. Time: 3.30 PM to 5.00 PM	Prof. A.N. Ganeshamurthy.	Sustainable Soil Management Models in Horticultural Systems in India	30

2.3.4. Photo Gallery-Centre for Climate Change

i. Climate Change Laboratory

	
CHNS Analyzer	Infra-Red Gas Analyzer
	
Hot air oven BOD incubator Rotary Shaker	Compound Microscope Leaf Area Analyzer

Flora of BNP permanent preservation plots



Lectures by Experts at EMPRI



2.4 Water Analysis Laboratory

EMPRI labs were inaugurated in 2016 and ever since then lab is growing with addition of many analysis equipments/instruments. Water and Microbiology laboratories are well equipped to carry analysis of Water, Wastewater, Soil, Sediment & Air samples for various Physico-chemical and biological parameters. Labs have been accredited for ISO 9001:2015 & OHSAS 18001:2007 during January 2018. The capacity for handling number of samples and parameters that can be analysed in the laboratories have been increased with time from 18 parameters(in 2016) to 44 parameters (by end of March 2020) with the procurement of new equipments which are listed in the below table under the heading of *List of New Equipments/Instruments that has been Installed During the Financial Year 2019-20*. The list of parameters that are newly added the existing are presented in the below table under the heading of *List of Newly Added Parameters Analysed in the Water Laboratory from Year 2019-20*. This increased capacity of laboratories with installation of new instruments/equipments has resulted in increased number of samples being received from the community and other governing bodies.

List of New Equipments/Instruments that has been Installed During the Financial Year 2019-20.

Sl. No	Equipment/Instrument Name
1	Gas Chromatography
2	Sonicator
3	Toxicity Characteristic Leaching Procedure Apparatus
4	Flash-point Apparatus
5	Respirable Dust Samplers
6	Jar Test Apparatus
7	Muffle Furnace

List of Newly Added Parameters Analysed in the Water Laboratory from Year 2019-20

Sl. No	Newly Added Parameters
1	Ortho-Chloro Pesticides
2	Toxicity analysis
3	Optimum Dosage Analysis
4	Mixed Liquor Volatile Suspended Solids
5	Fixed Solids and Volatile Solids
6	Source Emission- Particulate Matter
7	Source Emission- Ammonia
8	Source Emission- Sulphur dioxide

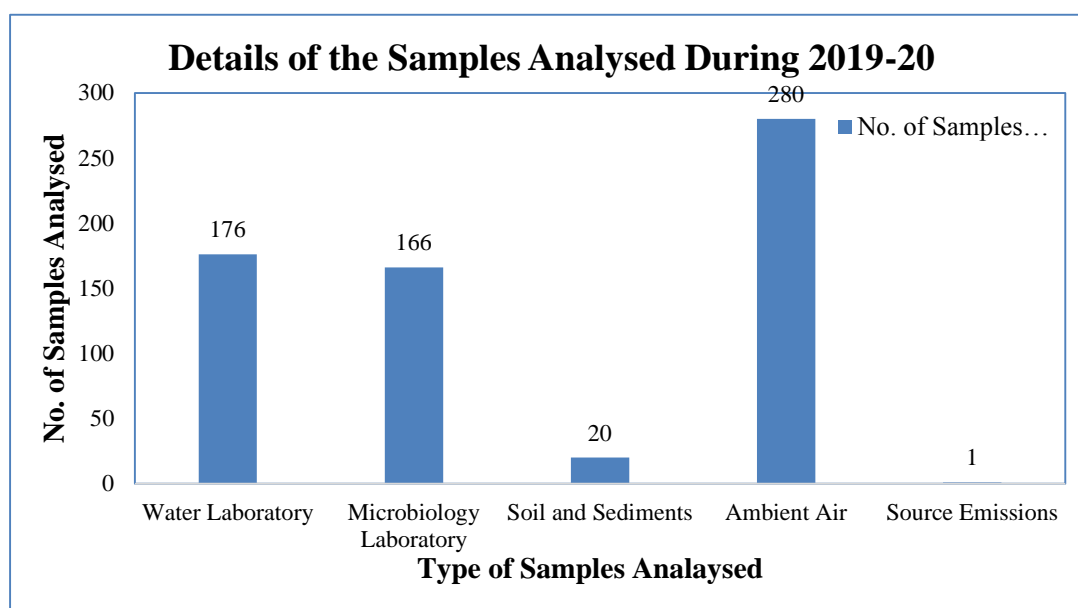
Laboratories are extensively being used for analysis of both in-house and external samples. The details of different samples that have been received and analysed in the laboratories during the Year 2019-20 is as presented in in the below table under the heading of *The Details of Various Samples Analysed During the Financial Year 2019-20*. The graphical representation of the same is presented in Fig. 1. apart from samples submitted by external clients. The various projects from which the samples of house have been received and analysed are as listed below.

- 1) Comprehensive study on Polluted stretches of Bhadra River
- 2) Documentation of Yettinahole project site and assessment of cumulative impact of multiple projects in afforested land scape
- 3) Third party Inspection Common Bio medical waste Management

4) Videography and Photography of Rejuvenation of Lakes in Bengaluru

The Details of Various Samples Analysed During the Financial Year 2019-20.

Sl. No	Type of Samples	No of Samples Analysed
1	Water Laboratory	176
2	Microbiology Laboratory	166
3	Soil and Sediments	20
4	Ambient Air	280
5	Source Emissions	1



Graphical representation of Different types of Samples Received from Laboratory Along with their Number

2.5 Outreach Activities

2.5.1. 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 at EMRPI, Bengaluru. . 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:

i. ENVIS Website:

The ENVIS centre Karnataka has a dedicated website on the National Informatics Centre (NIC) Content Management System (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 Ministry of Environment Forest & Climate Change (MoEF&CC).



ii. 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, Government of India (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: **27,147** (April 2019 to March 2020)

Module	Year	Status	Link
AMQP	2019	Full	View Data
AMQP	2018	Full	View Data
AMQP	2017	Full	View Data
AMQP	2016	Full	View Data
AMQP	2015	Full	View Data
AMQP	2014	Full	View Data
AMQP	2013	Full	View Data
AMQP	2012	Full	View Data
AMQP	2011	Full	View Data
AMQP	2010	Full	View Data
AMQP	2009	Full	View Data
AMQP	2008	Full	View Data
AMQP	2007	Full	View Data
AMQP	2006	Full	View Data
AMQP	2005	Full	View Data
AMQP	2004	Full	View Data
AMQP	2003	Full	View Data
AMQP	2002	Full	View Data
AMQP	2001	Full	View Data
AMQP	2000	Full	View Data

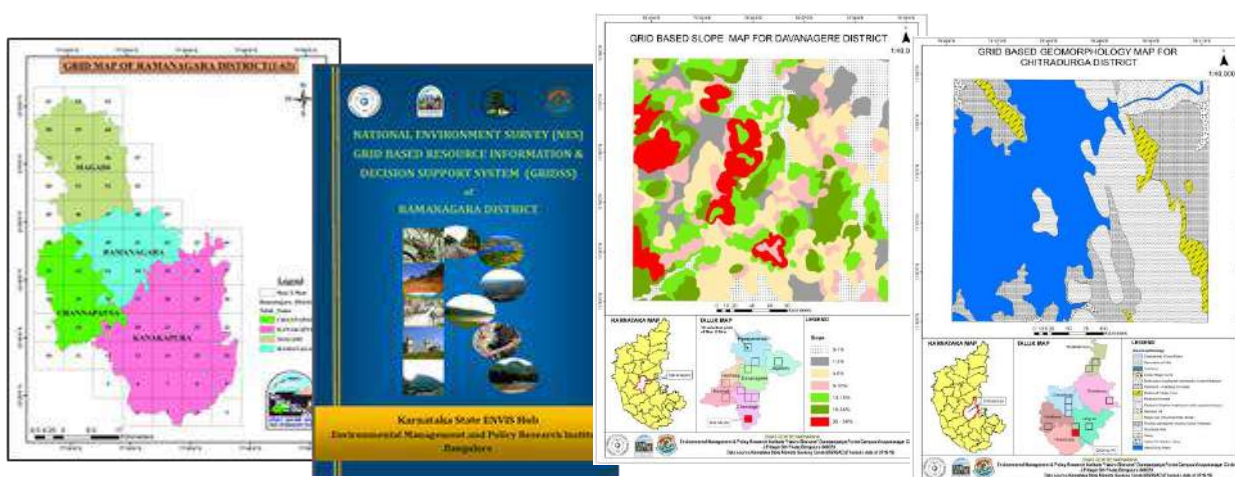
iii. ENVIS Newsletter 'PARISARA':

ENVIS centre has been publishing a quarterly newsletter 'PARISARA'. Centre has published 55 issues till 2020, issue 52 on **Air Pollution**, issue 53 on **Bangalore rural**, issue 54 on **Forest fires** and issue 55 on **Flash floods** for the year 2019-2020. Available for download on WWW.KARENVIS.NIC.IN



iv. National Environment Survey (NES) - Grid Based Resource Information Decision Support System (GRIDSS)

EMPRI-ENVIS was entrusted to carry out National Environment Survey (NES) - a Grid based Resource Information and Decision Support System (GRIDSS) program for 14 districts of Karnataka viz., Ramnagar, Bengaluru rural, Bengaluru urban, Bidar, Chitadurga, Davangere, Tumkur, Chikkaballapura, Kolar, Raichur, Ballari, Kalaburagi, Koppal and Yadgir. The study is performed through different parameters such as water, soil, forest & wildlife, flora & fauna, wetlands, lakes, rivers, LU/LC, Mining & water bodies etc. and mapped into 9 X 9km grids. The NES GRIDSS of Ramanagara Report was released on 02.04.2019 by Secretary, MoEF&CC, New Delhi. Till date mapping for 10 districts (including Ramanagar-mapped last year) have been completed out of 14 assigned districts of Karnataka. The number of thematic map prepared for each district is given below;



- Bengaluru Rural 468 maps prepared for entire district covering 52 grids under 9 themes
- Bengaluru Urban - 110 maps prepared for 10 selected grids under 11 themes

- Chikkaballpura - 110 maps prepared for 10 selected grids under 11 themes
- Tumkur- 110 maps prepared for 10 selected grids under 11 themes
- Kolar- 110 maps prepared for 10 selected grids under 11 themes
- Davangere- 110 maps prepared for 10 selected grids under 11 themes
- Chitradurga- 110 maps prepared for 10 selected grids under 11 themes
- Bidar- 110 maps prepared for 10 selected grids under 11 themes
- Raichur- 110 maps prepared for 10 selected grids under 11 themes

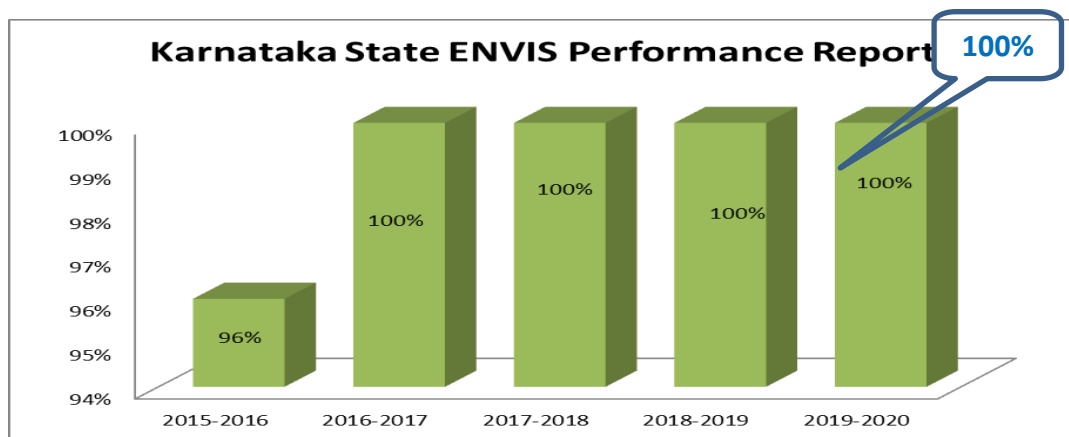
The centre has generated a total of 1348 maps in 2019-2020.

v. EMPRI Library:

The library is a documented repository of information and it has a collection of over 4000 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.,



Online Evaluation Outcomes for Last Five Years

vi. Green Skill Development Programme (GSDP) Courses

- GREEN SKILL DEVELOPMENT PROGRAMME (GSDP) Certificate Course on ETP /STP/ CETP operation and maintenance** was organised by EMPRI to the students who are graduate in science for period of two month. This course was conducted between November 11th 2019 to January 1st 2020 for duration of 300 hrs at EMPRI.

Outcome: GSDP Trainees who participated in the programme are well versed with the knowledge gained in the course and also these candidates got placed in various Research Institutions, NGO's and Private organizations. 3 of the ETP/STP/CETP candidates got placed in EMPRI as Lab Chemist and Lab assistants, 1 of the candidate has enrolled for PhD, few others are working in private organizations, and also some of the candidates started as entrepreneurs

2. **GREEN SKILL DEVELOPMENT PROGRAMME (GSDP) Certificate Course on Preparation of People Biodiversity Register (PBR)** organised by EMPRI to the students who are graduate in science for period of one month from 11th February to 13th March 2020. The duration of this course is 200hrs.

Outcome: GSDP Trainees who participated in the programme are well versed with the knowledge gained in the course and also these candidates got placed in various Research Institutions, NGO's and Private organizations. One of the PBR candidate got placed in EMPRI, and some candidates are willing to take up preparation PBR reports at their home town with the support of State Biodiversity Board, and few others are interested to take up higher studies.

vii. **The Centre has Created Knowledge Products and the Data Bases**

<ul style="list-style-type: none"> □ Database updated on Kareavis Website • Freshwater fishes of Karnataka • District wise Thematic Maps of Karnataka • Agriculture Biodiversity of Karnataka • 9*9km Grid Maps of Karnataka • Breed wise buffalo • Schemes of GOI and GOK updated. • State wise Solar installed capacity • Karnataka Eco-club Schools • Marine Water Fishes of Karnataka 	<ul style="list-style-type: none"> □ Posters / leaflets prepared • Interior Decoration • Indoor Plants to Purify Air • Renewable Energy Day • International Biodiesel Day • World Lion Day • International Tiger Day • World Population Day 2019 • Open Defecation Free • World Environment Day 2019 • World Tobacco Day 2019 • World Turtle Day • International Day For Biological Diversity • World Bee Day • Green Skill Development Programme • World Earth Day 2019 • National Environment Survey • Endangered Fauna Of Karnataka • World Sparrow Day 2019 • World Wildlife Day 2019 • World Wetland Day 2019 • Plastic Ban • Endemic Birds Of The Western Ghats Of Karnataka • World Nature Conservation Day 2020 • World Rivers Day 2020 • World Wild Life Day 2020 • International Day Of Action For Rivers • World Ozone Day 2020 • World Wetlands Day 2020 • My House Plants • Plants For Increasing Oxygen • Open Defecation Free Awareness Poster
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2.5.2. National Green Corps (NGC)

National Green Corps is a national school programme of Ministry of Environment Forests and Climate Change (MoEF&CC), Government of India (GoI) launched in 2001. The main objective of the scheme is to establish "National Green Army" by establishing Eco clubs in schools all over the nation to spread awareness on environment and carry out action based programmes for protection and improvement of environment. Environmental Management and Policy Research Institute (EMPRI) is serving as Nodal Agency for NGC in Karnataka to implement the programme since January 2009. In the year 2019-20, 14132 Eco club schools across 34 educational districts of the Karnataka State have received financial grant from MoEF&CC.

Number of Eco-Club Schools under NGC Programme

SL No	Category of Schools	No. of Eco-club schools
1	Government Higher Primary Schools	6587
2	Government High Schools	4464
3	Government Aided Higher Primary Schools	188
4	Government Aided High Schools	2868
5	Private (Unaided) Schools	25
Total		14,132

1) NGC Programme During 2019-20: For the financial year 2019-20, under Environment Education Awareness and Training (EEAT) Scheme MoEF&CC had sanctioned Grants- in-Aid of Rs 7,86,61,000 for supporting the activities of EEAT Scheme in the State of Karnataka. For the financial year 2019-20, MOEF&CC released an amount of Rs.7,28,54,260/- including the first installment of the sanctioned amount of the total grant for the year 2019-20 and reimbursement of administrative charges of FY 2018-19. Financial assistance to 14132 Eco-Clubs at Rs 5000/- per Eco-club with the ceiling of 500 Eco-clubs per district for supporting activities of Eco clubs and financial assistance for strengthening the implementation and monitoring of National green corps programme at district level @ Rs.25, 000/-per district for 34 educational districts were received.

2) Environmental Days Celebrations by EMPRI

- **World Environment Day Celebration 2019 theme-Air Pollution:** EMPRI celebrated World environment day on June 5th, 2019 by setting up an exhibition stall at world environment day event organized by Government of Karnataka in Chowdaiah Memorial Hall Bengaluru. Road rally and Cyclothon were organized as part of the celebration. EMPRI staff members interacted with the officers of different departments, school, college students and public to raise environmental awareness. Handouts and children books on environment were distributed to public and children to encourage environment protection. Banned plastic items and alternate items to plastics were kept on display in the stall to create awareness about the harmful effects of plastic on environment and ban on plastic usage. The event promoted environmental awareness among public at large. The event witnessed participation of Mr. Tejasvi Soorya, Member of Parliament along with few ministers of

karnataka. Around 10,00 participants from colleges, schools and public across various districts of Karnataka.

- On 7th, June 2019, EMPRI also celebrated world environment day at Doresanipalya campus and at Government High School, Puttenahalli. Road rally/jatha was carried out from Vinayaka nagar to Puttenahalli by EMPRI Staff to create awareness on environmental protection by holding placards with various environmental messages. Street plays were organized with a theme “Air Pollution” in Government High School, Puttenahalli premises. Lectures by EMPRI Staff on importance of world environment day The programme witnessed participation of 1000+ people.
- **World Ozone Day Celebration:** On 16th September 2019, World ozone day was celebrated at Government High School, Sarakki, J P Nagar Bengaluru. Dr Nagappa, Retired Senior Scientific Officer, Karnataka State Pollution Control Board and Mr. Kumaraswamy D, Retired Environmental Officer, Karnataka State Pollution Control Board, delivered lectures. Drawing, slogan writing and essay writing competitions were held with the theme “Save Ozone Layer” to the students. Prizes were distributed to the winners. The event witnessed participation of 600+ students.
- **World Wetlands Day Celebration:** On 01/02/2020, EMPRI organized World Wetlands Day celebration in Government High School, Agrahara, Dasarahalli, Bengaluru. Staff members from Central Pollution Control Board, Bengaluru Regional Office participated in the event. MOEF & CC, Regional Office, Bengaluru supported the event by providing literatures about “Importance of Wetland” to the students. Drawing and essay writing competitions were conducted to the school children on the topic “Save Our Wetland”. Drama, skits, dance and songs on protection of environment were conducted by the school children. Ramesh C, State nodal officer- NGC delivered a lecture on importance of wetlands. Over 400+ people including members from public participated in the event.

3) Swachhta Action Plan(SAP): Swachhta Action Plan(SAP) of Ministry of Environment, Forest and Climate Change is aimed at raising awareness on Air Pollution, Water Pollution, Waste Management, Environmental Conservation. core areas and play a pivotal role in comprehensive realization of Swachh Bharat whose notion was conceived by the “Father of the Nation; Mahatma Gandhi”. Based on the core areas details of Activities conducted by EMPRI under Swachhta Action Plan (SAP)- Swachhta Pakhwada Campaign are given in **Annexure – 12**

4) Achievements Under NGC

- Best Eco Club National: Government High School, Gojanoor, Gadag District received consolation prize under best eco-club award category at the National level by MoEF&CC.
- EMPRI received Certificate of Appreciation award for successfully implementing National Green Corps programme in Karnataka state.
- National Green Corps, Karnataka Website: EMPRI launched National Green Corps, Karnataka website, URL <https://ngc.karnataka.gov.in/> in the month of December 2019. Website was hosted by Centre for e-Governance. A user friendly Software has been developed to monitor, implement and support NGC activities at district as well as school level. Schools can submit their utilization certificates and annual reports online instead of physical copies.
- Lunched NGC Facebook account, [ngckarnataka](#), Facebook page: [national green corps Karnataka](#)

- Launched NGC Twitter account, [NGCkarnataka201](#)

5) Awareness Activities at Coastal Beaches

- **Cleanliness Drives on Coastal Beaches:** EMPRI organized mass cleanliness-cum-awareness drive in association with Society of Integrated Coastal Management (SICOM) of MOEFCC under “Swachh Nirmal Tat Abhiyan” programme for 7 days in 6 beaches of Karnataka. Cleanliness drives were organized in Bengre beach, (Mangalore district), Hejamadi beach, (Udupi dist), Ravindranath Tagore, Gokarna, Apsarakonda, Nirvana beaches (Uttara kannada district) from 11-11-2019 to 18-11-2019. Beach cleaning activities were conducted in association with education department, district authorities, NGOs, volunteers, local villagers, panchayats, Government, private and semi government organisations, school & college students. Eco club students and teachers actively participated in the drive. Waste collected under cleanliness drive were disposed as per waste management rules by the local authorities. Over 10,000+ people were part of the programme.
- **Environment Education Events at Coastal Beaches:** To plan sustainable tourism and healthy coastal management, MoEF&CC conceived an integrated coastal management scheme viz. BEAMS (Beach Management Services) to reduce existing pollutants on beaches and to aspire & achieve such high International Standards in India. To achieve this goal, EMPRI organised Environment Education Events at Padubidri and Kasarkod beaches on 10th and 20th February 2020 respectively. Environment Education Events were conducted to create awareness on environmental management including cleanliness and solid waste management in beaches. As part of the events, walkathons were organized. Eco club school children participated in walkathon and raised slogans to save the beaches. Drawing and painting competitions on theme “Save our Beach” and Eco quiz competitions were organized for school children. Officials from tourism department, forest department along with education department, volunteers, teachers, tourists, local communities, BEAMS services staff and school children took part in the event. Officials and subject experts delivered talks on topics such as marine bio diversity, marine pollution, effects of plastic pollution on marine animals etc. Prizes were distributed to the winners, 500+ people participated in the programmes.

6) **Training Programmes Conducted Under NGC Programme:** Under National Green Corps Programme, Various training programmes were conducted to create awareness on environmental issues and to implement NGC programme effectively. Major training programme were SATCOM Training to Eco club in-charge teachers, NGC-District Nodal officers Workshop, Training programmes to district programme assistants and 68 training programmes in all 34 educational districts for Eco-club incharge teachers. Details of Training Programmes conducted under NGC programme are given in **Annexure –13**

7) **NGC Team Visit to Eco Club Schools:** NGC team of EMPRI and Programme Assistants of respective districts visited total of 3696 schools in the year 2019-20. Details of the school visit are given in Annexure – 15.

8) **Major Eco-club Activities Conducted at Eco Clubs for the Year 2019-20:** District Programme Associates visited Eco-Club schools in their respective districts and collected information of eco-club activities carried out in the schools for the year 2019-20. Based on the inspection report by district programme assistants, district wise eco-club activities (depicted in percentage) conducted at Eco-Club schools is placed in **Annexure – 16**.

9) Photo Gallery - NGC Activities



World Environment Day celebration at Chowdiah Memorial Hall, Bengaluru



World Environment Day celebration in Government High School, Puttenahalli, Bengaluru



World Ozone Day Celebration



World Wetlands Day Celebration



Participation of employees in cleaning of office premises



Public awareness on Swachhta Pakwada campaign at public parks, market places, streets



Photos of world environment day programme at Bisleri International Pvt Ltd, Devanahalli



Photos of world environment day programme at The ITBP, Vijayanagara, Negalur Rural district



Cleaning of Kannamangala Lake by EMPRI staff, ITBP, Bisleri staff and school children



Plantation Drive at CRPF BDDS training School



Plantation drive at EMPR



Distribution of flyers on "Duties of waste generator" as newspaper inserts



Anti-litter campaign and plastic ban awareness training at Sacred Heart Girls High School, Bengaluru



Mysore Dasara Exhibition stall



Cleanliness drive at Cauvery River Front



“Swach aur swasth bharat keliye swach hawa” programme at EMPRI



Cleanliness drives at coastal beaches



Environment education events at coastal beaches



Certificate of Appreciation award to EMPRI at 1st Annual meet of State Nodal Agencies, Kevadia, Gujarat



Best Eco club National Award to Government High School, Gojanoor, Gadag District at 1st Annual meet of State Nodal Agencies, Kevadia, Gujarat



SATCOM training at DSERT, Bangalore



District nodal officers workshop

CHAPTER 3

HUMAN RESOURCES

3.1 Officers on Deputation from Government of Karnataka and Karnataka State Pollution Control Board

Sl.	Name	Designation	Date of joining	Date of leaving
1	Smt. Ritu Kakkar, IFS	Director General	02.01.2013	31-05-2019
2	Shri. Raj Kishor Singh, IFS	Director General	31-05-2019	--
3	Shri. Mahesh B. Shirur, IFS	APCCF & Director	22.11.2018	03-07-2019
4	Dr. K. H. Vinaya Kumar, IFS	CCF & Director (Research), concurrent charge	13.09.2011	--
5	Shri. Ramesha C.	Project Development Officer	31.08.2017	--
	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, 2020).

Sl. No.	Positions	Centre for Climate Change & DST	Centre for Lake Conservation / Water analysis Lab	Centre for Capacity Building	NGC	ENVIS	Total
1	Consultant	1	-	-	-	-	1
2	Research Scientist	3	2	-	-	-	5
3	Research Associates	4	3	-	-	-	7
4	Jr. Research Fellow	1	-	-	-	-	1
5	Project Assistant	2	-	-	-	-	2
6	Lab Chemist	-	1	-	-	-	1
7	Hydrologist	-	1	-	-	-	1
8	Training Head	-	-	1	-	-	1
9	Training Associates	-	-	2	-	-	2
10	Training Assistant	-	-	2	-	-	2
11	Programme Officer	-	-	-	1	1	2
12	Information Officer	-	-	-	-	1	1
13	I T Officer	-	-	-	-	1	1
14	Programme Coordinator	-	-	-	2	-	2
15	Programme Associate	-	-	-	4	-	4
16	Programme/Field/Project Assistant	-	2	-	33	-	35
17	Para Taxonomist	-	-	-	-	1	1
18	Lab Attender	-	2	-	-	-	2
	Total	11	11	5	40	4	71

3.2.2. Employees have been outsourced through manpower agency for the office management (as on 31st March, 2020).

Sl. No.	Positions	Administration	Accounts	Library	Total
1	Manager	1	1	-	2
2	System Administrator	1	-	-	1
3	Librarian	-	-	1	1
4	Office Assistant	1	-	-	1
5	Jr. Office Assistant	1	-	-	1
6	Computer Operator	1	-	-	1
9	Account Assistants	-	2	-	2
10	Jr. Account Assistant	-	1	-	1
11	Drivers	5	-	-	5
15	Dalayaths	3	-	-	3
16	Housekeeping	3	-	-	3
17	Security	4	-	-	4
	Total	20	4	1	25

3.2.3. Employees who have resigned from the service (2019-20)

Sl. No.	Positions	Climate Change Cell/DST	NGC	Centre for Lake Conservation/ Water Analysis Lab	Total
1	Jr. Research Fellow	1	-	-	1
2	Research Associate	2	-	2	4
3	Trainer	-	2	-	2
4	Programme Assistant	-	2	-	2
5	Field Assistant	-	-	1	1
6	Hydrologist	-	-	1	1
	Total	3	4	4	11

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 – 479, Shell Petrol Bunk,
Tumkur Road, Bangalore

Annexure - 1: Governing Body Committee Members

Sl No	Members	Designation
1	Additional Chief Secretary Forest, Ecology & Environment Dept. Government of Karnataka, Room No. 448, 4 th Floor, M.S. Building Bangalore	Chairperson
2	Principal Secretary Ecology & Environment Dept. Government of Karnataka Room No. 709, 7 th Floor, 4 th Gate, M.S. Building, Bangalore	Co-Chairman
3	Chairman, Karnataka State Pollution Control Board, Parisara Bhavan, 5 th Floor, Church Street, Bangalore	Member
4	Additional Chief Secretary Urban Development Dept. Government of Karnataka, Room No. 436, 4 th Floor Vikasa Soudha, Bangalore	Member
5	Commissioner for Industrial Development & Director of Industries & Commerce, Government of Karnataka, No. 49, 2 nd Floor, Khanija Bhavana, Bangalore	Member
6	Commissioner for Health & Family Welfare Services, Government of Karnataka, Ananda Rao Circle, Bangalore	Member
7	Secretary, Finance (Budget & Resource), Government of Karnataka, Room No. 250, 2 nd Floor, Vidhana Soudha, Bangalore	Member
8	Member Secretary Karnataka State Pollution Control Board, No. 49, 5 th Floor, Parisara Bhavan., Bangalore.	Member
9	Additional Director & Zonal Officer, South Zone Office, Central Pollution Control Board, Nisarga Bhavan, 7th D Cross, Shivanagar, Bangalore.	Member
10	Director General Environmental Management & Policy Research Institute Hasiru Bhavana, Doresanipalya Forest Campus, JP Nagar 5 th Phase, Bangalore.	Member Secretary

Annexure - 2: Executive Committee Members

Sl. No	Members	Designation
1.	Director General, Environmental Management and Policy Research Institute, Bangalore	Chairperson
2	Additional Principal Chief Conservator of Forests, Research and Utilization, Karnataka Forests Department, Bangaluru	Member
3	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	Director, Environmental Management and Policy Research Institute, Bangalore	Member Secretary

Annexure - 3: Research & Training Advisory Committee Members

Sl. No	Member	Designation
1	Director General, Environmental Management & Policy Research Institute, Bangalore	Chairperson
2	Member Secretary, Karnataka State Pollution Control Board, No. 49, 5 th Floor, Parisara Bhavan,, Bangalore	Member
3	Additional Principal Chief Conservator of Forests, Research and Utilization, Karnataka Forests Department, Bangalore	Member
4	Former Director General of Environmental Management & Policy Research Institute , Bangalore	Member
5	Special Director (Tech.), Ecology and Environment Department, Government of Karnataka, M.S. Building, Bangalore	Member
6	Professor of Law, National Law School of India University, Nagarbhavi, Bangalore	Member
7	Chairman, CISTUP, Indian Institute of Science, Bangalore.	Member
8	Director, Institute for Social & Economic Change, Bangalore	Member
9	Additional Director & Zonal Officer, Central Pollution Central Board(South), Bangalore	Member
10	Group Co-ordinator (Research), Institute of Wood Science and Technology, Bangalore	Member
11	Fellow (Centre of Environmental Studies), Southern Regional Centre (TERI), Bangalore	Member
12	Director, Environmental Management and Policy Research Institute, Bangalore	Convener

Annexure - 4: Selection Committee Members

Sl. No.	Members	Designation
1	Director General/Director Environmental Management & Policy Research Institute, Bangalore	Chairperson
2	Additional Principal Chief Conservator of Forests (Research & Utilisation)	Member
3	Director/Director (Research), Environmental Management & Policy Research Institute, Bangalore	Member
4	Special Director (Technical), Dept. of Ecology & Environment, GoK.	Member
5	Member Secretary, Karnataka State Pollution Control Board, Bangalore	Member
6	Member Secretary, Karnataka Biodiversity Board	Member
7	Project Development Officer, Environmental Management & Policy Research Institute, Bangalore	Member

Annexure-5: Internship Committee Members.

Sl. No.	Members	Designation
1	Director General, Environmental Management & Policy Research Institute, Bangalore	Chairperson
2	Director, Environmental Management and Policy Research Institute, Bangalore	Member
3	Director (Research), Environmental Management and Policy Research Institute, Bangalore	Member
4	Professor, National Law School of India University, Bangalore	Member

Annexure-6: Technical Advisory Panel Members

Sl. No.	Members	Designation
1	Director General Environmental Management & Policy Research Institute Bangalore	Chairperson
2	System Analyst, DPAR, (e-Governance), Bangalore	Member
3	Representative of IIT, Bangalore	Member
4	Representative, IIMB, Bangalore	Member
5	Director (Research), EMPRI, Bangalore	Convener

Annexure- 7: Trainings/Workshops Conducted During the Year 2019-20

Sl. No.	Date	Details of Training/Workshop	Target Participants	No.of Participants	Venue
01.	15-05-2019 to 16-05-2019	IFS Training / Workshop on “Eco-System Services: Valuation and Policy Issues”	IFS Officers from all over India	22	New Kumara Krupa Guest House, Sheshadripuram, Bengaluru
02.	04-06-2019	Workshop on Plastic Ban	Staff of EMPRI, Bisleri Staff, KSPCB Staff, Eco club School Children & Teacher and Public	200	Bisleri International Pvt Ltd, Devanahalli Bengaluru Rural District
03.	12-06-2019	Awareness through cleaning activity in Kannamangala Lake	Staff of Bisleri International Pvt Ltd, Devanahalli, Indo-Tibetan border force and Students of Higher Primary school of Kannamangala	150	Kannamangala Lake, Devanahalli taluk
04.	15-06-2019	Workshop on Plastic Ban	School Children, Teachers, Staff of EMPRI and Public	1000+	Government Model Higher Primary School & Government High School Mallasandra Village Bengaluru North Dist.
05.	05-07-2019	Workshop on Plastic Ban	Represented from NGO members of Karnataka plastic Association , BBMP officers and staff	1000+	Town hall, J.C road Bangalore
06.	20-07-2019	Workshop on Plastic Ban Notification - 2016	Members of Lions club of Bangalore west icons	75	Inspire India Meeting hall, Gandhi bazar Bangalore
07.	22-07-2019	Training program on Plastic ban notification 2016, Solid Waste Management notification 2016, Bio-Medical waste management -2016 and E – waste management	Enforcement Officers from Various dept.	74	V.S Acharya conference hall, Manipal, Udupi

Sl. No.	Date	Details of Training/Workshop	Target Participants	No.of Participants	Venue
08.	26-07-2019	Training program on Plastic ban notification 2016, Solid Waste Management notification 2016,	Enforcement Officers from Various departments	147	Taluk Office Meeting Hall , Ramnagar
09.	22-08-2019	Training program on Climate Change Plastic ban notification 2016, Solid Waste Management notification 2016 and Bio-Medical waste management -2016	Students of JSS College of Higher studies	111	JSS College of Higher studies, Mysore
10.	07-09-2019	Training program on Environmental Laws and Waste Management	Officers from HAL BIAL , BEL staff from Various industries	51	Prakruti Samsthe, Sadashiva nagar
11.	12-09-2019	Training program on Environmental Laws and Waste Management	Officers and Staff of DMA and Sugar Industry, Textile industry and Staff of Service Station	104	Agriculture University Conference Hall, Vijayapura
12.	21-09-2019	Training Program on Karnataka State Action Plan on Climate Change	Officers and Staff of line 47depts.	33	Kumara Krupa Guest House , Bangalore
13.	27-09-2019	Training Program, on Bio-Medical waste management Rules - 2016	Officers and Staff of Bangalore Centre Health care establishments	33	Prakruti Samsthe, Sadashiva nagar
14.	04-10-2019	Training program on Environmental Laws	SJP polytechnic civil department students	61	SJP Polytechnic, Bangalore
15.	11-10-2019	Training program on Plastic ban notification 2016,	Sacred Heart Girls School Students	300+	Sacred Heart Girls School
16.	12-10-2019	Training program on Plastic ban notification 2016, Solid Waste Management	Shantinikethan Residence welfare Association members	32	Shantinikethan Residence Welfare Association, Bangalore
17.	22-10-2019	Training Program on Climate Change	Officers from Various departments	35	Tejaswi Meeting hall , KSPCB
18.	25-10-2019	Training Program on	Staff from Industries	25	Prakruti Samsthe,

Sl. No.	Date	Details of Training/Workshop	Target Participants	No.of Participants	Venue
		Hazardous waste management rules - 2016			Sadashiva nagar
19.	30-10-2019	Training Program on Climate Change	Officers from Various departments	49	Tejaswi Meeting hall , KSPCB
20.	05-11- 2019	Training Program on Climate Change	Officers from Various departments	51	Tejaswi Meeting hall , KSPCB
21.	11-11-2019	Green Skill Development training program	Science graduates	20	Conference hall, Environmental Management & Policy Research Institute
22.	13-11-2019	Training Program on Plastic ban	Sri Sai Ram Engineering College Students	80	Sri Sai Ram Engineering College
23.	17-11-2019	Training Program on hazardous waste Management	Drivers	60	Prakruti Samsthe, Sadashiva nagar
24.	18-11-2019	Training Program on Solid Waste Management -2016	RV College Engineering students	56	RV College of Engineering
25.	22-11-2019	Training Program on Climate Change	Officers from Various departments	43	Tejaswi Meeting hall , KSPCB
26.	26-11-2019	Training g Program on Plastic Ban Notification -2016	Office bearers and members of Basavanagudi merchants forum and Students of Acharya patashala	150	Party hall, Sri sai jewel palace, DVG road, Basavanagudi , Bangalore
27.	29-11-2019	Training Program on Climate Change	Officers from Various departments	52	Tejaswi Meeting hall , KSPCB
28.	03-12-2019	Training Program on Climate Change	Officers from Various departments	34	Tejaswi Meeting hall , KSPCB
29.	13-12-2019	Training on Plastic ban notification 2016 and Solid Waste management Notification -2016	National Restaurant Authorities members	59	Indiranagar,Bangalore
30.	30-12-2019	Training on Bio-medical waste management	Medical and Para – Medical staff	30	Prakruti Samsthe, Sadashiva nagar
31.	30-12-2019	Training of Trainers on NGC program Activities	NGC Program assistants at district level	32	EMPRI
32.	04-01-2020	Construction and Demolition Waste Management	Industries, Builders, Resident welfare association members	30	Prakruti Samsthe, Sadashiva nagar
33.	22-01-2020	Training Program	Officers and Staff of	54	Shivamogga

Sl. No.	Date	Details of Training/Workshop	Target Participants	No.of Participants	Venue
		Waste Management Rules -2016	Urban Local Bodies of Shivamogga district		
34.	3-01-2020 to 29.01.2020	District / Taluk Level Training Program (DLTP& TLTP) “National Green corps, Swachatha Action Plan (SAP)- Creation of awareness on Solid waste Management & Plastic Ban , Afforestation in the context of Climate change”	Eco-club school teachers	68 Trainings X60 Participants in each Training =4080	34 Educational Districts
35.	25.02.2020 to 24.03.2020	Wastewater Treatment Plant Training Program	Unemployed Youths	19	EMPRI
Total		102 Trainings		8,352	

Annexure- 8: Awareness Programmes Conducted During 2019-20

Sl. No.	Date	Details of Awareness	Target Participants	No.of participants	Venue
01.	27-08-2019	Exhibition on Sustainable development goals Organized by: Planning and Statistics department	Department officers & Staff, NGO's and General Public	1000+	Freedom park ground , Bangalore
02.	12-09-2019 to 14-09-2019	Participated in Exhibition Organized by Bruhat Bengaluru Mahanagara Palike (BBMP) for creation of Awareness on ill effects of Plastic on environment & living beings	Various Govt officers and Staff, School Students, Vendors, General Public	5000+	Freedom park ground, Bangalore
03	14-03-2020 To 23-03-2020	Recorded message on Plastic ban was replayed	General Public		KSRTC Bus stands of all District Headquarters of Karnataka

Annexure- 9: Details of 3rd Party Audit Conducted During 2019-20

Sl.No.	Date	Details of Audit	Venue
01.	21-05-2019	Common Bio-Medical Treatment Plant Third Party Auditing	Medicare Environmental Management (P) Ltd, Plot No.39, K.I.A.D.B, Industrial Area, Dabaspet, Nelamangala TQ, Bengaluru - 562123
02.	31-07-2019	Common Bio-Medical Treatment Plant Third Party Auditing	Maridi Eco Industries Pvt Ltd. Plot No: 312-A2 & 312-A2 (Part), 2nd Phase, KIADB Harohalli Industrial Area, Harohalli Village & Hobli Kanakapura TQ, Ramnagar.

Annexure- 10. Workshop/ Seminars attended by Climate Change Researchers:

- The CCC team attended the **First Aid training program** conducted by St. John Ambulance India in Bangalore for 3 days during July 29-31, 2019.
- Dr Pavithra attended three day PG-workshop on “**Application of Geoinformatics**” organized by Karnataka Science and Technology Academy (KSTA), DST, GoK during December, 3rd-5th 2019 at Bangalore.
- Dr Pavithra participated in a 5 day workshop on “**Climate models**” organized by **Divecha Centre for Climate Change, IISc, Bangalore** sponsored by Department of Science and Technology during December, 16th-20th 2019.
- Ms Poorva attended training by **Bureau of Indian Standards (BIS) (Transition to IS/ISO/IEC 17025:2017) in Chennai during Jan 9 & 10, 2020..**
- Dr N.Hema attended Green build India International Conference, held at ITC Gardenia, Bangalore during 6-7 February, 2020.
- Dr K. H Vinaya kumar, Dr O.K. Remadevi, Dr M. Manjunath, Dr. N. Hema and Dr Pavithra participated in a four day **Capacity building workshop on vulnerability profiles for India: state and district level using a common framework**” organized by IIT, Mandi, IIT Guwahati and IISc Bangalore during February, 12th-15th 2020 at New Delhi.
- Dr B. Saritha Participated in 4 day training program on “**Laboratory Quality Management System and Internal Audit**” by National Institute of Training for Standardization (NITS), Bureau of Indian Standards (BIS) at The Citadel Hotel, Bangalore 17-20- Feb, 2020.
- Ms Nethravathy attended a 5 Day Training Program on "**Renewable Energy Integration with Architecture to Combat Climate Change**", from 24th to 28th February, 2020 at R V college of Architecture, Bengaluru.

Annexure- 11: Research Publications

1. Balasubramanian M, Manjunatha M, O K. Remadevi, K H Vinaya Kumar, Ritu Kakkar and R K Singh (2019) Climate Change and Impacts of Vulnerable Communities: A Case study of Karnataka, **ISEC Monograph** 63:ISBN 81-7791-161-9.
2. Hema N, Remadevi O.K, Chandrappa R, Vinayakumar K.H and Kakkar R. 2019. The socio-economic and environmental perspectives of metro rail commuters: A case study of Bengaluru city. **Indian Journal of Spatial Science**,10(2), 14-19.
3. Kumar C.T.A., Remadevi O.K., Aminu-Taiwo B.R. (2020) Pest Management in Tropical Forests. 227-254. In: Chakravarthy A. (eds) **Innovative Pest Management Approaches for the 21st Century**. Springer, Singapore Springer Nature 1st ed. 2020, XXI, 519 pp.
4. Ritu Kakkar, K.H. Vinaya Kumar, O.K. Remadevi, Balasubramanya Sharma, M. Manjunatha, B. Saritha, Kiranraddi M., H.S. Dattaraja and H.S. Suresh. Floral Diversity studies in the Permanent Preservation Plot of tropical deciduous forest region, Bannerghatta National Park, Southern India (submitted to **Journal of Tropical Ecology**).
5. Vinaya kumar, K.H., Ritu Kakkar, O.K. Remadevi, B. Saritha, M. Manjunatha, Balasubramanya Sharma, Kiranraddi M, and Poorvashree. A baseline study on the floristic diversity of Permanent Preservation Plots, established in Bannerghatta National Park, Karnataka (in press for book, **Building Climate Change Resilience**).
6. O.K. Remadevi K.H. Vinaya Kumar, Ritu Kakkar 2020. Butterfly monitoring programme for Karnataka (in press for the book, **Building Climate Change Resilience**)
7. O.K. Remadevi, K.H. Vinaya Kumar, Ritu Kakkar and R.K. Singh (Eds.) 2020 **Building Climate Change Resilience** (in press).
8. O.K. Remadevi, K.H. Vinaya Kumar, Ritu Kakkar and R.K. Singh (Eds.) 2020. **Karnataka Butterflies – A field Guide** (in press).

Annexure: 12, Activities conducted by EMPRI under Swachhta Action Plan (SAP) During the year 2019-20.

Sl. No	Date	Details of Activities	Target Participants	No. of participants	Location	Summary
1	01/06/2019	Cleaning of office premises	EMPRI Staff	50+	EMPRI, Bengaluru	Cleaning of office premises of EMPRI and Doresanipalya forest campus was carried out. Waste materials Collected including old papers and waste plastic materials were segregated and handed over to Bruhat Bengaluru Mahanagara Palike (BBMP) for the disposal
2	03/06/2019	Cleaning/ Public awareness of public parks, market places, street	EMPRI Staff & public	200+	Vidhan Soudha, Vikasa Sauda, High Court and Public parks such as Cubbon Park and Lalbagh of Bengaluru city	NGC team visited prominent places of Bengaluru & encouraged people take up cleanliness drive and promoted cleanliness through people's participation.
3	04/06/2019	Awareness on Air Pollution	School children, teachers, public & employees of KSPCB, Bisleri, & ITBP	200+	Bisleri International Pvt. Ltd, Bengaluru and	EMPRI staff delivered talks on the effects of air pollution and steps to be taken to prevent air pollution. Interactive session on plastic pollution and its adverse effect on environment was also organized. Handouts on air pollution and Plastic pollution were distributed. Plantation drive was organized as part of the programme.
4	04/06/2019	Awareness on Air Pollution at ITBP	Staff of ITBP	50+	Indo Tibetan Border Police office(ITBP), Devanahalli,	NGC team delivered presentation on effects of air pollution on environment to staff of ITBP staff.

Sl. No	Date	Details of Activities	Target Participants	No. of participants	Location	Summary
5	12/06/2019,	Cleaning of Kannamangala Lake	School children, teachers, public & employees of different organisations	100+	Kannamangala village, Devanahalli Taluk	Conducted Cleaning of lake and Collected waste materials. Waste materials were segregated and handed over to local authority for the disposal. EMPRI staff delivered talk on importance of reviving the dying lakes of Bengaluru to school children
6	15/06/2019	Cultural programmes, painting, essay writing competitions on `Swachh Bharat and Swachhta Rallies for awareness on Open Defecation Free communities :	school children, teachers public & EMPRI staff,	1000+	Government High School, Mallasandra, Bengaluru	Organised dance, group songs, skits and drama which aimed at promoting Swachh Bharat Abhiyaan and environmental protection. Drawing and essay writing competitions on theme “Swachh Bharat” were conducted. EMPRI staff delivered talks on current environmental issues. Prizes were distributed to the competition winners. Swachhta Rallies on ODF awareness were organised.
7	July 2019	Plastic ban implementation survey	Retail & wholesale traders, shops, street vendors & Public	1000+	8 zones of BBMP in Bengaluru city	Sample survey conducted by visiting Market, Mall, Street Vendors, Hospital, Temples etc to check Implementation status of plastic ban notification -2016

Sl. No	Date	Details of Activities	Target Participants	No. of participants	Location	Summary
8	26/07/2019 27/07/2019	Plantation Drive	Staff of DBTS, CRPF &	200+	Dog Breeding and Training School (DBTS) of the Central Reserve Police Force (CRPF)	Organized plantation drive and distributed 100 Red Sanders saplings to CRPF jawans. .
9	29/07/2019	Plantation Drive at EMPRI	Staff of EMPRI	75+	EMPRI, Doresanipalya campus	Rare species of plants were planted at EMPRI campus by staff members EMPRI.
10	1/08/2019 to 31/08/2019	Dust to dust bin campaign or household & public	Public and households	1000+	Households, public place	Flyers on “Duties of waste generator” from solid waste management rules-2016, Government of India were printed. Flyers were distributed among general public in public places by EMPRI staff. Flyers were also distributed to households as newspaper inserts in residential areas.
11	27/08/2019	Dust to dust bin campaign for public	Public, school children, government officers	1000+	“Sustainable development goal” exhibition at Freedom Park, Bengaluru	EMPRI team set up exhibition stall. Posters on different environmental issues were on display. Brochures, handouts along with flyers of dust to dust bin were distributed to public.

Sl. No	Date	Details of Activities	Target Participants	No. of participants	Location	Summary
12	31/08/2019	Swachatha Hi Seva programme for public	General Public	200+	Decathlon Eva mall, Brigade road, Bengaluru	Participated in marathon to raise awareness. Distributed flyers on “Duties of waste generator” to general public and morning walkers at Halasur Lake road and Brigade road to promote cleanliness drive. Workshop on eco-friendly Ganesha idols was organized.
13	12/09/2019 to 14/09/2019	Swachatha Hi Seva programme at exhibition	Various Government Officers, School Students, Vendor and General Public	10000+	“Plastic ban & alternative to plastic” event organized by BBMP, Bengaluru	Banned plastic items, alternative to plastics and exempted plastic items were showcased in the exhibition. Various hand-outs on waste management rules, banned and alternative plastic items, books on air pollution, “Save lakes” children books were Distributed. Documentary films on climate change, plastic ban, sustainability and other environmental issues were shown to the participants
14	29/09/2019 to 27/12/2019	Mysore Dasara Exhibition:	School children, College students and General public	6000+	Mysore Dasara Exhibition ground	EMPRI setup exhibition stall and was open to public for three months and showcased photographs from eco club activities of NGC schools and waste management posters, dry waste, wet waste, E-waste, hazardous waste dustbins, E-waste dust bin with E waste materials to create awareness on E- waste. Banned plastic items and its alternatives were also displayed. Animal dolls and animal costumes were kept. Handouts/flyers on environmental messages were distributed to visitors.

Sl. No	Date	Details of Activities	Target Participants	No. of participants	Location	Summary
15	11/10/2019	Anti-litter campaign and Plastic ban awareness training	School students, teachers, association members.	300+	Sacred Heart Girls High School, Residency Road, Bengaluru.	Conducted Anti-litter campaign and plastic ban awareness training to school children. Distributed hand-outs on banned plastic and its alternatives.
16	26/10/2019	Cleaning of Cauvery River Front.	School children, college students, NGOs and government officers and public	1000+	Cauvery River Front at Rajasopanakatte, Sriranganatha Temple, Srirangapattana, Mandya	Conducted cleanliness drive. Organised plantation drive, road Jatha and street plays. Collected nearly 600 Kilogram of waste which were segregated and handed over to Srirangapattana City Municipal Council, Government of Karnataka (GoK).
17	22-02-2020	Swachh Aur Swasth Bharat Keliye Swachh Hawa	Children & EMPRI staff	200+	EMPRI, Doresanipalya	Children were taken to forests of Doresanipalya campus and information about different tree species was given to them. Children visited the plant nursery. Documentary movies on environment were shown. Drawing and painting competitions were held and prizes given.

Annexure: 13 - Training Programmes Under NGC

Sl. No	Date	Details of activities	Target participants	No of participants	Location	Summary
1	21/08/ 2019	SATCOM (Satellite communication) teleconference	Eco-club In-Charge teachers	3353	DSERT (Department of State Educational Research & Training).	NGC team conducted orientation of NGC programmes and activities to teachers. Professor Mr. Nagesh Hegde, renowned Environmental Journalist discussed various measures and guided the teachers about eco club activities to be carried out at school level to save environment.
2	1/10/ 2019	NGC-District Nodal officers Workshop	NGC-District Nodal officers	36+	KumaraKrupa guest house, Bengaluru	Briefed about objectives of NGC and innovative ideas which can be implemented at schools. Discussed the plan of action for the year 2019-20. Interactive session and discussions were held to implement NGC programme effectively.
3	30/12/2019	Training programmes to District Programme Assistants	District Programme Assistants	32+	EMPRI	EMPRI team delivered presentation on NGC programme and activities to be implemented at school level. Resource personnel from Azim Premji foundation delivered talk on initiatives of Azim Premji foundation in creating environmental awareness.
4	3/01/2020 to 29/01/2020	District / Taluk Level Training Program (DLTP& TLTP) NGC, Swachatha Action Plan (SAP)	Eco-Club in-Charge Teachers	3805	34 Educational Districts	Presentations were given at District and Taluk Level trainings on 1)NGC Activities – by EMPRI staff members. 2)Training on Swachta Action plan – Awareness on Solid Waste Management & Plastic Ban – by Local KSPCB officers/ Experts at district level identified by KSPCB. Officers from Forest Department explained about Afforestation in the Context of Climate Change.

Annexure- 14 : Meetings Held Under NGC Programme

Sl.No	Date	Details of activities	Participants	Location	Summary
1	19/08/2019	State Steering Committee (SSC) meeting	Members of SSC	Room no 252, MS building, Bengaluru	In the meeting, Proceedings and action taken report of previous SSC meeting were noted and confirmed. Committee reviewed the progress, approved action plan and budget of NGC programme for the year 2019-20.
2	20/12/2019 to 21/12/2019	First Annual meet of State Nodal Agencies	State Nodal Agencies	Kevadia, Gujarat	Dr K H Vinay Kumar, Director EMPRI, Mr. Ramesha C, Nodal Officer, NGC, Mrs. Sathyashree, Programme Officer, NGC attended the meet. EMPRI received outstanding SNA award for its contribution to successfully implementing NGC programme in Karnataka state. Eco-Club In-Charge teacher, along with two students from Government High School Gojanoor received National Award and showcased their major eco club activities through presentation. EMPRI set up stall in the event and displayed major NGC activities of Karnataka state.
3	17/02 2020	Global Learning and Observations to Benefit the Environment (GLOBE) Program	State Nodal Agencies	Bhopal, Madhya Pradesh	Dr. K. H. Vinay Kumar, Director and NGC Programme Coordinator, Mr Nagendra Prasad attended the program. EMPRI will implement GLOBE program in Karnataka state.
District Implementation & Monitoring Committee (DIMC) Meeting					
4	16/12/2019	DIMC Meeting	DIMC members	District Commissioner Office, Ramanagara	Discussed about effective implementation of NGC activities
5	31/12/2019	DIMC Meeting	DIMC members	District Commissioner Office, Gadag	Discussed about effective implementation of NGC activities
8	05/02/2020	DIMC Meeting	DIMC members	District Commissioner Office, Davanagere	Discussed about effective implementation of NGC activities
9	07/02/2020	DIMC Meeting	DIMC members	District Commissioner Office, Kodagu	Discussed about effective implementation of NGC activities
10	19/02/2020	DIMC Meeting	DIMC members	District Commissioner Office, Shivamogga	Discussed about effective implementation of NGC activities
11	24/02/2020	DIMC Meeting	DIMC members	District Commissioner Office, Udupi	Discussed about effective implementation of NGC activities
12	29/02/2020	DIMC Meeting	DIMC members	District Commissioner Office, Chamarajanagar	Discussed about effective implementation of NGC activities

Annexure – 15 : NGC Team’s Visit to Schools

Sl No.	District Name	No of Schools Visited
1	Bagalkot	87
2	Bengaluru North	148
3	Bengaluru Rural	67
4	Bengaluru South	87
5	Belgaum	99
6	Bellary	181
7	Bidar	121
8	Bijapur	120
9	Chikkaballapura	135
10	Chamarajanagara	138
11	Chikkodi	151
12	Chikamagaluru	143
13	Chitradurga	204
14	Dakshina Kannada	15
15	Davangere	102
16	Dharwad	66
17	Gadag	82

Sl No.	District Name	No of Schools Visited
18	Gulbarga	102
19	Hassan	110
20	Haveri	72
21	Kodagu	142
22	Kolar	111
23	Koppal	115
24	Madhugiri	84
25	Mandya	108
26	Mysore	-
27	Raichur	52
28	Ramanagara	145
29	Shimoga	98
30	Sirsi	120
31	Tumkur	118
32	Udupi	106
33	Uttara Kannada	107
34	Yadgir	160
Total		3696

Annexure -16: Major Eco-Club Activities Conducted at Eco Clubs for the Year 2019-20:

District Name	Plantation Drive (%)	Environmental Days Celebration (%)	Competitions (%)	Jatha (%)	Rain water Harvest (%)	Organic composting (%)	Waste Segregation (%)	Eco-tour (%)	Green Diwali (%)
Bangalore Division									
Bangalore South	100	100	100	100	20	10	30	50	10
Bangalore Rural	90	95	90	100	50	50	60	35	85
Bangalore North	95	95	100	95	45	10	35	40	10
Chitradurga	95	90	95	40	50	35	50	30	10
Davanagere	95	90	90	50	40	50	30	35	40
Kolar	100	100	95	95	85	25	25	15	15
Shimoga	100	98	95	80	10	25	50	60	10
Tumkur	98	97	99	100	45	60	90	85	50
Madhugiri	95	95	90	80	40	40	50	15	20
Ramanagara	100	100	100	100	5	60	30	85	5
Chikkaballapura	100	100	95	60	30	70	90	30	40
Mysore Division									
Chamarajanagara	95	100	100	95	0	10	10	100	7
Chikkamagalore	100	95	85	80	80	35	40	10	15
Hassan	95	100	95	50	20	80	50	30	5
Kodagu	100	99	97	90	60	99	98	99	100
Mandya	98	100	95	80	10	80	50	30	20
Udupi	98	100	95	80	10	80	50	30	20
Gulbarga Division									
Ballari	98	100	85	95	5	35	45	25	20

District Name	Plantation Drive (%)	Environmental Days Celebration (%)	Competitions (%)	Jatha (%)	Rain water Harvest (%)	Organic composting (%)	Waste Segregation (%)	Eco-tour (%)	Green Diwali (%)
Bidar	85	80	90	85	10	5	50	20	20
Gulbarga	80	95	100	95	25	5	60	35	20
Koppal	95	100	100	100	40	40	60	30	20
Raichur	95	100	95	80	40	10	50	10	15
Yadgiri	85	95	100	100	15	10	50	30	10
Belagavi Division									
Bagalkote	80	100	75	90	15	40	70	60	5
Belagavi	95	100	90	40	50	80	90	40	80
Chikkodi	80	100	100	100	10	35	60	50	10
Bijapura	95	90	95	80	25	30	50	15	25
Dharwad	100	100	95	100	20	40	60	60	20
Haveri	80	95	100	95	25	5	60	35	20
Gadag	95	100	100	90	30	30	50	10	10
Uttarakannada	95	100	90	50	5	10	90	70	10
Sirsi	100	100	100	70	30	15	75	90	5