GSDP 2018 @ IISc & EMPRI – Proceedings

सत्यमेव जयते

GREEN SKILL DEVELOPMENT PROGRAMME (GSDP)

VALUATION OF ECOSYSTEM SERVICES & GREEN GDP

GOVERNMENT OF INDIA

MINISTRY OF ENVIRONMENT, FOREST AND CLIMATE CHANGE (MoEF&CC), NEW DELHI

INDIAN INSTITUTE OF SCIENCE

EMPRI Environmental Management & Policy Research Institute

PROCEEDINGS OF THE Green Skill Development Programme

VALUATION OF ECOSYSTEM GOODS AND SERVICES AND GREEN GDP

Organised by: ENVIS Centre – Western Ghats Biodiversity and Ecology, CES, Indian Institute of Science & ENVIS Centre, EMPRI, Bangalore.

VENUE: CCE LECTURE HALL, BEHIND IISC Main Library,
IISc CAMPUS, BANGALORE 560012

DATE: 5th AUGUST 2018 – 19th AUGUST 2018


Government of India
ENVIS
SAHYADRI : ENVIS @ CES
Indian Institute of Science
GREEN SKILL DEVELOPMENT
PROGRAMME (GSDP) - ENVIS
Venue: CCE Lecture Hall
Date: 5th to 19th August 2018
Jointly Organised by :
ENVironmental Information System [ENVIS] Sahyadri:
Western Ghats Biodiversity Information System
Centre for Ecological Sciences, Indian Institute of Science, Bangalore 560 012
&
ENVIS Centre: Karnataka State of Environment and Related Issues Environmental
Management & Policy Research Institute
Department of Forest, Ecology & Environment,
Government of Karnataka, Bangalore 560 078
EMPRI

PROGRAMME DETAILS

Date & Time	9-10.30 am	10.30-11.00 am, TEA	11-1.00 pm	1-2.00 pm LUNCH	2-4.00 pm	4-4.30 pm TEA	4.30-6.00 pm
5th Aug 2018	Registration (8 30 AM) & Inauguration		Valuation of Ecosystem through Grid based monitoring-TVR		Introduction to Spatial Analysis-TVR		Maps, Projections & GPS-TVR&VS
6th Aug 2018	Remote sensing & GIS Essentials-TVR		Remote sensing & GIS Essentials-TVR		QGIS theory and Interactive session-BS		Hands on QGIS-BS&VS
7th Aug 2018	Remote sensing & GIS Essentials-TVR		Open source GIS-BS&VS		Hands on GRASS-BS&VS		Hands on GRASS-BS&VS
8th Aug 2018	Hands on GRASS-BS&VS		Hands on GRASS-BS&VS		Hands on GRASS-BS&VS		Test
9th Aug 2018	Plant Taxonomy-AR		Conservation and Forest Management-Manoj Kumar		Sampling techniques-AR		Field sampling-AR
10th Aug 2018	Wetland monitoring-Macrophytes-SB		Concept and Design of Herbarium-SR / Pollination Services, PavitraNayak, EMPRI		Hands-on Macrophytes identification		Field sampling-AR
11th Aug 2018	Grass & Herbs identification-GR		Grass & Herbs identification-GR		Field Sampling		Interactive learning
12th Aug 2018	Identification & Taxonomy-GR		Identification & Taxonomy-GR		Field Sampling & Interactive learning		Field Sampling & Interactive learning
13th Aug 2018	Permanent plot monitoring @ BNP		Permanent plot monitoring @ BNP		Interactive session @ EMPRI		Interactive session @ EMPRI
14th Aug 2018	Wetland monitoring-SV&AK		Wetland monitoring-Algae, Zooplankton,		Hands-on hysic-chemical parameters		Hands-on Algae, Fish identification

			Fish- SV&AK				
15th Aug 2018	Bird diversity & Sampling-VM		Butterfly diversity & Sampling-CS		Field survey & Identification		Field survey & Identification
16th Aug 2018	Coastal Ecosystem monitoring-PNM&DH		Coastal Macro Algae Taxonomy		Macro Algae Sampling and Value added products-DH&SG		Macro Algae Sampling DH&SG
17th Aug 2018	Valuation of Coastal Ecosystem-Mangroves-PNM		Valuation of Coastal Ecosystem-Mangroves, Fish, Crab, Salt etc		Valuation of Coastal Ecosystem-Livelihood		Valuation of Coastal—Contd.
18th Aug 2018	Valuation of Ecosystem Goods and Services-TVR & team		Valuation of Ecosystem Goods and Services-TVR & team		Valuation of Ecosystem Goods and Services-TVR & team		Valuation of Ecosystem Goods and Services-TVR & team
19th Aug 2018	Expert Lecture		Expert Lecture		**Test**		**Concluding Session**
TVR-TV Ramachandra; BS-BharathSetturu; VS-Vinay S;AR-Aditya Rao; PNM-Prakash N Mesta; SV-Sincy V; AK-Asulabha K; SB-Sudarshan P Bhat; VM-Vrijulal M; CS-ChaturvedShet; GR-GR Rao; DH-DeepthiHebbale; SG-Sharanya G; SR-Shankara Rao							

Please note:

1. Accommodation of Outstation Participants: CENTENARY VISITORS HOUSE near Ramaiah Hospital, IISc, Bangalore (Phone: 080 22933500/ 22932100)
2. **Mobile phone (even silent/vibration mode) not allowed inside the class room**
3. Smoking is not allowed inside and closer to the classroom
4. Working Lunch and tea (morning and evening) would be arranged at NESARA Open-Air Restaurant during the programme
5. Accommodation (Breakfast and Dinner) at Centenary Guest House (Phone: 080-22933500/22932100).
6. Contact T V Ramachandra 080-22933099/2293 3503; Bharath Setturu 9483832144; Vinay S 9916488990; EMPRI

GSDP PROGRAMME ON: VALUATIONS OF ECOSYSTEM GOODS AND SERVICES AND GREEN GDP, 5-19 August 2018, organized jointly by ENVIS Centres at IISc and EMPRI, Bangalore

- Tirtha Mohapatra, Participant GSDP- Valuation of Ecosystem Goods and Services

Sl.No	Over all subjects covered vs. Session wise detail descriptions	Date and Time	Lessons Learnt
DAY 1	1) Inauguration 2) Valuation of Ecosystem through Grid based monitoring 3) Introduction to Spatial Analysis 4) Maps, Projections & GPS	**5th August 2018**	Inauguration of the Session: In presence of Dr. Vinaya Kumar, Director EMPRI Self Introduction by the Students Introduction by Dr. TVRamachandra , Conenor, ENVIS Centre at IISc Dr. T.V Ramanchandra has highlighted on Prudent Environmental Management for Sustenance of Natural Resources Objectives: If we make valuation of the ecosystem, then degradation will not happen. **Key Points: Ecosystem and Food Chain** In a true ecosystem there will be no waste, however in a human ecosystem there is waste In every ecosystem there is transfer of energy and material loss of energy from producer to consumers to decomposers through respiration **Ecological Disaster:**
SESSION WISE DETAIL DESCRIPTIONS			
	1. Session-Pre-Lunch a) Inauguration b) Ecosystem and Food Chain c) Ecological Disaster d) Sustainability, Global Warming and Climate Change e) Power and essence of remote sensing 2. Session Post-Lunch a) Monoculture and its effect b) Siltation and its effect c) Importance of flow of data 3. Session Post Lunch and Post Tea a) Endemic species b) Why grid based monitoring?		

			→ When things happen beyond the carrying capacity then ecological disaster result. When resources are plenty, people misuses the resources and when resources are less, then people struggle to use the resources → System which is diverse is stable → We need to focus on less water consuming crops → This is time for decision makers to take a call on the conservation and preservation of natural resources → Unethical things happen when we don't give justice to our job (don't understand nature, going against the nature, obstruct nature's flow artificially) → Food and water scarcity put wild animals to move from their habitations towards human settle ments, so the man-elephant conflict → Our incentizing system in various social development schemes stops doing job by people → Government should not give anything free to farmers, rather government must develop and create farmer friendly environment, show successful model. The free model make our system more inefficient → For short-term vote miracle politicians throw free concept to society, so the moral is we people must be sensible decision maker → At present we require one person to seven tree but we have now one tree to seven person, it is scientifically proved → Nature's principle is equilibrium e.g energy and material transitions (optimizations), remediation (if within carrying capacity) and sustainability (absence of over exploitation) → There are three systems in nature e.g hydrological, bio-geochemical and nutrient

			→ Our biological integrity depends on our physical and chemical integrity → Inefficient knowledge about a system create problems → Our urban water scarcity is because of over concretization and limiting ground water recharge problem → Earning is not the only criteria now to concentrate and the alternative is balancing approach for conservation of our environment and biodiversity → The changes in the system over a period of time is key to analyze and forecast the future of the landscape → We need to monitor ecosystem to know the species diversity and their economic value Post Lunch Session → Monoculture always stop diverse pollination and lead to food scarcity; the leaves fall in monoculture have the degradation pattern same and slow, so rain water don't go inside soil and run away. This stop the water recharge capacity → Due to loss of vegetation, soil become more porous and lead to siltation and siltation stop electricity generation from water → If we have data on a system, then we have knowledge on the diversity, if we have the diversities then we know about significance and if we have significance then we know the importance of the ecosystem → Urban flood, urban water pollution are indicators of mis-management of landscape. The interconnectivity of the wetlands are lost so the urban area falls under sever flood.

			→ Water when stagnant (not moving) then remediation will stop → Inter-linking of rivers to avail water in water scarce area is mere indicator of the our inability to understand the linkages of hydrology with landscape dynamics, ecology, biodiversity management. It will affect the species living for 12 months and will lead to a threatened life in the water efficient areas. So need to develop a symbiotic relations with forest and must not cut trees. River linking is nothing but a free passage to timber looting. This will lead to water scarcity throughout the region (earlier surplus region and scarce regions), invasion of species leading to food insecurity. → In monsoon water from surface enter into sea and many decision makers want those water to get diverted is a mere indicator of poor knowledge on environment. So by doing so we are inviting the saline water to flow towards landscape through mouth of river affecting people's livelihood (this was highlighted with case studies from Western Ghats). → So we need to respect land, energy, water, forest and agriculture to make ecosystem sustainable. These are the basic indicators of local resources and scope for livelihoods and creation of jobs across the line → Population growth is not our threat in reality but over exploitation and poor resource management are responsible which can only resume anomalies in the system **Post-lunch and post-tea session:** → Species which is particularly available in an area and not anywhere else → The classification of district is based on thee agro-climatic zones

			→ ***The agro-climatic zone is considered as unit of measurement at the rate of 9kms to 9kms size which is called "GRID". So we need to do the stratified sampling procedure to take the sample to identify species and document them all. So if we want to get value of our ecosystem then we have to capture the species diversities and quantify the biomass from respective ecosystems*** → ***Valuation of ecosystem is done when we feel there is a loss to the system.*** → Total Ecosystem Valuation = Direct Use + Indirect use + Optional value + Existence Value → Use Value = Direct Use+ Indirect use value+ Future Value → If we pollute our natural ecosystem it finally come to us as food to our dinning → The value of a person can be assessed from rate of her/his success plus quality contribution to the society.
SUMMARY OF THE SESSION AND DAY- ORALLY BY SPECIFIC PARTICIPANTS AS ASKED FOR DISCUSSION AND BY WRITING WAS SUBMITTED BY EVERY PARTICIPANTS			
DAY 2	1) Remote sensing & GIS Essentials 2) Remote sensing & GIS Essentials- 3) QGIS theory and Interactive session 4) Hands on QGIS	**6th August 2018**	**Pre-Lunch Session:** **Grid based Monitoring** : The goal is to measure and publish the state of resources at a particular point in time and in a particular location. Spatial Analysis: Concept → Spatial data- The data having geo-referral e.g longitude, latitude and altitude Example: Maps, Images, postal code, socio-economic data etc → Scale= it is one unit in the map (160 may be mt, cm, km etc) → Classify the heterogeneity in the spatial data and classify them (image) → If we want to draw the pathway or route map we need
SESSION WISE DETAIL DESCRIPTIONS			
	1. Session-Pre-Lunch a) Grid based monitoring b) Fundamentals of the Scale, Image, Contour, layer, thematic map 2. Session Post-Lunch a) Advantages of GIS over other data b) QGIS and Concept 3. Session Post Lunch and Post Tea a) MAPS & Projection		

			to draw the Polygon, Line or points → Contour- It gives the elevation profile of a space → To understand the landscape we need to add layers and finally we need to draw the thematic map → Geospatial technology consists of Remote Sensing, GIS and GPS → Data are available in different form and types: a) IKNOS (1 mt data) b) Landsat (15mt-120mt) c) MODIS (250 mts to 1 km) d) Data from Survey of India e) Data from Remote Sensing f) Data from pre-calibrated GPS g) Google earth Data **Post-Lunch Session**: → In excel we can store data only however in GIS one can store both spatial and attribute information → While modeling data we need Raster Data or Vector Data → Size of a image= number of rows X no of columns X gray level → Data Model: → Creating data base need separate layering and separate digitalization of the data → We need layers before modeling because we need plan, we need data to promote sustainable development → Sustainable planning tools: GIS, remote sensing and GPS → GIS = Software + hardware + Geographic Information which lead to Location in the Space **Post-Lunch and Post Tea:** → We studied about the earth dynamics e.g surface of

			earth (geoid, elliptical), Semi-Major Axis, semi-minor axis. → The semi-major axis is greater than semi-minor axis so earth is ellipsoid type → Longitude= pole to pole distance (Run North to south) → Latitude= Run East to West → Map based on scale (Cadastral- Large Scale, Topographic- Medium scale and Geographic-Small Scale) → Projection = when we convert 3D to 2D it is called projections and projections also face have many anomalies in distance, shape, area and directions → Every grid on earth surface = a) Along East and West = 6 degree b) Along North and south = 8 degrees → I degree= 60 minutes and 1 minute=60 seconds
SUMMARY OF THE SESSION AND DAY- ORALLY BY SPECIFIC PARTICIPANTS AS ASKED FOR DISCUSSION AND BY WRITING WAS SUBMITTED BY EVERY PARTICIPANTS			
DAY 3	1) Remote sensing & GIS Essentials 2) Open source GIS 3) Hands on GRASS 4) Hands on GRASS 4. Session-Pre-Lunch 5. Session Post-Lunch 6. Session Post Lunch and Post Tea	**7th August 2018**	**GIS= Geographic Information System** → GIS has capacity to store, retrieve, analyze, model and map data of a large area → GIS can be used in land use planning, utilities mgt, ecosystem modeling, landscape assessment, transportation, market analysis, visual impact analysis, tax assessment etc → Geographic data = Observations + Attributes → Geo-spatial data = Spatial + Thematic data (statistical aspects +Locational Aspects) → DATA for GIS application includes: → A) Digitised and scanned data → Databases → GPS Field sampling → Remote sensing data

			→ Aerial photography based data **Storing of Spatial Data:** → For that purpose we need vector and raster data → In vector based data, the basic unit of spatial information are a) Points b) Lines c) Polygons → The coordinate points are nothing but locations on earth's surface relative to other locations → Points = Zero dimensions, represented by single X,Y coordinates (Example= location of a tree) → Lines = A set of ordered coordinates that represents shape of geographical features → Arcs= Otherwise called INFO, synonymous with line → Polygon = use to represent an area → Have attributes **Entity Relation Model**= Database is an element in a vector based GIS The DBMS has three components : entities, attributes and relations and these three are otherwise called Entity-relation Model **Raster Representation of data in GIS:** → This is the second method to store, process and display the spatial data. → Each area is divided into rows and column → Rows and columns form grids → Each grid must be rectangular and not necessarily square → Spatial location of each cell is implicitly contained and ordering of the pixels → It is an abstraction of the real world

			GRID Size: → Pixel describes the unit in an image → In raster pixel equivalent is called the grid cells → The smallest unit of information available in an image is pixel/cell **Raster Data Structure:** → Here every pixel is given a single value → If or when there are many values are encountered, there is no compression → Each component of raster stores a value → We count a cell with that value → The longer and more frequent the consecutive values are the greater the compression
SUMMARY OF THE SESSION AND DAY- ORALLY BY SPECIFIC PARTICIPANTS AS ASKED FOR DISCUSSION AND BY WRITING WAS SUBMITTED BY EVERY PARTICIPANTS			
DAY 4	1) Hands on GRASS 2) Hands on GRASS 3) Hands on GRASS		Pre-lunch Session: Steps in drawing thematic maps (with map direction, scale, legend and lebel) on various flora and fauna as given below with a district Map and prepare a district report at the end. How to put the flora and fauna data (secondary sources) into the district map with grid? The target was to 1. Population 2. Demography 3. Livestock 4. Lithology 5. Culture 6. Geoclimate 7. Topography 8. Ethology 9. Algae
SESSION WISE DETAIL DESCRIPTIONS			
	1. Session-Pre-Lunch a) Hands on experiences on QGIS b) Digitalization (Points/Line Maps/Polygons) c) Layering d) Learning Thematic mapping 2. Session Post-Lunch a) Hands on practices 3. Session Post Lunch and Post Tea a) Hands on practices	**8th August 2018**	

			10. Fishes 11. Birds 12. Butterflies 13. Reptiles 14. Mammals
TEST (8TH AUGUST 2018) 4.30 TO 6.00 PM			
SUMMARY OF THE SESSION AND DAY- ORALLY BY SPECIFIC PARTICIPANTS AS ASKED FOR DISCUSSION AND BY WRITING WAS SUBMITTED BY EVERY PARTICIPANTS			
DAY 5	1) Plant Taxonomy 2) Conservation and Forest Management 3) Sampling techniques **4) Field sampling** 1. Session-Pre-Lunch a) Plant Taxonomy 2. Session Post-Lunch a) Sampling Technique 3. Session Post Lunch and Post Tea a) Field visit and sampling	**9th August 2018**	**Pre-Lunch Session:** This session covered angiosperms (Seeds/flowering plant). The Angiosperms are divided into monocotyledons and di-cotyledons (seeds open up into two cotyledons e.g black gram) The classification of plants are as follows: Group→Division→Class→Order→Family→Species Classifications are based on anatomical parts, evolutionary relationships, APG Systems During classification of species most of the scientific names are found in latin words because latin language are dead language and it never change whereas English is a living language. We further studied how the plant classification is done based on various aspects like- → Phyllotaxy – Arrangements of Leaves → Position of the mid-rib of the leaf In addition to this we have discussed about morphology of plants e.g Leaf (leaf shape, leaf margin,), stem and flowers (position of flowers, position of androecium and gynoecium) In order to describe the plants we discussed about a plant through it's habit, habitat, root, stem, leafs, inflorescence,

			floral descriptions (calax, corolla, androecium and gynoecium), inflorescence, seeds and fruit types, floral diagram Methods of Sampling Plants: We learn about the transect method (line and belt), Bisect Method, Tri-sect method, Ring count method, Quadrant method, clip quadrant method, Carbon sequestration. Finally the entire class got involved in sampling of various plants in quadrant method in IISc Campus.
SUMMARY OF THE SESSION AND DAY- ORALLY BY SPECIFIC PARTICIPANTS AS ASKED FOR DISCUSSION AND BY WRITING WAS SUBMITTED BY EVERY PARTICIPANTS			
DAY 6	1. Wetland monitoring Macrophytes 2. Concept and Design of Herbarium and Pollination Services 3. Hands-on Macrophytes identification **4. Field sampling** 1. Session-Pre-Lunch a) Wetland b) Functions of wetland c) Treatment d) Bioremediation e) Major causes of wetland lossess f) Physical, chemical and biological characteristics g) Bio-monitoring the wetland 2. Session Post-Lunch a) Concept and Design of Herbarium and Pollination Services 3. Session Post Lunch and Post Tea a) Macrophytes identification	**10th August 2018**	Session:-1 When we are not respecting the ecosystem then we are abusing the ecosystem. Our sole objective is to learn and contribute to the ecosystem. Wetland= The land transition between terrestrial and aquatic system covered by shallow water. The major function of wetlands is remediation treatment (how much nutrient the plant to take) and ground water recharge. We need bioremediation because we want to assess periodic changes in the environmental quality of an ecosystem, and we want to bring alteration in the ecosystem. The major causes of wetland loss are agriculture conversion, deforestation, encroachment, sewage entry into wetland, over exploitation etc. So we need to improve our knowledge base on physical, chemical and biological characteristics of the wetland. On the other hand bio-monitoring of the wetland by identifying the stress through their presence, enhancing the assessment and management of aquatic ecosystem helps us to identify the pollution tolerating and pollution non-tolerating species in the wetland.

			In addition to this we also studied about the indicator species like phytoplankton (unicellular, filamentous, act as producer through photosynthesis), Zooplankton, macrophytes, fishes as indicators species. Macrophytes (on the basis of occupying space- emergent, free floating, floating, sub-merged) are the aquatic plants visible to the naked eye, large enough to, available in water bodies where water is shallow enough for light to enter with. The major function of macrophytes are: producer at primary level, interlinking the biotic and abiotic environment, provide habitat for other organism, influence water chemistry, influence hydrology and sedimentation, bio-indicator of health, have economic, cultural and medical value. Macrophytes are following the process of adaptation e.g tissue filled with water (aerenchyma), having waxy leaves, cuticle absent or present as thin layer, less rigid, having light and feathering roots, with less xylem. For sampling we take 50X50 cm quadrant, we sample depending on the type of habitat, types of vegetation, variations, distribution of vegetation etc. We need to treat the sample and estimate the biomass, nutrient and heavy metal estimation Herbarium- Environment and plants are co-evolve and make life possible for many species on the earth, provide comfort to other species. Plants attract monsoon, plants with wild life form biodiversity, moisturizing environment is done by plants. The failure of ecosystem is due to speedy depletion of ecosystem., temperature rise, no-rain, flood, perennial rivers becomes seasonal

			rivers, landslide due to too much of rain. So we fail to understand the diversities and record of all species in a scientific manner. So the early period plants are now endemic. Nothing is natural on this earth, something come million tears ego become naturalizing to be the nature of that area, so nothing is natural. To restore it we must know what the biodiversities was before and require restoring those with respect to an area. We have to keep all species in a place called "Herbarium" Macrophytes identification: We studies many species across the line with basic characteristics and features. Following are the species: 1. Water Hyacinth 2. Pistia 3. Lemna 4. Wolfia 5. Azolla 6. Salvania 7. Alligator Weed 8. Typha 9. Water primosa 10. Colocassia esculenta 11. Polygonum glabrum 12. Ipomoea acquatica 13. Sagiterria 14. Cyorus species 15. Marslia etc On the day end **we had a test on the identification** of various species.
SUMMARY OF THE SESSION AND DAY- ORALLY BY SPECIFIC PARTICIPANTS AS ASKED FOR DISCUSSION AND BY WRITING WAS SUBMITTED BY EVERY PARTICIPANTS			

DAY 7	1) Grass & Herbs identification 2) Grass & Herbs identification **3) Field Sampling** 4) **Interactive learning** 1. Session-Pre-Lunch 2. Session Post-Lunch 3. Session Post Lunch and Post Tea	**11th August 2018**	During the day 7th session on need for Western Ghat's conservation of biodiversities; it was evident that there is a strong connecting link between plants and flow of water in river. A country like India is targeted by every country because we are a tropical country and our temperature is high so we have diversified species available. On the other hand we are worried about forest because the areas mentioned as forest area in our records are in reality fall short of it with large margin. We discussed about nine phyto-geographical regions in India example: Western Himalaya, Eastern Himalaya, Indus valley, Gangetic Plain, Central India, Malabar, Assam and Andaman Nicobar Island. In the trend of evolution the civilization has born from deciduous forest and river. There is a strong and direct link between strong rain fall and strong bio-diversity. We understood the effect of monoculture and polyculture has a strong impact on biodiversity and ecosystem. Role of evergreen forest in water recharge in river and deciduous forest act as indicator of water scarcity. The effect of continental drieft and separation of India from rest of countries for 150 million years and birth of deciduous forest came into being as we moved from pole towards equator. We discussed about the causes of man-animal conflicts e.g as we occupy their breathing space for cultivation, industrial development, infrastructure development etc. Session 2-We had practiced the thematic mapping of agro-climatic zone in QGIS
SUMMARY OF THE SESSION AND DAY- ORALLY BY SPECIFIC PARTICIPANTS AS ASKED FOR DISCUSSION AND BY WRITING WAS SUBMITTED BY EVERY PARTICIPANTS			

DAY 8	4. Identification & Taxonomy 5. Identification & Taxonomy 6. Field Sampling & Interactive learning 7. Field Sampling & Interactive learning 1. Session-Pre-Lunch a) Documentation of Biodiversity in the Village b) Biodiversity c) Biodiversity Management Committee d) Livestock in the Village e) Methodology to Collect data f) Grid based Data Collection and Documentation 2. Session Post-Lunch a) Angiosperm 3. Session Post Lunch and Post Tea	**12th August 2018**	In due process of learning documentation of biodiversities in different villages, it was evident that if anything is not properly documented, then our environment may face irreparable damage. The key issues are: People are still struggling for equal share of benefits Respect and Protect Knowledge of local people In Dr. Rao's session on Angiosperm classification we came to know that classical taxonomy and plant systematic are key components where we mainly focus on classification, identification, nomenclature and description of species. The difference between plant and animal kingdom classification was described.
SUMMARY OF THE SESSION AND DAY- ORALLY BY SPECIFIC PARTICIPANTS AS ASKED FOR DISCUSSION AND BY WRITING WAS SUBMITTED BY EVERY PARTICIPANTS			
DAY 9	1) Permanent plot monitoring @ BNP 2) Permanent plot monitoring @ BNP **3) Interactive session @ EMPRI** 4) **Interactive session @ EMPRI** 1. Session-Pre-Lunch and Post Lunch a) Visit to Bannerghatta National Park and practical session with EMPRI Team on Grid Based Monitoring of Species (Identification, Sampling, Tagging, Calculation of Girth Recording) b) Visit to Core Area of National park and demonstration of Air Direction , Rainwater Measurement, Temperature and Sight Seeing from the Top 2. Session Post Lunch and Post Tea a) Visit to EMPRI and demonstration of	**13th August 2018**	Hands on experiences on identifying different species and sampling of the species → Learn the sampling process in forest ecosystem through grid approach, tagging → If < 1 cm girth – measure in digital caliper → If >1 cm girth take tape measure → In a grid, if new seedlings not arise then there is some problem in soil, so we have to see 3-4 soil species → In EMPRI **Green GDP Accounting** for Forestry was trained → Understood the concept of GDP= Consumption+ Investment + Public Spending+ [Export-Import] → Green GDP= GDP- Depletion of Natural Resources- Cost of Pollution+Environmental benefits → Non state Domestic Product+Economic Value of Forest Ecosystem =Environment Adjusted State

	Water Testing Lab, Micro-biology Lab, Climate Change Lab b) Presentation and Interactive Session in EMPRI on Green State Domestic Product (GSDP) -Accounting for Forestry, Methodology Issues		Domestic Product → In the same approach the Research Scholar Miss Ritu Singh has addressed
SUMMARY OF THE SESSION AND DAY- ORALLY BY SPECIFIC PARTICIPANTS AS ASKED FOR DISCUSSION AND BY WRITING WAS SUBMITTED BY EVERY PARTICIPANTS			
DAY 10	1) Wetland monitoring 2) Wetland monitoring Algae, Zooplankton, Fish 3) Hands-on physicochemical parameters 4) Hands-on Algae, Fish identification 1. Session-Pre-Lunch a) Valuation of Wetlands 2. Session Post-Lunch a) Wetland monitoring Fish 3. Session Post Lunch and Post Tea a) QGIS Practices	**14th August 2018**	Session: Pre-Lunch Wetland Monitoring: This session was an extension session of 10th August 2018 and major points in this session was economic and eco-logical value of wetlands and their contribution to biodiversities Session: Post-Lunch This session was started with identification and valuation of birds and their contribution to ecosystem. The birds are evolved from Dinosaurs, and over the period of time due to diversity in habitats these species have got adaptations in beak, feather, eyelids, body colour etc. The birds are differentiated based on crown, colour, beak shape, tail shape feather pattern **Session 2: FISH** Fishes are the cold blooded animal having backbone (vertebral column), gills and fins. Many are exotic in nature (kill other species). They store heavy metals in their body which directly transfer to human being when we eat. In addition to that the fish collection and identification, types of fins, types of fins are also discussed. Finally the threat to fish like construction of dams, water pollution, toxic wastes, pesticides, fertilizers, sedimentations, exotic species, impact of overfishing and scope for its conservation was discussed in details.

SUMMARY OF THE SESSION AND DAY- ORALLY BY SPECIFIC PARTICIPANTS AS ASKED FOR DISCUSSION AND BY WRITING WAS SUBMITTED BY EVERY PARTICIPANTS			
DAY 11	1) Bird Diversity and Sampling 2) Butterfly Diversity and Sampling 3) Field Survey and Identification **4)** Field Survey and Identification 1. **Session: Pre-Lunch**- Birds and Biodiversity → Identification & Special Features , Life Cycle → Environmental and Economic Importance 2. **Session**: **Post-Lunch**-Insects (Butterflies) and Biodiversity → Life Cycle, Identification & Special Features → Environmental and Economic Importance **3. Session : Post Lunch and Post Tea Break** → Secondary Data compilation on BIRDS for Different Districts in Karnataka for Spatial Analysis	**15th August 2018**	Independence Day celebration at IISc Main quadrangle: all participants with faculty took part in the event. IISc fraternity appreciated the participants active participation. During the pre lunch session we studied about the features of birds, evolution of birds from dinosaurs, first fossil bird-Archaeopteryx. In addition to that the causes of bird biodiversity, external, internal anatomy, behavioural analysis (crown, colour, beak shape, tail shape and feather pattern, highly developed visual system, foot and wing adaptations, behaviour, feeding habits, nesting habits, courtship behaviour, migration and types, V shaped movement was also given due importance) In the due process the ecological significance of the birds were also extensively discussed. Specifically discussed about how birds play different levels of tropic web, helps in biological control, their role in pollination, role as bio-indicator. Post-lunch session: In this unit Butterfly Diversity and Sampling we mostly study on the classification, identification process (insects cut into three sections- head, thorax, abdomen; three pairs of jointed legs, 2 pair of wings, compound eyes one pair of antenae); ecological significances (pollinations, bio-indicators, food chain/web), metamorphosis, feeding habits, adaptations to escape threats, association with ants, ways to attract butterflies (types of tree species, flowers,) Documentation process- Date time, location, weather, common name, scientific name, family, individual count, activity, character)

SUMMARY OF THE SESSION AND DAY- ORALLY BY SPECIFIC PARTICIPANTS AS ASKED FOR DISCUSSION AND BY WRITING WAS SUBMITTED BY EVERY PARTICIPANTS			
DAY 13	1) Coastal Ecosystem Monitoring 2) Coastal macro-Algae Taxonomy 3) Macro-algae Sampling and Value Added Products 4) Macro-Algae Sampling 1. **Session Pre-Lunch** : Water Quality Monitoring →Lakes and Water Problems →Monitoring Water Bodies →Hands on Field Experience: Sampling, Physical, Chemical and Biological Parametric Data Collection (IISc Campus Water Body) 2. **Session Post-Lunch**: Sample Data Analysis to find : →TDS →Dissolved O2, →Electrical Conductivity, →Transparency, →Turbidity, →Free CO2, →Total Hardness (Calcium) 3. Fish Biodiversity, Pollution, Environmental and Economic Value, Conservation 4. Test on Pre and Post Lunch Sessions **Assignment:** *Allocation of Various Assignments to Participants for Final Day Presentation* *Example: Day and Session wise Reporting of Chapters by Tirtha and Raghavendra*	**16th August 2018**	**Session 1:** The session was on Water Pollution and Water Quality Monitoring Water pollution: The change in water quality that can harm the organism or water unfit for human uses. The key areas of discussion was: 1. To have an idea and understanding on the Physical, Chemical and Biological Characteristics of water 2. To define the status and trends of water quality in a water body. 3. To analyze the causes for the observed conditions and trends of water pollution in the water body 4. Identify the area specific problems (of the water quality) Discussed the function of the water bodies, source of pollution, lakes and water pollution, effect of untreated sewage water to the lake, encroachment of the lakes and its consequences Understood the flow of the waste pyramid as *REFUSE→REDUCE→REUUSE→RECYCLE→RECOVER→DISPOSE* Discussed on the consequences of nutrient enrichment (C,N,P); O2 depletion in water body make high ammonia so kill the aquatic species, effect of detergent and foams in lake water and consequences Studied the physical parameters (colour, temperature, transparency, turbidity, odour), Chemical Parameter (PH, Electric Conductivity, TDS, Hardness, Nitrate, Phosphate, Chloride), Biological Parameter (Qualitative analysis of plankton) Sample collection from the polluted water body (from Inlet, Centre and Output) was taken from one of the reserviour and all the parameters are demonstrated in the class.

<table>
<tr><th colspan="4">SUMMARY OF THE SESSION AND DAY- ORALLY BY SPECIFIC PARTICIPANTS AS ASKED FOR DISCUSSION AND BY WRITING WAS SUBMITTED BY EVERY PARTICIPANTS</th></tr>
<tr><td rowspan="2">DAY 14</td><td>1) Coastal Ecosystem monitoring
2) Coastal Macro Algae Taxonomy
3) Macro Algae Sampling and Value added products
4) Macro Algae Sampling</td><td rowspan="2">16th August 2018</td><td rowspan="2">In theme of the first session were estuarine system (the transition areas between land and sea) and its importance and need for monitoring. The four zones of the marine ecosystem (intertidal, neritic, oceanic and benthic) and scope for existence of biodiversities, followed by various coastal land scapes were discussed. In addition to this the importance of sand dunes as defense against sea erosions, and unit of rich flora and fauna has also been discussed.

The keystone species and their role in conservation of biodiversity, salt tanks and its contribution, sand mining and its impact on erosion of coastal land mass and micro-habitat mapping was given due importance.

In addition to that various coastal regulation zones (CRZ-I to CRZ-IV) and Critically Vulnerable Coastal Area (CVCA) and their role in conservation and protection of vulnerable, endangered species was the focal point of interest.</td></tr>
<tr><td>1. Session-Pre-Lunch
Coastal Ecosystem Monitoring
a) India and its Coast
b) Coastal Karnataka
c) Estuarine System
d) Zone of Marine Ecosystem
e) Coastal Landscape
f) Fragile Ecosystem
g) Bay
h) Importance of Sand Dunes
i) Schedules under Wildlife Protection Acts
j) Keystone Species
k) Salt Tanks
l) Erosion and Role of Biodiversity
m) Sand Mines Monitoring
n) Mangrove Monitoring
o) Depth Profile and Monitoring
p) Microhabitat Mapping
q) Scope for Research
r) Coastal Regulation Zones
s) Critically Vulnerable Coastal Area
ASSIGNMENTS: Schedule Animals of your districts (Every participants are assigned a district of Karnataka)
2. Macro Algae (Sea Weeds)
a) Classification, Identification, Monitoring and Utilization</td><td>The classification, Identification and Utilization of the Macro-algae (Sea Weeds) was discussed with special focus on various layers of pigmentations and cell types. The thallus and its adaptation (hold fast, rhizome), habitation of Rhodophyta, Phaeophyta and Chlorophyta was discussed in addition to the alternate mode of reproduction (Asexual and Sexual based on environmental condition). The key aspects of sampling by quadrant method (.25*.24mt) followed by utilization of sea weeds (biomass- Carpohydrate+Protein+Lipid) in production of cosmetics, food, fertilizer, animal food, bioplastic and biofuel was discussed. The cultivation of Macro-algae by vegetative propagation (rafts using rope) and scope for further cultivation was discussed to address</td></tr>
</table>

	b) Habitat and Distribution of Green, Red and Brown Algae (Upstream, Mid-stream and Estuarine mouth) c) Pigmentation and Types of Macro Algae d) Characteristics of four different Macro Algae e) Physiology and Reproduction [Asexual and Sexual- Alternate Reproduction (2n)(n)] f) Sampling (Quadrant Method e.g 0.25mt X 0.25 mt) g) Material Required for Sampling h) Sea Weeds Utilization (Biomass-Carbohydrate, Proteins and Lipids) i) Macro Algae Cultivation and Scope in India ❖ **ASSIGNMENTS:** *Green, Red and Brown Algae list across the coastline of India (Three Groups to do three Varieties)* 3. Session Post-Lunch a) Micro-Algae- →Characteristics, Identification and Types b) Diatoms, Classification, Habits, Habitat, Life Cycle c) Importance of Diatoms d) Why we should care Diatoms? e) What kind of Sample we need to take? f) Why ecosystem monitoring is required? g) Ecological or Bio-monitoring of Diatoms (Species Composition and Species Diversity) h) Measuring relative abundance [Diversity Index 9Value between-1 to 4)]		the economic value of the Macro-algae Micro-Algae: Under Micro algae we studied diatom (the unicellular, microscopic, colony forming aquatic species having flagella, cell wall with silica), its characteristics, pattern of classification, Reproduction, Importance of Diatoms, Why should we care diatoms, how to sample diatoms, why ecosystem monitoring is required,, Biological and Physio-chemical monitoring, food chain, coastal monitoring, ocean colour monitoring, scope for diatom cultivation, application of algal biomass

	i) Occurrence of Benthic Organisms in Running Water and affected by Ecological, Geographic, PH, Nutrients etc. j) Biological Vs Physio-chemical Monitoring, k) Food Chain, Coastal Monitoring k) Ocean Colour Monitoring l) Scope for Diatom Cultivation m) Application of Algal Biomass **4. Session Post Lunch and Post Tea** 5. **ASSIGNMENTS:** Review of detail assignments for 17th August 2018 and Final Day and Review on QGIS assignments to be covered on 17th August 2018 6. Announcement of Documents to be submitted to Ministry by Participants (AADHAR NO-, PAN NO-, ADDRESS DETAILS, QUALIFYING CERTIFICATE)		
SUMMARY OF THE DAY- SUBMITTED BY EVERY PARTICIPANTS			
DAY 13	1) Valuation of Coastal Ecosystem Mangroves 2) Valuation of Coastal Ecosystem-Mangroves, Fish, Crab, Salt etc 3) Valuation of Coastal Ecosystem-Livelihood 4) Valuation of Coastal ecosystem—Contd. 1. Session-Pre-Lunch b) QGIS Practice Session for Topography, Population, Agro-climatic Zone, 2. Session Post-Lunch b) QGIS Practice Session for Lithology, Slope, Livestock c) Session Post Lunch and Post Tea b) QGIS Practice session for Forest Cover c) Mangrove Forest Ecosystem	**17th August 2018**	**Session: 1** We studied about the importance of coastal ecosystem particularly in terms of mangrove ecosystem. Mangroves are the salt tolerant plants growing in swampy mud in coastal area, across the inter-tidal zone of river mouths, lagoons and creeks. Mangoves have adaptations like pneumatophores, stilt roots, buffer roots, salt filtering roots, salt glands, lenticles to servive in salt rict area etc. Bright example of Sundarban in West Bengal was cited with mangrove types (high, medium and low salinity species). A detail discussion on different valuation methods was also presented by faculty member like Economic valuation Method, Eco-Valuation Method, **Session-2:** It was a practice session for a) QGIS Practice Session for Topography,

			Population, Agro-climatic Zone, a) QGIS Practice Session for Lithology, Slope, Livestock a) QGIS Practice session for Forest Cover
SUMMARY OF THE DAY- SUBMITTED BY EVERY PARTICIPANTS- NOT YET SUBMTTED			
DAY 14	1) Valuation of Ecosystem Goods and Services 2) Valuation of Ecosystem Goods and Services 3) Valuation of Ecosystem Goods and Services 4) Valuation of Ecosystem Goods and Services 1. Session-Pre-Lunch a) Valuation of Hydrological Services b) Eco-services by Macro-algae (Special focus on carotenoid and biomass) c) Eco-services by Micro-algae (special focus on bio-ethanol production) 2. Session Post-Lunch- Case analysis a) Ecosystem service valuation for protected area management (China) b) Eco-valuation of wetland in Jagadishpur Ramasar Centre, Nepal c) Change in eco-system services and impact on livelihoods (Maguri-Motapung Beel, Assam) 3. Session Post Lunch and Post Tea a) Mangroves ecosystem (remaining portion of 17th August session)	**18th August 2018**	The key aspects of this session was understanding on the value of hydrological ecosystem services which links human and nature, focus on conservation and restoration of natural ecosystem. For example River ecosystem helps us in water purification and lakes-water retention and estuary- climate regulations. On the other hand the ecological services (provisioning, regulating and cultural) and human well being (security, material and health) relationships is need to be compared to value of the ecosystem goods and services. For the valuation of ecosystem goods and services various approaches are there like cost based approaches, use actual data and creation of value at either catchment scale or regional scale. Ecosystem Services by Macro Algae was also discussed based on the carotenoid value as an anti-oxidant, bio-ethanol and soil-conditioner production. The case study on protected area eco-services valuation in China reflected how the core area, buffer zone and non-protected area are contextually varies according to the market based valuation, local valuation keeping the need of the users at the top of the priority. The wetland eco-services at Jagadishpur Ramasar Centre while valuated the ecosystem services considered direct, indirect and non-use value to categorize and rank the priority areas and find the most goods and services value e.g fish and identified future use value as the most important aspects and recommended strategic management and implementation of law and order to protect and conserve the wetland.

SUMMARY OF THE DAY- SUBMITTED BY EVERY PARTICIPANTS-NOT YET			
DAY 15	1) Expert Lecture 2) Expert Lecture 3) **Test** 4) Concluding Session	**19th August 2018**	Pre-lunch session: Pending assignment on the District Profile was done by participants. **Post-Lunch Session:** The validation session was conducted by the IISc and EMPRI team in presence of honourable guests Head of Ramakrishna Mission, Banerghatta National Park, Dr. S Ayyappan (Nabard Chair Professor, Former Secretary, DARE (GoI) & Director General, ICAR), Dr. Indrira from Azim Premji University, Dr.Mythili, Tata Institute of Social science and Dr. Vinaya Kumar, CCF, Director EMPRI TVR presented two case studies on ecosystem evaluations (Bangalore and west Coast). Participants shared their experiences about the sessions and followed by photo session with high Tea

BEST PRACTICES :

1. ***Versatile Faculties with wide experiences and exposures***
2. ***Discipline and Punctuality: Session used to start exactly at 9 am and all faculty interacted with the participants (summary – random selection of participants for summary, submission of each session summary by the participants)***
3. ***Immediate Class Summary through Oral Question Answers Session***
4. **Delegation of responsibilities*: Good democratic way of functioning was evident as each participants were made responsible for successful conduct of GDP. For Example: Proceedings preparation: Tirtha Mohapatra, Session Summary compilation:* Yazhini; *Collection of spatial data*: Ankit Kumar and Anirudh Kishore, *Time Management*: Balwinder Singh; *Food Management*: Vinay and Prakash Mesta; *Evaluation of session summary (by each participants) and feedback submission to TVR and respective session faculty*: Ravishankar; Mid Term Tests: Aditya Rao and Sudrashan Bhat (for Macrophytes Identifications); Second Test: Sincy and Asulabha (wetlands – water quality, biodiversity); Final exam setting up question paper, evaluation and verification – TVR, Vinay, Bharath Settur; Invigilation – Bharath Settur, Vinay S, Sudarshan Bhat**
5. ***Session Wise Summary Writing***
6. ***Field based Demonstration***
7. ***Live experiences on Green Community Food Kitchen: Outing for Observing Green Kitchen Concept (Aadmya Chetana Trust)***
8. ***Case to case QGIS class based presentation***
9. ***Case Analysis***

PICTURE TELLS THE STORY: DAY-1 to DAY-15

Government of India

GREEN SKILL DEVELOPMENT PROGRAMME (GSDP) ~ ENVIS

Venue: CCE Lecture Hall

Date: 5th to 19th August 2018

Jointly Organised by :

ENVironmental Information System [ENVIS] Sahyadri:
Western Ghats Biodiversity Information System
Centre for Ecological Sciences,
Indian Institute of Science, Bangalore 560 012

&

ENVIS Centre: Karnataka State of Environment and Related Issues
Environmental Management & Policy Research Institute
Department of Forest, Ecology & Environment,
Government of Karnataka, Bangalore 560 078

GSDP –Program Schedule

Date & Time	9-10.30 am		11-1.00 pm		1-2.00 pm LUNCH	2-4.00 pm	4-4.30 pm TEA BREAK	4.30-6.00 pm
5th Aug 2018	Registration & Inauguration	10.30-11.00 am TEA BREAK	Valuation of Ecosystem through Grid based monitoring-TVR			Introduction to Spatial Analysis-TVR		Maps, Projections & GPS-TVR&VS
6th Aug 2018	Remote sensing & GIS Essentials-TVR		Remote sensing & GIS Essentials-TVR			QGIS theory and Interactive session-BS		Hands on QGIS-BS&VS
7th Aug 2018	Remote sensing & GIS Essentials-TVR		Open source GIS- BS&VS			Hands on GRASS-BS&VS		Hands on GRASS-BS&VS
8th Aug 2018	Hands on GRASS-BS&VS		Hands on GRASS-BS&VS			Hands on GRASS-BS&VS		Test
9th Aug 2018	Plant Taxonomy-AR		Plant Taxonomy-AR			Sampling techniques-AR		Field sampling-AR
10th Aug 2018	Wetland monitoring-Macrophytes-SB		Concept and Design of Herbarium-SR	Macrophytes-SB		Hands-on Macrophytes identification		Field sampling-AR
11th Aug 2018	Grass & Herbs identification-GR		Grass & Herbs identification-GR			Field Sampling		Interactive learning
12th Aug 2018	Identification & Taxonomy-GR		Identification & Taxonomy-GR			Field Sampling & Interactive learning		Field Sampling & Interactive learning
13th Aug 2018	Permanent plot monitoring @ BNP		Permanent plot monitoring @ BNP			Interactive session @ EMPRI		Interactive session @ EMPRI
14th Aug 2018	Bird diversity & Sampling-VM		Butterfly diversity & Sampling-CS			Field survey & Identification		Field survey & Identification
15th Aug 2018	Wetland monitoring-SV&AK		Wetland monitoring-Algae, Zooplankton, Fish- SV&AK			Hands-on physico-chemical parameters		Hands-on Algae, Fish identification
16th Aug 2018	Coastal Ecosystem monitoring-PNM&DH		Coastal Macro Algae Taxonomy			Macro Algae Sampling and Value added products-DH&SG		Macro Algae Sampling DH&SG
17th Aug 2018	Valuation of Coastal Ecosystem-Mangroves-PNM		Valuation of Coastal Ecosystem-Mangroves, Fish, Crab, Salt etc			Valuation of Coastal Ecosystem-Livelihood		Valuation of Coastal—Contd.
18th Aug 2018	Valuation of Ecosystem Goods and Services-TVR & team		Valuation of Ecosystem Goods and Services-TVR & team			Valuation of Ecosystem Goods and Services-TVR & team		Valuation of Ecosystem Goods and Services-TVR & team
19th Aug 2018	Expert Lecture		Expert Lecture			Test		Concluding Session

TVR-TV Ramachandra; BS-Bharath Setturu; VS-Vinay S;AR-Aditya Rao; PNM-Prakash N Mesta; SV-Sincy V; AK-Asulabha K; SB-Sudarshan P Bhat; VM-Vrijulal M; CS-Chaturved Shet; GR-GR Rao; DH-Deepthi Hebbale; SG-Sharanya G; SR-Shankara Rao

Date: 5 August 2018

Inauguration









Lectures by Ramachandra. T.V

Date: 6 August 2018

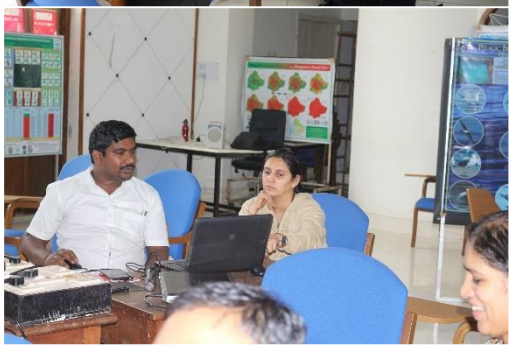
Lecture and Hands on session – Spatial Analysis- Ramachandra T V, Bharath S, Vinay S












Date: 7 August 2018

Lecture and Hands on session – Spatial Analysis- Ramachandra T V, Bharath S, Vinay S

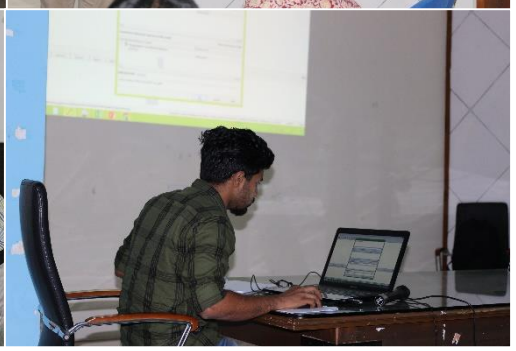






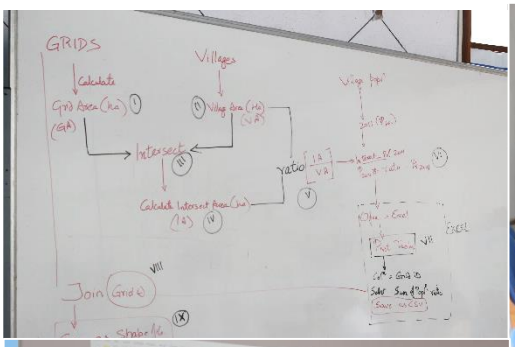


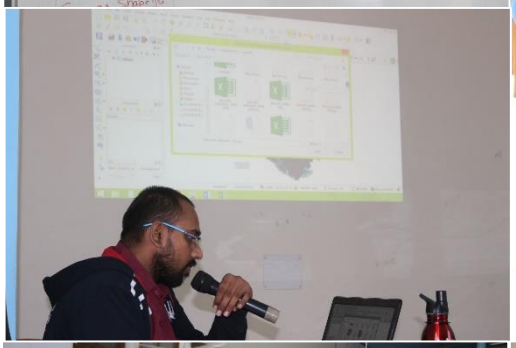


Date: 8 August 2018

Hands on session – Spatial Analysis- Bharath S, Vinay S, Prakash, N M





Date: 9 August 2018

Plant Taxonomy and Sampling– Aditya Rao, Vishnu.D M

Date: 10 August 2018

Macrophytes Lecture and Identification– Sudarshan Bhat, Aditya Rao
World Bio-fuel day ~ Deepthi H, Saranya G










Lecture on Herbarium– Shankar Rao


Date: 10 August 2018

Date: 11 August 2018

Spatial Analysis – Interactive session



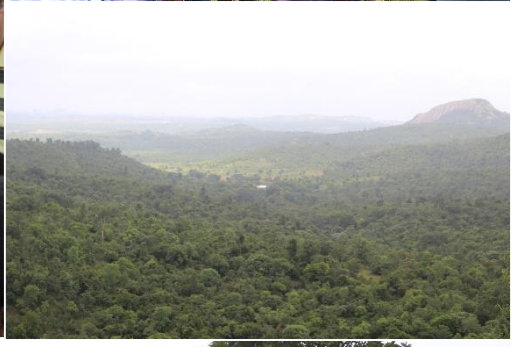
Grass & Herbs; Herbarium, Bees Lecture– Rao G R, Aditya Rao, Pavitra

Date: 12 August 2018

Biodiversity Documentation – Prakash N M
Identification and Taxonomy– Rao G R


Date: 13 August 2018

Long term monitoring ecological plot at Bannerghatta National Park ~ EMPRI



Date: 13 August 2018

EMPRI –Interactive Session



Adamyachetana –Interactive Session






Date: 14 August 2018

Birds, Butterflies diversity and sampling – Vrijulal M V, Chaturved Shet

Date: 15 August 2018

Independence Day at IISc

Date: 15 August 2018

Wetland Monitoring Lecture and Field work – Sincy V, Asulabha K S.









Date: 16 August 2018

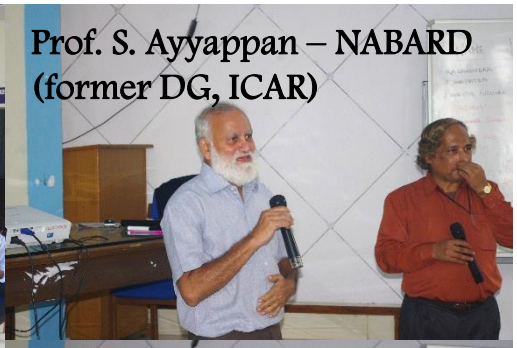
Coastal Ecosystems, Macro and Micro Algae Lecture – Prakash N M, Deepthi, H, Saranya G



Spatial Analysis – Hands on Session – 17th,18th and 19th August 2018

Date: 19 August 2018

Final Exams and Valedictory session



Prof. S. Ayyappan – NABARD (former DG, ICAR)

K. H. Vinaya kumar (IFS) - EMPRI

Sri. Vishnumayananda – Ramakrishna Mission

Visit to Ramakrsihna Mission shivanahalli campus, adjacent to Bannerghatta National Park

GSDP COURSE ON VALUATION OF ECOSYSTEM GOODS AND SERVICES
5th to 19th AUGUST 2018 @CCE LECTURE HALL, IISc, BANGALORE
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GSDP COURSE ON VALUATION OF ECOSYSTEM GOODS AND SERVICES
5th to 19th AUGUST 2018 @CCE LECTURE HALL, IISc, BANGALORE
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GREEN SKILL DEVELOPMENT PROGRAMME (GSDP) ~ ENVIS

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