

MINUTES OF EIGHTH MEETING OF TECHNICAL AND FINANCIAL APPRAISAL COMMITTEE (TFAC) OF THE R&D SCHEME FOR CONSERVATION & DEVELOPMENT OF THE MoEF&CC HELD ON 26th SEPTEMBER, 2019 AT INDIRA PARYAVARAN BHAWAN, MoEFCC, NEW DELHI.

The 8th meeting of the Technical and Financial Appraisal Committee (TFAC) of the Scheme on R&D for Conservation & Development of the MoEFCC was held under the chairmanship of Prof C.R. Babu on **26th September, 2019** at MoEFCC in Indus Conference Hall, Ground Floor, Jal Wing, Indira Paryavaran Bhawan, New Delhi. Advisor (RE), MoEF&CC and Member-Secretary of the TFAC welcomed the Chairperson and members of the TFAC for the meeting. List of participants is at **Annexure-1**. A total of 18 proposals received including 11 proposals under the new R&D Scheme on Conservation & Development and 7 on-going/completed projects under the old R&D Scheme were considered, which are listed at **Annexure-2**.

1.0 Confirmation of Minutes of the sixth Meeting of TFAC held on 4th September, 2019:

The minutes of the 7th Meeting of the Technical and Financial Appraisal Committee (TFAC) held on 4th September, 2019 were confirmed.

2.0 A total of 18 proposals of the R&D Scheme were taken up for consideration.

I RECONSIDERATION OF R&D PROJECTS RECEIVED ONLINE UNDER NEW R&D SCHEME:

1. No. 24/2018/RE – **“Spatial mapping and change analysis of Elephant habitat and corridors in Sathyamangalam Tiger Reserve using remote sensing and GIS for conservation and management”**. Prof S Jayakumar, Department of Ecology and Environmental Sciences, School of Life Sciences, Pondicherry,

The proposal was reconsidered by TFAC in its 4th meeting held on 29.05.2019. The project was reconsidered in the 3rd TFAC meeting held on 17.05.2019. The Committee had sought revision on the following:

- i) The Committee had noted that the study must focus on the regeneration of degraded areas including forests of Sathyamangalam Tiger Reserve (STR) and its degraded elephant corridors instead of 5km area proposed by the PI outside the STR.
- ii) The Committee noted that water availability in STR and along the corridors is scarce and address the issue of how the water bodies, reservoirs and water holes are recharged and ensure water availability perennially in elephant habitat and corridors. Modelling of water availability should be undertaken.
- iii) The data collected by geospatial studies using remote sensing should be validated by ground truthing studies in the area (STR + corridors) for vegetation and species identification and mapping water resources mapping.
- iv) The study must come up with specific plan for recharge of water reservoirs and ground water in the STR + corridors.
- v) The PI must engage the State Forest Department to collaborate in the proposed study.

- vi) The PI had agreed to drop the Equipment (Advanced computational facility) costing Rs 1,50,000/- as work station already exists.
- vii) It was suggested that local people/villagers should be engaged in project.
- viii) The Committee was of the view that considering the extent of study area and scope of work, the budget of Rs. 38,95, 000/- appears to be less and needs to be re-examined along with cost break-up of various components. The salary of JRF/SRF should be as per the revised order of DST/MoEFCC. The Committee, after deliberations, recommended the project for funding and requested the PI to modify the proposal as proposed above and resubmit on the MIS-Portal.

Expected Outputs:

1. A detailed map of intensity of Elephant Habitat and existing corridors use.
2. Regeneration status of Elephant Habitat and existing corridors.
3. A detailed map of locations for constructing water-harvesting structure.
4. Spatial distribution of human elephant conflict locations and hot spots.
5. Forest type and cover density maps and change maps of elephant habitat and corridor;
6. Map of change dynamics of settlements and agriculture areas in the STR
7. Management plan

Expected Outcome:

1. Mitigation strategy for human elephant conflict
2. A detailed conservation and management plan for Elephant habitat and corridor

PI made presentation before the TFAC on 26.09.2019. It was informed that a new objective is added for regeneration (objective no.3-Estimating the forest regeneration status of elephant habitat and corridors in the STR and objective no. 4 is modified as "Mapping and change analysis of human settlements and agriculture areas in the STR". Objective 5 added as "Mapping of drainage network, water bodies, reservoirs and watershed in the STR and identifying locations for constructing water recharge structures in each watershed.

Objective-3-"Estimating the forest regeneration status of elephant habitat and corridors in the STR" added. It was informed that Random plots of 5m x 5m will be established in the elephant habitat and corridors and the number of seedlings and samplings inside the plot will be recorded. For each 4km x 4km grid 20 plots will be sampled. (Total = 120 grid x 20 = 2400 plots) and Plants which are less than 1 m height will be considered as seedling and plants which are more than 1 m height and girth at breast height (GBH) ≤ 30cm will be considered as sapling.

Objective - 4 modified as "Mapping and change analysis of human settlements and agriculture areas in the STR". Human settlements and agriculture areas in the STR will be mapped using remote sensing data for 1987, 1997, 2007 and 2017 in 1:50,000 scale. Increase or decrease of settlement and agriculture areas will be analyzed using change detection analysis in GIS. Change in crop cultivated over a period of 30 years will also be analyzed through questionnaire survey.

Objective - 5: Mapping of drainage network, waterbodies, reservoir and watershed in the STR and identifying locations for constructing water recharge structures in each watershed. The studies involved Drainage network, water bodies and reservoir inside the STR will be digitized from the Survey of India topographical map; 2. Watershed boundary will be

digitized from National watershed map prepared by the National Bureau of Soil Survey and Land Use.3. Rainfall trend will be analyzed based on data obtained from rain gauge stations. Watershed wise location will be identified to construct water recharging structures such as check dams and percolation pond. The data will be validated as Mapping the change dynamics of elephant habitat and corridors using remote sensing data for 1987, 1997, 2007 and 2017 and GIS in 1:50,000 scale. The methodology involves: 1)A reconnaissance survey and Ground control points (GCPs) collection will be done. 2)The forest inside the demarcated boundary of elephant habitat will be classified for the forest cover density using Normalized difference vegetation index (NDVI) for 1987, 1997, 2007 and 2017 in 1:50,000 scale using the Landsat 5 Thematic Mapper, Landsat 7 Enhanced Thematic Mapper Plus, Landsat 8 Operational Land Imager, IRS ID LISS III and Resource Sat LISS IV satellite data. 3) Accuracy assessment will be carried out to validate the accuracy of forest cover maps. 4) Change analysis of elephant habitat and corridors will be done between the years to estimate the forest cover change; 5) Matrix analysis will be done to estimate the pixel-wise change between years using ERDAS Imagine software;

PI stated that the project will be done with the collaboration of the State Forest Department. The local communities will be involved throughout the field work and Contingency head includes field labour charges. PI has dropped the Equipment (Advanced computation facility) costing Rs.1,50,000/- as work station already exists.

Revised Cost of project: 49,63,400.00

Tenure	1st Year (in Rs.)	2nd Year (in Rs.)	Total Budget (in Rs.)
2 years	25,39,200.00	24,24,200.00	49,63,400.00

The component-wise break-up of revised cost of the project is given below (in Rs.):

COMPONENT	Year 1 (In Rs.)	Year 2 (In Rs.)	Year 3 (In Rs.)	Total Cost (In Rs.)
Salary Research Associate – 1 Junior Research Fellow – 2	13,08,000.00	13,08,000.00	0.00	26,16,000.00
Equipment (Advanced computational facility)	0.00	0.00	0.00	0.00
Consumables Satellite data	1,00,000.00	0.00	0.00	1,00,000.00
Travel Cost	4,00,000.00	4,00,000.00	0.00	8,00,000.00
Contingency	400000.00	400000.00	0.00	8,00,000.00
Institutional Charges	3,31,200.00	3,16,200.00	0.00	6,47,400.00
Any Other	0.00	0.00	0.00	0.00
Total Budget	25,39,200.00	24,24,200.00	0.00	49,63,400.00

Letter of endorsement from Field Director has been provided. Principal Chief Conservator of Forests and Chief Wildlife Warden, Tamil Nadu Forest Division, Chennai vide letter no WL5(A)/36635/2018 dated 31.8.2018 has granted NOC/Permission for the propose study. Chief Conservator of Forests & Field Director, Sathyamanglam Tiger Reserve Vishakhapatnam (P.O), Erodevide letter no C.No. D/7526 /2018 has also granted permission.

The Committee observed that Tamil Nadu Forest has several exotic and invasive alien species such as *Lantana camara* and *Prosopis juliflora* in abundance. Wattle have become highly invasive and are affecting the regeneration of indigenous forest tree species. The Committee desired that regeneration of forest through plantation of native species needs to be done. Phyto-sociological research regarding the regeneration of forest needs to be carried out. PI should study the Elephant-man conflict, identification of corridor and its restoration. The book **“Right of Passage, Elephant Corridors Of India:”** by **Vivek Menon, Sandeep Kr Tiwari, K Ram Kumar, Sunil Kyarong, Upasana Ganguly and Raman Sukumar published by Wildlife Trust of India (WTI)** should be consulted.

The Committee observed that the title should be revised as **“Assessment of Changes for the Conservation and Management of Sathyamangalam Tiger Reserve”**. The Committee suggested that restoration of habitat is necessary so that regeneration of forest can be assessed. Instead of identifying new elephant corridor, it was suggested that the corridor of Western Ghats, which have already been identified by Vivek Menon in the above cited publication can be selected. The area infested by alien invasive species should be assessed for extent of invasion.

The Committee after deliberations recommended the proposal for funding subject to the aforesaid conditions.

2. No.90/2018/RE – **“Assessment of Ecosystem Services from Manas National Park, Assam”**. PI: Dr. Ajay Kumar, Scientist C, Forest Ecology and Climate Change Division, Rain Forest Research Institute Deovan estate, Sotai Ali, A.T. Road (East), Jorhat, Assam. Co-PI: Dr. DhrubaJyoti Das, Scientist E, Forest Ecology and Climate Change Division, Rain Forest Research Institute, Jorhat, Assam

Project proposal was considered in the 4th meeting of TFAC held on 29th May, 2019.

Objectives of Project:

1. To quantify the provisioning services with special reference to NTPFs from Manas National Park and surrounding areas.
2. To estimate the economic value of ecosystem services in Manas National Park.
3. To assess the contribution of ecosystem services in local livelihood in Manas National Park

Cost of Project (in Rs):

Tenure	1st Year	2nd Year	Total Budget (in Rs.)
2 years	1044800.00	916760.00	1961560.00

COMPONENT	Year 1 (In Rs.)	Year 2 (In Rs.)	Year 3 (In Rs.)	Total Cost (In Rs.)
Salary	4,84,800.00	5,81,760.00	0.00	10,66,560.00
Equipment	2,20,000.00	0.00	0.00	2,20,000.00
Consumables	25,000.00	25,000.00	0.00	50,000.00
Travel Cost	2,50,000.00	2,80,000.00	0.00	5,30,000.00

Contingency	15,000.00	20000.00	0.00	35,000.00
Institutional Charges	0.00	0.00	0.00	0.00
Any Other	50,000.00	10000.00	0.00	60,000.00
Total Budget	10,44,800.00	9,16,760.00	0.00	19,61,560.00

PI made presentation before the Committee. It was informed that the 1st objective “To assess the socioeconomic status of local communities residing in and around Manas National Park (MNP)” has been revised: **“To quantify the provisioning services with special reference to NTFPs from Manas National Park and surrounding areas”**. Selection of representative villages (at least 20-30%) from each group for the intensive study. Selection of 10% households for final survey. Primary data would be on Collection and utilization of various forest products (fuelwood, fodder, medicinal plants and various NTFPs) from MNP and surrounding forests collected. For estimation of economic value of ecosystem services in Manas National Park, the ecosystem services for the valuation selected, Employment Generation; Regulating Services like Carbon storage/sequestration, pollination, flood regulation, Water flow regulation, Sediment regulation, nutrient cycling, Quantification by biophysical assessment, Cultural Services, etc. will be studied. Data analysis will be done.

Assessment of all provisioning services including NTFPs, cultural services (Ecotourism), Regulating services (Carbon Sequestration) will be based on primary data collection. ‘VALUE+’ approach (Verma et al., 2016) to assess the services for which monetary valuation is not possible, will be followed. Electronic Basal Area Factor Scope is not available with the Institution. The Committee noted that the study carried out by Ms. Madhu Verma on Ecosystem services has not included Manas National Park. In addition to study of ecological services at Manas, impact of indirect services such as eco-tourism, carbon sequestration, ecosystem services should also be assessed in MNP.

The Committee after deliberations recommended the project for funding.

3. No. 152/2018/RE: **Project on “Design and Implementation of an Unmanned Aerial vehicle (UAV)-based Platform for Environment Quality monitoring and data analysis using Deep Learning at Solid Waste Disposal Sites”** PI: Dr. R. Rani HemaMalini, Professor and Head, Department of Electrical and Electronics Engineering, St. Peter's Institute of Higher Education and Research, Avadi, Chennai -600 054 Tamil Nadu

Co -PI [Dr. B. Shanthini](#), Professor & Head, Department of Information Technology, St. Peter's Institute of Higher Education Technology, Avadi, Chennai 600054

The proposal was earlier considered by TFAC in its 2nd meeting held on 29.04.2019, wherein the following had been discussed:

The Committee had noted that as per information of PI, the dump site is more than 20 years old and height of the solid waste dump is about 100m. The data will be collected from a height of 100m over the dump area. The Committee stated that studies on potential impacts of air quality on health of populations are already available. The Committee had noted that different models on air quality dispersion and characteristics are also available. The Committee had desired that data reliability of sensors needs to be verified, since validation of sensors for reliability, accuracy and wider applicability are main concerns of sensors so developed. The Committee had desired that Tamil Nadu State Pollution Control Board may be contacted on their views on the proposed project and its utility in their on-

going monitoring of air quality in the area in which the dumpsite is located. The Committee had observed that there are many objectives (7) in the proposal which may not be possible to study in the 2 years of project period. The Committee was of the view that the project may restrict to objective no. 2 (To design a microchip made out of sensors capable of measuring environmental quality parameters) and objective 6 (To develop an efficient algorithm to determine the optimal observation period for accurate air quality prediction.). Validity of data generated by this study is questionable and needs to be verified. Methane, VOCs, PM 2.5 (instead of PM10), and CO may also be included in the study/monitoring. In regard to Met data – wind direction & speed and humidity be also included. It was also suggested that PI should also develop microchip for industrial area.

Revised objectives of the Project:

1. To design a microchip made out of sensors capable of measuring environmental quality parameters
2. To develop an efficient algorithm to determine the optimal observation period for accurate air quality prediction

Revised Outputs

1. Environmental quality data for the study area (Kodungaiyur) in and around solid waste dump yards.
2. Pollution variation maps based on the location and time with respect to solid waste disposal time
3. Extents up to which the pollution levels have effects on human settlements
4. Pollution contour maps for the study area

It was also informed that as per suggestion of Committee Methane, VOCs, PM 2.5 (instead of PM10), and CO are included in the research. It is also included to monitor the data on wind direction, wind speed and Humidity.

Revised Outcome

1. A guideline or policy framework for the budget allocation to the health issues due to air pollution for the government authorities, urban planners, public health inspectors / engineers and NGOs according to the monitored air pollution data
2. It is also useful for preparing a policy for use of sensors and electronics

Detailed Methodology:

1. Design and Implementation of the UAV platform to monitor environmental quality data
2. Monitoring and tracking of the solid waste disposal sites using EQMD and UAV
3. Environmental quality data analysis using deep learning with EQMD data
4. Analysing the trends and variations of pollution

Details of additional equipment required under the project are given below:

S.No.	Equipment	No of Units
1.	Environmental Quality Monitoring Device(EQMD)	2
2.	UAV (Quadricopter)	2
3.	Portable Power Supply Unit	2
4.	UPS	1

5.	Smart Phone	2
6.	Server	1
7.	Laptop	1
8.	Computer (Desktop)	1
9.	Flight Controller	2
10.	Data Storage (Hard disk External)	2
11.	Camera	2
12.	Printer	1
13.	Plotter	1
14.	Power Bank	2

Manpower :JRF-1Specialist/Consultant -1

(Revised)Break-up of Cost of project (in Rs):

The proposed revised cost of the project and year-wise break-up of the cost is given below:

Tenure	1 st Year	2nd Year	3rd Year	Total Budget
2 years	26,60,000	10,25,000	0.00	36,85,000

The component-wise break-up of revised cost of the project is given below (in Rs.):

COMPONENT	Year 1 (In Rs.)	Year 2 (In Rs.)	Year 3 (In Rs.)	Total Cost (In Rs.)
Salary	705000	705000	0.00	1410000
Equipment	1685000	0.00	0.00	1685000
Consumables	25000	25000	0.00	50000
Travel Cost	70000	70000	0.00	140000
Contingency	25000	25000	0.00	50000
Institutional Charges	150000	150000	0.00	300000
Any Other	0.00	50000	0.00	50000
Total Budget	26,60,000	10,25,000	0.00	36,85,000

Total revised cost of the project: Rs.36,85,000/-

PI did not attend the meeting and had requested permission for Co-PI to make a presentation before the Committee.Co-PI made a presentation. It was stated that in order to validate the collected sensor data, it is proposed to compare them with the values measured by the Pollution Control Board data for the entire period with specific interval of time.Among the various monitoring stations of the pollution control board placed in Chennai, the Manali is the nearest monitoring station of study area, hence it is chosen to validate the sensor data. All the data collected by the Pollution Control Board are published daily and freely available on their website. All sensors will be evaluated in this research are operated outside field conditions, and reasonably performing sensors will be also tested under controlled laboratory conditions with varied temperature and relative humidity conditions.

For Data Reliability and Evaluation of Sensors, it is informed that choosing an appropriate sensor is an important step in any data collection effort. High standard and pre-calibrated

sensor will be bought with good accuracy. The sensor will be tested in simulation using Pspice software, the simulated data and real time data will be compared, the sensor can also be calibrated with the data sheet available, it is further proposed to validate the sensor data using linear regression method, it can also be calibrated with standard calibration centers such as NABL, matching sensor data with data of Pollution Control Board and to get certification from PCB. PI has contacted the TNPCB authorities and discussed about the potential use of the research work in the solid waste management facilities. PI has obtained letter dated 27.05/2019 from Member Secretary, Tamil Nadu Pollution Control Board, 76, Mount Salai, Guindy, Chennai. As suggested by the Committee, a microchip (a device to monitor the industrial pollution) for industrial area will be developed in accordance with the type of industries. Design of industrial pollution monitoring EQMD proposed as follows: The process of industrial quality assessment is an evaluation of the industrial quality in relation to standard quality set by pollution control board. The proposed system will receive the measured data from sensor and provide the useful information for users by understanding the extent of air pollution for that industry. This information includes the measurement of toxic or harmful gases present in the air which can lead to adverse effects on human health as well as agricultural field. The function of smoke sensor is to capture the current real time status of pollution in air. EQMD is the main device in this research work which consists of Raspberry processor, GIS, GPS, sensors for measurement of parameters such as CO, CO₂, NO₂, SO₂, VOC, Methane, Wind Direction, Wind Speed, Temperature, humidity, and PM 2.5. For monitoring the industrial pollution, the many sensors can be used.

The Committee observed that there is no novelty in project if all the sensors used by PI are those available in market and not that developed by the Institute. The quality of the sensors developed by private sector and available in market cannot be verified and ascertained by GOI as an R&D project under the scheme.

The Committee observed that the data generated should be verified for its validity. CPCB/SPCB website has a well defined Protocol for on-line monitoring system. The MoEFCC has given the Council of Scientific & Industrial Research (CSIR)-National Physical Laboratory (NPL) with certifying air quality monitoring instruments. This is in anticipation of a rising demand by States - against the backdrop of the National Clean Air Campaign - for low cost air quality monitoring instruments that can monitor levels of nitrous oxides, ozone and particulate matter recently. The Central Government has designated CSIR-NPL as national verification agency for certifying instruments and equipments for monitoring emissions and ambient air. CSIR-NPL shall develop necessary infrastructure, management system, testing and certification facilities conforming to international standards, according to a notification dated 22 August, 2019.

The Committee decided that the project could be taken up subject to the following conditions: i) that the PI should develop an innovative sensor in-house that would meet the requirement of measuring AAQ not just for dumpsites alone but as a reliable alternate to existing method of using CAAQMS, in industrial areas, air pollution control areas, etc, which was agreed to by the PI. Indigenous sensors developed by the Institute would be useful for CPCB and SPCBs. CPCB has a monitoring system wherein the data is verified/validated by NPL and thereafter the validated data is accepted by CPCB. ii) Validation of data should be done by NPL and India Meteorological Department (IMD), Ministry of Earth Science. iii) In addition to the dumpsite, the sensor should also be used to verify its reliability by checking its data on AAQ at a nearby CAAQM Station installed by TNPCB. The Title of project should also be revised accordingly. The Outcome should also be revised specific to the project and not for preparation of Guidelines but as a reliable alternate tool for monitoring AAQ.

The Committee agreed to PI's request that duration of the project duration should be 3 years. The Committee after deliberations decided that the proposal is recommended for funding subject to the above mentioned conditions.

4. No.151/2018/RE: Project on "**Pre-feasibility study for Landfill Gas Recovery and Utilization at the Madurai landfill, Tamil Nadu, India.**" PI: Dr.D.Brindha, Assistant Professor, Department of Civil Engineering, ThiagarajaraCollege of Engineering, Madurai 625105. **Co -PI:** Ms S.Sivasangari

Project duration: 3 years

Location of the project: Vellakkal Sold Waste Dump at Avaniyapuram, Thirupparankundram, Madurai, Tamil Nadu.

The proposal was considered by TFAC in its 2nd meeting held on 29.04.2019, wherein the PI had stated the following:

It had been stated that every million tonne of municipal solid waste (MSW) in a landfill is estimated to be able to produce approximately 300 cubic feet per minute of landfill gas (LFG). This amount of LFG could generate approximately 0.78 megawatts of power, or provide 9 million Btu per hour of thermal energy. LFG is a natural by-product of the decomposition of organic material in anaerobic (without oxygen) conditions. LFG contains roughly 50 to 55 percent methane and 45 to 50 percent carbon dioxide. It was informed that the over a period of 15 years, solid wastes collected from the city is disposed off by open dumping at Vellakkal site, located in Avaniyapuram Municipality over an extent of approximately 110 acres. Total area: 110 acres (approximately); boundary distance: 2.85 km (1.77 miles). Vellakkal is an operating landfill. Field measurement techniques for landfills range from square meter to square kilometre scales, including chambers, tracer techniques, micrometeorological approaches, vertical radial plume mapping (VRPM), and aircraft mass balance approaches. Generally different models are used to calculate landfill methane emissions such as First order model, Multi-phase model, LandGEM (US-EPA) etc. Testing wells are installed either in a cluster of three or at five dispersed locations in the landfill. A blower is used to extract LFG from the landfill. LFG composition, landfill pressures, and orifice pressure differentials from the wells are measured and the landfill gas production flow rate is calculated.

The Committee had observed that the piping of methane gas to the nearby residential area would make the project sustainable and serve as a model to use it at other similar dumpsites in other towns and cities in the country. This will also help in reducing GHG emissions from the site. The Committee had desired that the Madurai Municipality be also involved and made a stakeholder in the project. The Project may come out with specific assessment of reduction in gaseous pollutants including GHG emissions from solid waste dumps. It is also suggested that PI should associate a microbiologist who could suggest suitable microbial bacteria which could hasten the process of decomposition in the dump site. The Committee had suggested that the PI should suitably revise the project and resubmit for funding.

Objectives of the Project:

1. To quantify the potential greenhouse gas (GHG) emission reduction from implementing a project.
2. To perform a field investigation (pump test) of LFG extraction rates at the landfill by installing extraction wells.

3. To assess the technical and economic feasibility of the development of an LFG control and utilization project at the landfill.
4. To evaluate the project economics by quantifying capital and operational costs and sources of revenues, and calculating the net present value and internal rate of return.

Expected outputs of the project:

1. GHG emission reduction
2. LFG recovery
3. FTR containing a prefeasibility study for implementing LFG to energy recovery project

Expected outcome of the project:

1. Reduction in GHG emissions
2. Outcome will help field/communities for improving quality of life and for sustainable livelihoods.
3. Study will help in significant reduction of pollutant generation and energy efficiency

Total Project cost: Rs.18,60,000/-

The proposed cost of the project and year-wise break-up of the cost (in Rs) is given below:

Tenure	1st Year	2nd Year	3rd Year	Total Budget
3 Years	10,05,500	8,54,500		18,60,000

The component-wise break-up of cost of the project is given below (in Rs.)

Heads	1st year	2nd year	3rd year	Total
1) Salary				
a) Junior Research Fellow (JRF)	25,000+5% HRA per month	25,000+5% HRA per month	-	6,30,000
b) Non-Technical staff	10,000 per month	10,000 per month	-	2,40,000
2) Permanent Equipment with detailed description				
a)MRU optima Biogas Analyser: It can be used for landfills and Anaerobic digesters & measures CH ₄ , CO ₂ , CO, NO, NO _x , NO ₂ , H ₂ S, Oxygen plus pressure, flow and temperature.	2,50,000	-	-	2,50,000
b) Gas Chromatography: It can be used for both Laboratory and Industrial use .Autocooling, Flow & Pressure programming. Multi Ramp temperature programming are available.	1,75,000	-	-	1,75,000
c) New Hp Desktop Core i7 8GB Ram Computer	37,000	-	-	37,000
3) Expendables	Rs.15,000	Rs.15,000	-	Rs.30,000
4) Travel	Rs.25,000	Rs.20,000	-	Rs.45,000
5) Other project cost(Any other) – with detailed description	2,00,000	1,50,000		3,50,000
Pump test to carry out prefeasibility study			-	
6) Dissemination of project work	18,500	25,000	-	43,500
7) Contingency	25,000	34,500	-	59,500

8) Institutional charges	NA	NA	-	NA
Grand Total	10,05,500	8,54,500	-	18,60,000

The details of manpower and equipment required for the project is given below:

Research Fellows (JRF/SRF)-1, Field worker -1

Details of equipment required under the project are given below:

S.No.	Name	No. of units
1.	Micro GC Biogas analyser	1
2.	Gas Chromatograph electron capture detector	1

PI made presentation before the 8th TFAC held on 26.09.2019. It was informed that as per TFAC recommendations, PI has included the feasibility of use of LFG to serve as a pipe line gas connection scheme to nearby houses in the study. PI has obtained guidance from the Department of Microbiology of Thiagarajar College, (Arts & Science), Madurai for fastening the decomposition process. A letter obtained in this regard was placed before committee. A letter from Madurai Municipality was also submitted by PI.

The Committee observed that the study proposed by PI is part of Smart City. Madurai, Tamil Nadu is a smart city; however use of LFG from dump sites requires being included in the Smart City programme. The Madurai Municipality can use this study outcome as a template and replicate in other similar sites in other areas also. The PI must identify potential users of the gas supplied by pipeline in vicinity of project area within 1-2 km. The PI should do preliminary survey of the area and potential users of LFG. The Committee informed that Dr. J. Daniel Chellappa, Scientist, Bhabha Atomic Research Centre (BARC) has launched similar project on natural gas generation project using biodegradable garbage in Melur and Tirumangalam. PI may contact him and the experience gained by him can be utilised by PI in formulation of the project for use of LFG for a nominal charge for professional services which can be included as part of the Project cost.

The Committee desired that both letters from Department of Microbiology of Thiagarajar College, (Arts & Science), Madurai and Madurai Municipality should be uploaded in the Correspondence Section of the Portal. The Committee desired that the PI must obtain a No-Objection from the Madurai Municipality for the feasibility of supply and use of LFG by pipeline in the vicinity of the landfill after project commencement and after identification of potential users for the LFG.

The Committee after deliberation recommended the project for funding subject to the above conditions.

- No. 40/2018/RE – **“Emerging infectious disease in birds across a gradient of alien invasive trees mapped using Remote Sensing on Shola Sky Islands.”** PI: Dr. Robin Vijayan, Assistant Professor, Indian Institute of Science Education and Research Tirupati (MHRD Institution), Karakambadi Road, Tirupati 517501.

The proposal was considered by TFAC in its 4th meeting held on 29.05.2019.

In the TFAC meeting held on 29.05.2019, the PI had informed the Committee that that PI has been working in Western Ghats area since 2000. The PI has studied the bird species Shortwing found in Western Ghats. Results indicated that the bird is found only on the mountain-tops or Sky Islands. It was informed that Avian Malaria infects only birds of

ancient divergence from mammal lineage but birds don't get malaria – hosts immuno compromised. Avian Malaria has caused 7 extinction events and severe decline in population in insular/island populations. Wooded habitats increasing which may spread infections. About 1200 individual birds were screened for avian malaria and 42% overall have infection of avian malaria. Grassland birds don't have this. Avian malaria caused by two parasite *eg. Plasmodium – mosquitoes and Haemoproteus - biting midges*. It is a field-lab-desk research. The Desk work will be - Map landscape, invasive in detail (3m, 5m resolution). Field work is to capture the bird & collect blood samples ~400/year. PI proposed to create 5 sq.km grids covering 3000 sq/km under the study. Lab – generated data Next Gen Seq. data to examine relationships between hosts & parasites. It was informed that map will be provided for preparation of a Management Plan.

The Committee had noted that the scope of the proposed study is very large for the short duration of the project. The Committee had desired that the project period be increased to 3 years. The Committee had suggested that the scope of work should be reduced, The Committee had desired that the study should look into altitudinal gradient of the Invasive Alien species along with land use change gradient in the proposed study area. The Committee had desired that the genetic component be deleted from the proposed objectives or at least not be made part of this study and the costs along with equipment thereon be deleted. It was suggested that the preparation of Management Plan should be dropped and the PI should focus on research and the outcome of which forms the basis for preparation of a management Plan. The Committee had desired that expected outcome –i)“*Inputs for Wildlife Management Plans of three divisions*” and objectives ii,iii,iv,v,vi, viii should be continued. Outcomes iii,iv,v should be only for selective species as per RET.

The Committee had also observed that the budget appears to be high and had suggested that the PI should suitably revise the project with reduced budget along with revised objectives as recommended by the Committee and resubmit the revised project for funding. The Committee had after deliberations recommended the project for funding subject to revisions of the project as above.

Duration of Study: 3 Years

Location of Study: Kodaikanal, DistreictDindigul, Tamil Nadu (location details with specific Lat-Longs in a tabular form not provided)

PI made presentation before 8th TFAC held on 26.09.2019 and considered the revisions made by PI as given below:

Revised Objectives:

- 1) Map the extent of Alien Invasive timber plantations (exotic timber trees such as *Acacia*, *Eucalyptus* and Pine) on the spread of disease (Avian Malaria – infects only birds) across in the Sky Island system.
- 2) Examine emerging Infectious Disease in an avian system, across multiple Protected Areas that can serve as a baseline database. Sampling birds and malaria across PAs & landscape change
- 3) Examine interactions of Emerging Infectious Disease with the increasing spread of Alien Invasive species. Identify indicator species.

Revised Expected Outputs:

- i) Inputs for Wildlife Management Plans of three divisions will be provided
- ii) Species management plans can be produced for some specific species
- iii) Maps of invasive species in different protected areas

Expected Outcome:

- i. Baseline knowledge of disease in the landscape
- ii. An understanding of the spread of exotic invasive species
- iii. Knowledge of the relationship between Emerging Infectious Disease and landscape change

(Revised)Break up of cost of Project (In Rs)

Tenure	1st Year	2nd Year	3rd Year	Total Budget
3 years	30,93,040	23,57,040	23,63,411	78,13,491

COMPONENT	Year 1 (In Rs.)	Year 2 (In Rs.)	3rd Year	Total Cost (In Rs.)
Salary	12,45,600	12,45,600	12,97,440	37,88,640
Equipment	4,95,000	0.00	0.00	4,95,000
Consumables	1,06,000	6,000	6,000	1,18,000
Travel Cost	6,93,000	6,93,000	6,41,700	20,27,700
Contingency	1,00,000	1,00,000	1,00,000	3,00,000
Institutional Charges	4,03,440	3,07,440	308271	1019151
Any Other	50,000	5,000	10,000	65,000
Total Budget	30,93,040	23,57,040	23,63,411	78,13,491

Manpower Requirements:

Research Associate (1)

Research Fellows (JRF/SRF) (1)

Field Assistant (1)

EQUIPMENT (Revised)	No of Units
Computer GIS	1
Netbook field data collection	1
High resolution GPS	1

The PI made a presentation before the Committee. It was informed that emerging infectious diseases (EIDs) is one of the greatest challenges to mankind with their recent, human-mediated proliferation through introduced species and climate change. In a community with such diseases, major outstanding questions concern the contrasting roles of evolutionary history and ecology. Of particular significance are vector-borne diseases such as avian malaria (AM), which is caused by *Haemosporidian* parasite genera (e.g. *Plasmodium*, *Haemoproteus* and *Leucocytozoon*). AM has been associated with large-scale mortality when introduced into naive bird communities on isolated communities like islands. Continental habitat islands, such as montane sky islands, including the Western Ghats (WG) Shola Sky Islands, have different levels of isolation and several similarities with oceanic islands (Gillespie Roderick 2002). Isolated communities like those on islands go

through contractions and expansions of ranges, with local extinctions (taxon cycling). Some of these are possibly due to AM or other pathogens, that can severely impact insular communities.

It was informed that the study will: 1) Map the extent of Alien Invasive timber plantations in the Sky Island system 2) Examine Emerging Infectious Disease in an avian system, across multiple Protected Areas that can serve as a baseline database 3) Examine interactions of Emerging Infectious Disease with the increasing spread of Alien Invasive species. Coverage of Protected Areas: A network of Protected Areas and reserve forests covers the Shola Sky Island landscape. Scope of project has been reduced and project duration increased to 3 years and the budget also has been proposed for 3 years. Genetics component of the study has been dropped. Equipment for genetics has also been deleted. Lab Assistant (1) has been deleted. The total cost of the project has reduced from Rs.102,07,791/- to 78,13,491/-.

It was stated that in this study, the impact of alien invasive species (exotic timber trees like Acacia, Eucalyptus and Pine) on the spread of disease (Avian Malaria – infects only birds) across the Shola Sky Island system would be studied. Detailed maps with high resolution Remote Sensing, and establish plots will be generated which will capture birds (for ~10 minutes) and blood samples collected to understand bird and parasite genetics with advanced Next Generation Sequencing techniques.

It was informed that the coverage of area include nine National Parks, twenty Wildlife Sanctuaries and twenty seven Reserve Forest Divisions of the Shola Sky Islands. There has been no systematic examination of avian malaria in these landscapes. A better understanding of the spatio-temporal dynamics of vector-borne disease requires a more nuanced understanding of how the dynamics and distribution of parasites, vectors, and hosts interact in space and time (Lambin et. al 2010). The results will be utilised to develop a model to assess the sensitivity of avian malaria dynamics to alterations in bird community structure, within a GIS framework, and thus identify key species (or functional groups) that critically impact disease dynamics. The identification of such key species (or functional groups) will improve the understanding of disease dynamics in natural communities, and such species (or functional species groups) could also be used as indicators of ecosystem health in the future.

The Committee noted that the travel cost is very high i.e. Rs. 20,27,700/- but observed that the area of coverage extends to nine National Parks, twenty Wildlife Sanctuaries and twenty seven Reserve Forest Divisions on these Shola Sky Islands and agreed to the same.

The Committee after deliberation recommended the project for funding.

6.No.317/2018/RE: Project on “Ecological assessment of endemic and threatened Laughingthrushes of the Western Ghats to develop conservation plan for securing their population and habitats PI: Dr. S. Babu, Senior Scientist, Salim Ali Centre for Ornithology and Natural History, Anaikatty, Coimbatore 641108, Tamil Nadu.

The proposal was considered by TFAC in its 4th meeting held on 29.05.2019.

In the meeting held on 29.05.2019, PI had informed that the Western Ghats are hotspots of the world - biological diversity and high-degree of endemism with nearly 40% of India's bird diversity with at least 16 endemics - tropical montane forests (1400 – 2695 m). Montane forests are associated birds endure both regional (habitat loss, monoculture plantation,

invasive weeds, developmental activities etc.) and global (global climate change) level intimidations to their life. Restrict and reduce the species ranges (elevation range) to a narrow pocket. Both regional and global level threats on the species range of the Western Ghats endemic birds have not been appraised. Predicting potential distribution of Laughingthrushes (Banasura Laughingthrush, NilgiriLaughingthrush, AshambuLaughingthrushSps out of 27 species of Laughingthrush in India, 5 sps. are found in Western Ghats) will be carried out by compilation of occurrence locations: ebird-India, GBIF, oriental bird images, other published literature, Environmental variables– climate, Vegetation and terrain (elevation, slope- Extracted from DEM) would be studied.

Occurrence locations and environmental variables will be checked for spatial autocorrelation and multi-collinearity respectively using SDM toolbox. MaxEnt – Maximum Entropy algorithm (Phillips *et al.*, 2006; Elith *et al.*, 2011) will be followed. Binary layer conversion– 10 percentile training presence / minimum training presence logistic threshold will be followed. Map of potential areas will be masked with area above 1200 m elevation and this will be the base map for further sampling. Grid based occupancy framework will be followed. Two sq km spatial grids will be generated using Geospatial Modelling Environment – overlaid on base map to identify individual sampling unit. Spatial replicate will be applied to estimate detection probability (p) of Laughingthrushes. Grids will be subdivided into four 700 X 700 m sub-grids to calculate. Within each sub-grid, a 500 m transect will be laid – presence and absence of Laughingthrushes and habitat covariates (both sampling and site covariates that influence the detection probability (p) and occupancy (ψ) of Laughingthrushes). Intensive sampling area will be selected based on the results of occupancy survey. Major LULC types within Laughingthrushes distribution range will be prepared from satellite images. Vegetation sampling and phenology, nest-site selection of Laughingthrushes. Maxent models will be generated with additional set of occurrence locations for all species. Conservation plan will be prepared.

The Committee had desired that the PI should first discuss with the concerned State Forest Departments and formulate a joint proposal for the conservation of the Laughingthrushes in Western Ghats and resubmit to the Committee for consideration.

Duration: The project is for a period of **3 years**.

Geographical location of the project:

S.No	State	District	Sub - District	Latitude	Longitude
1.	KARNATAKA	KODAGU	NA	11.951	75.948
2.	KERALA	KOLLAM	NA	8.83	77.226
3.	KERALA	KOZHIKODE	NA	11.390	76.055
4.	KERALA	MALAPPURAM	NA	11.263	76.480
5.	KERALA	PALAKKAD	NA	10.932	76.617
6.	KERALA	THIRUVANANTHAPURAM	NA	8.563	77.226
7.	KERALA	WAYANAD	NA	11.590	75.9728
8.	TAMIL NADU	COIMBATORE	NA	10.927	8.417
9.	TAMIL NADU	KANNIYAKUMARI	NA	8.417	77.351
10	TAMIL NADU	THE NILGIRIS	NA	11.461	76.590
11	TAMIL NADU	TIRUNELVELI	NA	8.760	77.289

Objectives of the Project:

1. To assess the structure and composition of vegetation in different habitats of Laughingthrush and phenology of food plants of Laughingthrushes.

2. To elucidate the distribution pattern and abundance of Banasura Laughingthrush *Montecincla jerdoni*, Nilgiri Laughingthrush *Montecincla cachinnans* and Ashambu Laughingthrush *Montecincla meridionalis* in the Western Ghats.
3. To identify the factors that influence the habitat and nest-site selection of these Laughingthrushes
4. To evaluate the extent of anthropogenic pressures on the population of Laughingthrush in the Western Ghats and develop a conservation plan for these species to secure their population and habitats.

Expected outputs of the project:

1. Area of occupancy (AOO) or distribution range of all Laughingthrushes will be demarcated and quantified in the Western Ghats. Important areas for the conservation of all species will be prioritized.
2. Current distribution range of Laughingthrushes will be compared with future climate scenarios and the amount of area reduced in response global warming will also be estimated.
3. A minimum population size of all target species will be estimated within their distribution range. Habitats that support high density of Laughingthrushes and nests will be identified.
4. Anthropogenic pressure that influences either directly or indirectly will be quantified. Implementable recommendation for the conservation and management of the species will be drawn based on the results of the study.
5. A spatial atlas on these species emphasizing population, important areas and threats acting on them will be prepared. It will be distributed to all local stakeholders involved in the conservation of these species.
6. A comprehensive conservation plan for three species will be prepared by compiling both primary and secondary information available.
7. Publication of results as peer-reviewed articles in reputed journals. Research Fellows will be allowed to register for their Ph.D.

Expected outcome of the project:

Data generated and conservation plan prepared on the target species will facilitate the conservationist, forest managers and policy developers to implement effective on-ground conservation initiatives on Laughingthrushes and other high-elevation endemic birds of the Western Ghats.

Measurable Outcome

1. Species range map of select Laughingthrushes of the Western Ghats.
2. The effect of global warming on species range of endemic Laughingthrushes in different climate scenarios
3. Population size of Laughingthrushes
4. Important areas for the conservation
5. Conservation plan on Laughingthrushes
6. List of man-power trained/involved the project.

Revised Cost of Project (in Rs. lakhs):

Tenure	1 st Year	2 nd Year	3 rd Year	Total Budget
3 years	20.01	15.97	17.73	53.71

(Revised) Component-wise break-up of cost of the project (In Rs. lakhs) is given below:

COMPONENT	Year 1	Year 2	Year 3	Total Cost
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Salary	9.87	9.87	10.54	30.28
Equipment	3.25	0.00	0.00	3.25
Consumables	0.25	0.25	0.25	0.75
Travel Cost	3.08	3.08	3.07	9.23
Contingency	0.25	0.25	0.25	0.75
institutional Charges	2.51	2.02	2.12	6.65
Any Other	0.80	0.50	1.50	2.80
Total Budget	20.01	15.97	17.73	53.71

(Revised) Details of manpower and equipment required for the project is given below

JRF/SRF-2 (Technical); Field Assistant -2

Details of equipment required under the project are given below:(Revised)

S.No.	Equipment	No of Units
1.	GPS	2
2.	Camera Traps	5

PI made presentation before 8TH TFAC meeting held on 26.09.2019. It was informed the concerned State Forest Department (Kerala & Tamil Nadu) been incorporated in the project as co-investigators. PCCF of Tamil Nadu has nominated the Director and Addl. PCCF, Advanced Institute for Wildlife Conservation, Chennai as a co-investigator for Tamil Nadu part. Likewise, the PCCF of Kerala has nominated Additional Chief Conservator of Forest, Agastiyavanam Biological Park Circle, as a co-investigator for Kerala part. The consent letter from the PCCFs of Tamil Nadu and Kerala obtained. NOC from Shri Sanjay Kumar Shrivastava, PCCF, Panagal, Saidpet, Chennai obtained vide letter no WL5A/22942/2019 Dated 21.08.2019 and PCCF(WL) & Chief Wild Life Warden, Thiruvanthapuram vide letter no KFDHQ-3478/2019-CWW/WL/WL-10 dated 22.06.2019. The budget of the project has been reduced from Rs. 93.73/- lakhs to Rs 53.71/- lakhs.

The Committee noted that the PI proposed 3 motorcycles under travel cost which cannot be agreed to; the PI may however hire 2 motorcycle for 6-7 months in each of the 3 years for use in field work and the budget of the same should be accordingly revised in travel cost/head. Shri Neeraj Kumar, Additional Principal Chief Conservator of Forest, Kerala State Forest Department would be included as Co-PI in project. A letter from PCCF, Govt of Kerala on his letter head should be submitted to Ministry.

The Committee after deliberations recommended the above project for funding subject to the above conditions.

8. No.313/2018/RE: Project titled **“Population Status, Ecology and Conservation of the Indian Swiftlet (*Aerodramus unicolor*) in the West Coast and Offshore Islands of Maharashtra”**. PI: Dr. Manchi Shirish S., Senior Scientist, Salim Ali Centre for Ornithology and Natural History, Anaikatti P.O., Coimbatore 641108

The proposal was considered by TFAC in its 4th meeting held on 29.05.2019.

In the presentation made by PI in the meeting held on 29.05.2019 before Committee, the PI had informed that there are three Himalayan Swiftlet *Aerodramus brevirostris*, Indian Swiftlet *Aerodramus unicolor*, Edible-nest Swiftlet *Aerodramus fuciphegus*, Glossy Swiftlet *Collocalia esculenta*. The species are endangered as the nest made with its saliva is a delicacy and is threatening the survival of edible-nest swiftlets throughout their distribution ranges. During the past three to four decades, there has been a high demand in

international market for the nest of these bird species, which has led to uncontrolled harvesting and overuse that is directly affecting the populations of these cave-dwelling species.

The present study involves study of the Indian Edible-nest Swiftlet from Western Ghats and the offshore Islets and from southern Maharashtra to Kerala and Sri Lanka. The studies will be carried out by locating caves, estimating population, breeding population and non-breeding population. Using locations of the caves, distribution map of the species will be generated. Intensive Study Areas (ISA), and Select ISA spatially based on the population size and accessibility would be mapped. Periodic visit will be conducted to the numbered nests to understand breeding biology, chronology and success throughout its distribution. Habitat studies, Breeding habitat, Foraging habits and habitat. 6 colonies in Northern and 6 colonies in Southern Western Ghats will be selected and Birds will be captured using Mist-Nets Capture at the cave opening during dawn or dusk while leaving or returning to roost. Once capture the bird, collect morphometric data such as lengths of wing, tail, body, bill, tarsus and others Plumage Moulting will be studied. Molecular characterization will be studied.

The Committee had observed that the PI's objective to study speciation (which is an evolutionary process) cannot be carried out as the work plan outlined does not provide information on speciation. Also, the study involves the Indian Black Swiftlet, and hence the title of the project should specify Indian Swiftlet (Black). The Committee desired that a letter from the State Forest Depts. of the concerned Western Ghats States be obtained. The letters of the State Governments must should clarify that no such study has been undertaken in the past. Habitat modelling needs to be carried out. The Committee desired that the PI should study the distribution pattern and its relationship with local communities, population status, ecological issues, anthropogenic factors. The objectives should be sharply focussed. The title should also require modification. The Committee was of the view that molecular characterisation (genetic study) should be deleted from the scope of the project. The budget should be revised and the PI should also discuss the project with authorities of Nilgiri Biosphere Reserve. The Committee had decided that that the proposal should be revised and submitted online for further consideration.

Details of Co-PI: Dr. Ram Pratap Singh Salim Ali Centre for Ornithology and Natural History, Anaikatti P.O., Coimbatore 641108

Project duration: 3 years

(Revised) Geographical location of the project:

S.No	State	District	Sub -District	Latitude	Longitude
1.	MAHARASHTRA	MUMBAI	Mumbai	19.074112	72.877604
2.	MAHARASHTRA	PALGHAR	NA	19.690419	72.768182
3.	MAHARASHTRA	RAIGAD	NA	18.670435	73.070386
4.	MAHARASHTRA	RATNAGIRI	NA	17.335839	73.452736
5.	MAHARASHTRA	SINDHUDURG	NA	16.327180	73.559067
6.	MAHARASHTRA	THANE	NA	19.350525	73.177096

(Revised) Objectives of the Project:

1. To estimate the population and evaluate the distribution pattern of the Indian Swiftlet in the Coastal Districts including offshore islands of Maharashtra
2. To understand breeding ecology (breeding biology and nesting and foraging habitat) of the Indian Swiftlet in the Coastal Districts including offshore islands of Maharashtra.

- To identify threats, and formulate the Conservation Plan for the Indian Swiftlet in the Coastal Districts including offshore islands of Maharashtra.

(Revised) Expected Outputs of the project:

- Initiate the Population status and distribution survey and the data collection to identify threats to the species in the region.
- Population status and distribution survey completed. Species distribution maps generated. Threat analyses on-going. An initiated ecological study of the species at the selected sites. Continuing the data collection to explore threats to the species in the region
- Population, distribution, breeding ecology, and threats to the species are understood and documented. Conservation plan for the Indian Swiftlet prepared based on the scientific understanding of the species, is submitted to the MoEFCC.

(Revised) Expected outcome of the project:

- Information/data generated for conservation and population recovery of the Scheduled-I species
- Baseline information for species management throughout its distribution range
- Baseline information on distribution of caves in the Western Districts of Maharashtra
- A conservation plan, formulated based on the scientific information of the species for further implementation. The report will also be shared with the concerned State Forest Departments for further required management action.

Break up of Project(Revised)

Tenure	1st Year (in Rs.)	2nd Year (in Rs.)	3rd Year	Total Budget (in Rs.)
3 years	3093040	2357040	2363411	7813491

COMPONENT	Year 1 (In Rs.)	Year 2 (In Rs.)	3rd Year	Total Cost (In Rs.)
Salary	1245600	1245600	1297440	3788640
Equipment	495000	0.00	0.00	495000
Consumables	106000	6000	6000	118000
Travel Cost	693000	693000	641700	2027700
Contingency	100000	100000	100000	300000
Institutional Charges	403440	307440	308271	1019151
Any Other	50000	5000	10000.00	65000
Total Budget	3093040	2357040	2363411	7813491

The details of manpower required for the project is given below:

SRF1 and 2 field Assistants

Details of equipment required under the project are given below: (Revised)

S.N.	Name	No. of units
1.	Binoculars - (Model: Nikon Monarch 5) (for identification of the species in close range)	1
2.	Spotting scopes with accessories – (Model: Vanguard Endeavor HD 20-60x82) (for identification of the species in long range)	1
3.	High-sensitive GPS (Model: Garmin Oregon 750) (for mapping the foraging and nesting locations)	1

PI made presentation before the Committee. It was informed that under Objective 1-the work involves Locating caves using existing literature, discussing with the researchers and local people; Estimating population(breeding by nest method & non-breeding by Roost Count Method);using locations of the caves to generate a distribution map of the species; objective -2 involves From survey results identify the Intensive Study Areas (ISA)-Select ISA spatially based on the population size and accessibility by Conducting periodic visit to the numbered nests. Habitat studies involves Meteorological Data (inside caves);Nest site surface characters,Cave Morphometric Characters and Habitat Modelling etc. Foraging Habits and Habitats and later the Data will be analyzed to understand the crucial foraging habitats for the species. Objective 3-Snowball Survey; Compilation of the outputs of Objective 1 and 2Identify the conservation requirements, Prepare the conservation plan for the species. It was informed that the common English name of the study species is recognized by all the national and international authorities and related literatures as Indian Swiftlet. As the scientific name of the species is given in the title, adding 'black' will not serve any purpose. Hence the word "black" is not added in the title. Habitat modelling was already part of the proposal. The letter no. 22(8) Research/CR-39(18-19)/1324-2019-2020 Dated 4.7.2019 received from Principal Chief Conservator of Forest (Wild Life), State Forest Department, Ramgiri, Nagpur Maharashtra obtained. .Thebudget is revised and brought down to Rs49.77 lakhs from Rs 438.42 lakhs as all the States except Maharashtra has been deleted from the study.

The Committee noted that the PI has restricted the area of study only to the State of Maharashtra as most of the population of Indian Swiftlet are found in Maharashtra. The Committee desired that detailed ecological studies should be carried out under the project. The PI should study the viable population of Indian Swiftlet, status of poaching, etc. The population status of Swiftlet should be obtained from State Forest Department, if available. The Committee recommends the sanction of Bilocular-1, GPS-1,Spotting Scope -1 SRF1 and 2 Field Assistants.

The Committee after deliberations recommended the project for funding subject to above conditions.

- 8. No. 275/2018/RE: "Tracking and assessment threats of highly critically endangered scaly giant (*Manis pentadactyla*) with special reference to sensitization of local communities for its long-term conservation in north-eastern states of India".** PI: Dr Janmejay Sethy, Assistant Professor, Amity Institute of Forestry and Wildlife, Amity University, Gautam Budhh Nagar, Noida 201303, Uttar Pradesh.

The project was not considered as the PI had sought deferment to the next TFAC meeting.

- 9. No. 249/2018/RE: Project on "Assessment of the status of endemic and threatened plants across the protected areas of Arunachal Pradesh".** PI Dr.Navendu Page, Scientist – C, Wildlife Institute of India, Chandrabani, Dehradun, Uttarakhand. Co-PI: Dr. Gautam Talukdar, Scientist – E, Wildlife Institute of India. The proposal was considered by TFAC in its 1st meeting held on 15.03.2019.

The Committee had desired that the WII study should be in collaboration with BSI so that there is no overlapping/duplication of work. The Committee, had after deliberations, recommended the project for funding withBSI being as co-PI/co-institution of the project. In addition the State Forest Department must also be involved. The Committee had after

deliberations decided that the PI should revise the proposal in the light of suggestions made by the Committee and resubmit it for further consideration for funding of the project.

Details of the Project: The project is for a period of 3 years. The geographical locations of the project are Boleng, Siang in the State of Arunachal Pradesh.

PI/Co-PI had made a presentation before the Committee. In response to Committee's observation that a number of studies have been carried out by ZSI and BSI, it had been clarified that the present study would in addition to inventorisation, also undertake studies on spatial distribution of the endemic and threatened species. It was stated that Arunachal Pradesh is by and large unexplored and inaccessible. The PAs are very large and the biodiversity thereon have not been inventoried. BSI has done work but has not brought out State level reports on the flora of NE India. The present project would cover all the PAs of the State of Arunachal Pradesh.

Objectives of the project:

- i. To generate a comprehensive database on the distribution of endemic and threatened plants of north-east India with a special focus on the state of Arunachal Pradesh.
- ii. To identifying priority species for conservation by carrying out species conservation status assessment using IUCN red list criteria.
- iii. To produce a pictorial book on the distribution and conservation status of endemic and threatened woody plants of north-east India.

(Revised)Cost of the project and year-wise break-up of the cost (in Rs)

Tenure	1 st Year	2nd Year	3rd Year	Total Budget
3 years	2501520.00	1891520.00	3199200.00	75,92,240.00

The component-wise break-up of cost of the project is given below (in Rs.)

COMPONENT	Year 1 (In Rs.)	Year 2 (In Rs.)	Year 3 (In Rs.)	Total Cost (In Rs.)
Salary	5,51,520	5,51,520	5,59,200	16,62,240
Equipment	5,10,000	0.00	0.00	5,10,000
Consumables	3,70,000	2,70,000	2,70,000	9,10,000
Travel Cost	7,50,000	7,50,000	7,50,000	22,50,000
Contingency	50,000	50,000	50,000	1,50,000
Institutional Charges	0.00	0.00	0.00	0.00
Any Other	2,70,000	2,70,000	15,70,000	21,10,000
Total Budget	25,01,520	18,91,520	31,99,200	75,92,240

The details of manpower and equipment required for the project is given below:

1 Research Fellow (JRF/SRF), 1 Expert and 2 Field Assistants are required for the project. Details of equipment required under the project are given below:

S.N.	Name	No of Unit
1	Camera with lens	1
2	Binocular	1
3	Camera flash	2
4	Tripod	1
5	Densiometer	1
6	Range Finder	1
7	GPS	1
8	Pocket Weighing Balance	1

Expected outputs of the project:

- i. Final technical report highlighting the results and the findings of the study will be submitted to the steering committee and ministry.
- ii. Key findings of the study will be presented in conferences as well as published in peer reviewed scientific journals.
- iii. Copy and details of the research publications resulting from the study will also be submitted at the time of submission of the final technical report.
- iv. Project findings such as distribution maps and photographs will be integrated in open source online databases such as North-East Biodiversity Portal and the India Biodiversity Portal.
- v. A pictorial book featuring the endemic and threatened plants of north-east India along with their distribution and threat status will be produced.

Expected outcome of the project:

- i. The information generated on the geographic distribution of endemic and threatened species will serve as a baseline for the ministry and other bodies for taking necessary decisions on management and conservation of these species.
- ii. Species distribution maps and priority species and areas identified would help in developing species recovery plans and other such conservation policies in north-east India.
- iii. This information and data will be available to a wide range of stake holders through online data portals and books. This will empower them to take informed decision while planning and executing their research and in making conservation recommendations.
- iv. The database on distribution and status of endemic species will certainly help reduce the existing gaps in our knowledge and further help in identifying the remaining gaps that need to be addressed.

PI made presentation before 8th TFAC meeting held on 26.9.2019. It was informed that Dr A.A.Mao, Director, Botanical Survey of India sent letter dated 16.5.2019 expressing inability to collaborate with project as they don't have manpower at BSI, Itanagar and has stated that only technical help can be provided from BSI. BSI has also informed vide letter no. BSI-295/1/2018 dated 21.05.2019 that Dr Umesh Tiwari, Scientist 'C', BSI-APRC may not be able to co-ordinate the above project due to preoccupation. PI has also written letter no. WII/Misc./07/2019 dated 10.07.2019 to PCCF (Wildlife) and Chief Wildlife Warden, Department of Environment and Forest, Itanagar, Arunachal Pradesh however response is awaited.

The Committee noted that the inclusion of the cost of publication of the book noted that the inclusion of the cost of publication of the book in 3rd year by Rs1570000/- budget pushed the 3rd year budget to Rs15,70,000/- which is very high and a decision will be taken on the publication of book after the outcome of the project. The Committee desired that PI should select around 100 no number of species in the study area.

The Committee after deliberations decided that the present proposal is not recommended for funding in its present form and a revised project should be submitted afresh online after incorporating the objectives of the Project at **Item No.11**. Recommendations of PCCF, Arunachal Pradesh and Directors of BSI and ZSI and also experts co-opted should be provided in the revised proposal.

10. No.247/2018/RE: Project on “**Quantification of Plastic debris in the Coastal Ecosystem of Gulf of Kachchh Marine Protected Area (GOKMPA) and assessing the Environmental Damage**”. PI: Dr. Anju Baroth Scientist C, Department for Habitat Ecology, Wildlife Institute of India, Dehradun. Co-PI of the project: Dr. K. Sivakumar, Scientist-F (uploaded) Dr. Gautam Talukdar, Scientist E, Wildlife Institute of India.

The proposal was considered in the 1st TFAC meeting held on 15.03.2019.

Details of the original Project: The project is for a period of 3 years. The geographical location of the original project covered the States of Tamil Nadu, Andhra Pradesh, West Bengal, Gujarat, Maharashtra, Odisha, Kerala, Karnataka.

In the presentation made to the TFAC in the meeting held on 15.03.2019, the PI had informed that the National Geographic Society is partnering with WII to examine the use and migration of plastics from source to the sea. The present project would combine a Desk study involving collection of secondary data on plastics and specifically field studies on the impacts of plastics on coastal and marine ecosystems of all the coastal States in the country.

The Committee had observed that the entire project appears to be a desk study based on secondary data. Secondly, the objectives set out in the study do not directly come in the mandate of WII. The Committee was of the view that the project needs to be modified to estimate the extent of plastics in coastal and marine environment of just one State, since the data collection even for one State is an enormous task, the Committee was of the view that the PI must focus on just one State and involve Universities, Colleges etc for collecting data. It was informed that for undertaking data on beaches of 8 metro cities, the National Centre for Coastal Research, Chennai has engaged Universities at a nominal cost of Rs 50,000/- per university. After deliberations, the Committee decided that the project be revised to undertake a study on assessment of extent of plastics entering the coastal and marine environment of one State only covering the major metros and their beaches. The study need not cover the aspect of micro plastics entering the food chain. One university which could be associated and could be used as a Centre for the study and hence provision made for base camp, etc could be avoided. The project cost requires revision, as cost for travel, salary for fellows, volunteers etc will also be greatly reduced by restricting the study to one State. The Committee after deliberations decided that the project requires major revision and the PI should revise the project in light of Committee's comments and in consultation with NCCR, Chennai and resubmit it for reconsideration. Outcomes of the Project should be shared for preparation of specific Action Plan in consultation with the State Government.

(Revised) Objectives of the project:

1. Generate baseline data on plastic debris/waste in Gulf of Kachchh Marine Protected Area (GOKMPA)
2. Assess environmental impact of the most abundant plastic waste quantified in GOKMPA
3. Evaluate the Monetary value of environmental damage done due to plastic waste in GOKMPA

(Revised) Expected Outputs:

- i. First time generation of baseline data on plastic waste in a marine protected area
- ii. First time integration of plastic waste from a marine protected area with life cycle environmental impact of plastic
- iii. First time evaluation of monetary value of environmental damage that is caused by plastic waste in a marine protected area.

(Revised) Outcome:

1. The project will create baseline for plastic pollution assessment in coastal states of India (can be replicated along PA and non PA). The outputs generated through this study will help MoEFCC identify most ecological damaging type of plastic industry and can ensure compliance from these industry under Plastic Waste Management Rule, 2016
2. As a part of MoEFCC commitment towards Convention on Biodiversity, the study will facilitate MoEFCC meet the Aichi target 8, 11, 14 and 19. 3. The study will also help MoEFCC meet the SDG 6, 12, 13, 14 and 15. 4. A road-map for conservation and clean up of coastal protected areas for India.

(Revised) Cost of the project and year-wise break-up of the cost (in Rs):

Tenure of the project	1st Year	2nd Year	3rd Year	Total Budget
3 years	40,40,465	24,67,115	0.00	65,07,580

(Revised) Component-wise break-up of cost of the project (in Rs) is given below:

COMPONENT	Year 1 (In Rs.)	Year 2 (In Rs.)	Year 3 (In Rs.)	Total Cost (In Rs.)
Salary	15,90,240	14,94,240	0.00	30,84,480
Equipment	6,00,000	0.00	0.00	6,00,000
Consumables	9,45,000	1,57,500	0.00	11,02,500
Travel Cost	6,30,000	6,30,000	0.00	12,60,000
Contingency	79,225	48,375	0.00	1,27,600
Institutional Charges	0.00	0.00	0.00	0.00
Any Other	1,96,000	1,37,000	0.00	3,33,000
Total Budget	40,40,465	24,67,115	0.00	65,07,580

The details of manpower and equipment required for the project is given below:

Research Associate 1 JRF 2 Field Assistant 2

Revised

S.N.	Name of Equipment	No of Unit
1	LCA Software	1
2	GPS	6
3.	Binoculars	6

PI made presentation before committee. It was informed that **Objective 1: PI Generate baseline data on plastic debris/waste in Gulf of Kachchh Marine Protected Area (GOKMPA)** Primary data will be collected through standing stock survey of the GOKMPA. Following protocol will be used for the standing stock survey (NOAA Marine Debris Shoreline Survey Field Guide, 2012):later Site Selection, Shoreline Characterization, Standing Stock Survey. **Under Objective 2: Assess environmental impact of the most abundant plastic waste quantified in GOKMNP**-The primary data collected from objective 1 will be used. Plastic waste will be categorized into different types. A Life Cycle Assessment will be conducted for the plastic waste which is found most abundant in GOKMPA, to assess the potential ecological, environmental and human health impacts. Modelling through LCA software using ISO 14040:2006. Impact of Climate change, Ozonedepletion, Terrestrialacidification, Freshwatereutrophication, Human toxicity,Photochemical oxidant formation, Particulate matter formation, Terrestrialecototoxicity, Urban land occupation, Fossil depletionwill be assessed.**Under objective-3:Evaluate the monetary value of the environmental damages.** The methodology is adopted from UNEP Natural Capital Cost framework (2014). Impact End points from **Objective 2** will be quantified for environmental, social and economic cost as per the standard UNEP framework.Number of project personnel increased from 2 to 5 to fulfill the field component of the vast landscape. Plus with recent increase in the fellowship of Researchers by DST/CISR, there is an increase in the salary head from Rs. 26,16,960/- to Rs 30,80,480/- (increased Rs. 4,67,520/-) Thus overall budget has been revised to **Rs. 65,07,580/-** from Rs. **70,74,899/-** (Decreased Rs. 5,67,319/-).

The Committee noted that the Ministry of Environment and Forest on 9 September 2013 had declared India's first marine eco-sensitive zone around Marine National Park in Gulf of Kutch, Gujarat. This decision prohibits any industrial activity in the area. The ministry declared 313 sq km around the park as an eco-sensitive zone through a notification. Of this, 208 sq km is land while the remaining is on the seaside.The Notification states that land use for recreational, commercial or industrial development will not be permitted in the area except for residential purpose. Mining, including fresh water mining, and release of polluted water and waste will also be prohibited. The ministry even disallowed fishing by trawlers.

The Committee noted that PI has selected the State/location without knowing the magnitude of plastic pollution. It was observed by the Committee that PI has not assessed whether the PA and the ESZ selected for the study requires such a study being carried out nor has surveyed the literature.

The Committee after deliberations did not recommend the project for funding.

11. 250/2018/RE: Project on “**Ecological impacts of major Invasive Alien Species on native flora in Pakke Tiger Reserve, Arunachal Pradesh in North-East India**”. PI: Dr. Amit Kumar, Scientist – C, Wildlife Institute of India, Chandrabani, Dehradun, Uttarakhand. Co-PI: Dr. B.S. Adhikari, Scientist F, Prof. Qamar Qureshi, Dr. Navendu Page, Dr. G. S. Rawat, Wildlife Institute of India.

The proposal was considered by TFAC in its 1st meeting held on 15.03.2019.

In the presentation made to the Committee in the meeting held on 15.03.2019, it was informed that an estimated 2.6% of the geographical area of the country is covered with invasive alien species (IAS). It was stated that exhaustive studies on *Lantana* and *Parthenium* have been carried out. It was stated that the present project is to undertake studies on present status of invasive alien species in on PAs of three different geographical regions of 3 Tiger Reserves – Rajaji NP in Uttarakhand, Paki NP in Arunachal Pradesh and Kanha NP (MP) in Central Highlands of India and the ecological impacts of weed infestation in these PAs. The project would involve studies on biotic pressures, soil characteristics and wildlife movement.

The Committee had noted that studies on specific nutritional status of weed infested habitats and ecosystems have been already done. The most effective method of removal of weeds would be to physically remove the weeds and repeat the process for few years until the weed has been completely removed from such areas. However, the success of the exercise depends upon the restoration of weed free landscapes to their original natural state of ecosystem. The Committee was of the view that the project should be revised focussing on this issue and restrict studies to one PA. The Committee was also of the view that the cost of travel of Rs 15 lakhs and Contingency of Rs 15 lakhs provided in the budget is on the higher side. The Committee after deliberations, decided that the proposal should be resubmitted after revision in the light of Committee’s observations for reconsideration.

Project Duration: The project is for a period of 3 years.

(Original) Geographic Location: The geographical location of the project is in 3 Protected Areas (PAs) in Uttarakhand (Rajaji National Park), Madhya Pradesh (Kanha National Park), Arunachal Pradesh (Pakhe National Park).

Revised Project: The project is restricted to one PA, namely Pakke Tiger Reserve, Arunachal Pradesh.

Objectives of the project:

1. To study the invasion patterns of alien plants in terrestrial ecosystems of selected PA
2. To assess the ecological impacts of invasive alien plant species on native flora in selected PA
3. To suggest ecological restoration measures.
4. To assess the efficacy of various management practices in controlling the invasion of alien species

Expected outputs of the project:

1. Technical report highlighting the results of the study
2. Baseline information on the status and distribution pattern of invasive alien species
3. Evidence based experimental design to curb the invasion for better management of PAs
4. Training of front line staff of forest department to monitor invasive alien species

Expected outcome of the project:

1. Patterns of diversity of invasive alien species as well as native flora (inter-species competition).
2. Influence of invasive alien species on native flora across the invasion gradients
3. Spread and patterns of invasion for conservation planning
4. Mapping and management guidelines for the control of invasive alien species

(Revised) cost of the project and year-wise break-up of the cost is given below:

Tenure	1st Year (in Rs.)	2nd Year (in Rs.)	3rd Year (in Rs.)	Total Budget (in Rs.)
3 years	2755760	1755760	1545760	60,57,280

The component-wise break-up of cost of the project is given below:

COMPONENT	Year 1 (In Rs.)	Year 2 (In Rs.)	Year 3 (In Rs.)	Total Cost (In Rs.)
Salary	1205760	1205760	1145760	3557280
Equipment	500000	0.00	0.00	500000
Consumables	500000	0.00	0.00	500000
Travel Cost	400000	400000	200000	1000000
Contingency	50000	50000	50000	150000
Institutional Charges	0.00	0.00	0.00	0.00
Any Other	100000	100000	150000	350000
Total Budget	2755760	1755760	1545760	60,57,280

PI did not attend the meeting. Dr. Navendu Page (Co-PI made a presentation before the Committee. It was informed that the native plant assemblages and their relationship with abiotic parameters such as physico-chemical properties of the soil (texture, pH, WHC, OC, N, P, K) and biotic viz. grazing will be quantified. The Protected Area(PA) will be assessed through efficacy of the past management through management plan. Understand the status and distribution of native flora including invasive alien species especially past growth trends. As per the comments, title has been renamed as '**Ecological impacts of major Invasive Alien Species on native flora in Pakke Tiger Reserve, North-East India**'. As suggested, abbreviation "IAS" has been removed. Number of PAs/sites has been reduced from three to one. One new Objective -3 has been added i.e. To suggest ecological restoration measures. Budget has been revised, and reduced from 77,34,880/- Rs. to 60,57,280/-

The project of Dr. Navendu Page (WII) on "**Assessment of the status of endemic and threatened plants across the protected areas of Arunachal Pradesh**" (includes Pakke Tiger Reserve) and the project of Dr. Amit Kumar (WII) on Alien Invasive species is to be implemented in one PA of Arunachal Pradesh i.e. Pakke Tiger Reserve. The Committee suggested that both the projects should be integrated into one single project under **Item No 9** and re-submit the revised project as a fresh project for further consideration.

The Committee did not recommend the project for funding in its present form.

II CONSIDERATION OF ON-GOING PROJECTS UNDER OLD R&D SCHEME:

12. F.No.19-68/2012-RE: Project on **“Development of Hybrid Nanomaterials – based water filters for affordable potable water”**. PI: Dr. V. Alexander, Department of Chemistry, Loyola College, Chennai.

Project Details: This ongoing project was started on 1st January, 2016 for a period of 3 years with a total cost of Rs. 71,78,000/-. The tenure of the project was over on 31st December, 2018. A total of Rs47,14,160/- has been released so far out of approved project cost of Rs71,78,000/-. PI submitted utilization certificate, GFR 19 during the meeting. Progress report, ES and GFR 12A for FY 2017-18 have also been received.

The TFAC in its 3rd meeting held on 17.05.2019 had sought details sought by Steering Committee in its meeting held on 28.09.2018 to be addressed in the FTR as an Addendum Report

The Screening Committee had sought details of the following:

- i) Balance work to be completed and time frame for completion.
- ii) Comparative table of the techno-economic feasibility and efficacy and long-term sustainability of the technology be furnished in terms of all the physico-chemical parameters of water treatment as per ISI standards by conventional treatment vis-à-vis the present technology in the Final Technical Report at the stage of completion of the project.
- iii) Cost effectiveness of the technology for achieving ISI standards vis-a-vis conventional technology.

The project was discussed internally in 8th TFAC meeting held on 06.09. 2019 as the PI could not attend the meeting and had requested its consideration internally by the Committee. It was noted that the PI has submitted Addendum Report to FTR on the points raised in 4th Meeting of Steering Committee held on 28.09.2018 vide e-mail dated 23.09.2019.

The Committee after deliberations of the Addendum Report decided that the project may be closed and recommended release of balance payments, if any, upon submission of all requisite documents such as Consolidated UC, ES, etc.

13. F.No.19-79/2013-RE: Project on **“Remediation of Ground Water Contaminated with Hexavalent Chromium in Sukinda Valley, Odisha, Using Nano Zero Valent Iron (n-ZVI) Technology”**. PI: Dr. Alok Sinha, Centre of Mining Environment, Indian School of Mines, Dhanbad

Project Details: This ongoing project was started on 3rd March, 2017 for a period of 2 years with a total cost of Rs. 24,80,800/-. The tenure of the project will be over on 2nd March, 2019. A total of Rs 17,12,320/- has been released so far out of approved project cost of Rs. 24,80,800/-. Audited UC, ES, GFR -12A, GFR 19 and 5 copies of APR for FY 2017-18 have been received. The PI has submitted Executive Summary, Geo. Coordinates and an Undertaking for completion of the project.

Objectives of the study:

- To establish the current groundwater quality at Sukinda Mining area for different seasons.
- To study the mobility of n-ZVI slurry in soil obtained from study area and to optimize the mobility of n-ZVI slurry using different surfactants.
- To study the feasibility of reduction of chromate by n-ZVI and modified n-ZVI by preparing synthetic groundwater samples.
- To study the impact of associated water quality parameters on the reduction of chromate.
- To conduct pilot scale studies for in-situ remediation of contaminated groundwater as per actual geology of the area.

This case was considered in 4th Meeting of SC held on 28.09.2018 for APR presentation. The PI has attended the 4th SC meeting. The Committee desired that the efficacy of the technology vide conventional technology may be examined vide standards and also the cost-economics of treatment of effluents and groundwater vide conventional treatment and details furnished as part of the report. Tenure of the project is over on 2nd March 2019.

The PI has submitted Audited UC, ES, GFR -12A, GFR 19 and 5 copies of APR for FY 2017-18. The PI has submitted Executive Summary, Geo. Coordinates and an Undertaking for completion of the project. Unspent balance with PI – Rs. 12.82 lakhs, as per UC FY 2017-18. Agency is yet to register on the EAT. Amount to be released is Rs 7,68,480/-. The project was listed for consideration in the 7th meeting of TFAC held on 04.09.2019, but PI had not attended.

The PI made a presentation before the TFAC in the 8th meeting held on 28.09.2019. It was informed that Pilot Scale Reactor setup and mechanism in the Laboratory, Pilot scale tests will be performed to simulate actual site conditions. Impact of the injection of n-ZVI slurry in columns/boxes containing soil saturated with simulated groundwater, moving at actual velocity, will be studied and analyzed in laboratory and at the Site actual groundwater will be collected at the site and stored in a container with movable cover so as to ensure anaerobic conditions. The water will be pumped in the Perspex glass chamber where it will enter the soil through perforated entry so as to distribute the water uniformly. Injection wells will be provided in the box at suitable distances and the calculated amount of nano iron slurry will be injected. Concentrations of Cr (VI) and Cr(III) in the influent as well as effluent will be monitored for calculating the efficiency of remediation.

Work under progress to be done include procurement of Planetary Ball Mill (Two times the tender was rejected); Kinetic Studies for reduction of Cr (VI) by n-ZVI in column reactors with and without stabilizing nano particles (n-ZVI) is under progress and assessment of various parameters will be studied; Pilot scale tests will be performed to simulate actual site conditions. Impact of the injection of n-ZVI slurry in columns/boxes containing soil saturated with simulated groundwater, moving at actual velocity, will also be studied and analyzed in laboratory (will be done in month of December). Final Report preparation will be done. The PI has vide e-mail dated 16th September 2019 requested for extension of one year to complete field work and submit the FTR by end of March 2020.

The Committee observed that ground water contamination is an issue at Sukinda Valley and the project should help in remediation of groundwater in actual field conditions. The Committee noted that the PI has sought for extension of one year as the remediation work needs to be carried out. It was observed that six months is already over as on 16.03.2019.

Final Technical Report (FTR) has not been submitted till date. The PI has completed Objective 4 of the project and Objective 5 is on-going. Pilot project will be implemented in the field. The Committee suggested that the outcome should lead to decontamination of aquifer.

The Committee after deliberations decided to extend the project till the end of March, 2020 for completing pilot study in field and that the PI should complete the project and submit the Final Technical Report (FTR) by March 2020. The Committee further decided that an amount of Rs. 7,68,480/- instalment be released to the PI immediately for completion of balance scope of work and subject to submission of all relevant documents.

14.F.No. 19-20/2012-RE: Project on **“Machining and Erosion studies of Red mud an Industrial waste-based Polymer matrix Composite”**. PI: Dr. M. Uthayakumar, Department of Mechanical Engineering, Kalasalingam University, Virudhnagar, Tamil Nadu

The proposal was considered in the 3rd meeting of the Steering Committee held on 30th August 2018 to consider R&D projects of XIth and XIIth Five-Year Plans.

Project Details: This is an on-going project started on 20th May, 2016 for a period of 3 years with a total cost of Rs. 27,00,000/-. The tenure of the project was over on 19th May, 2019. A total of Rs 21,38,400/- has been released so far out of approved project cost of Rs 27,00,000/-. Audited Utilization Certificate, Expenditure Statement, GFR 12, GFR 19, proforma of assets and Annual Progress Report for the FY 2017-18 have been received.

Objectives:

- i. To fabricate natural fibre reinforced composites filled with red mud particulate,
- ii. To investigate the reinforcement effect of natural fibre filled with red mud particulate in thermosetting (General Purpose & Phenolic resin) matrix through various mechanical properties tests such as Tensile, Bending, Shear and Impact strength,
- iii. To study the effects of surface modification of natural fibre filled with red mud particulate on mechanical properties and to carry out studies on fibre matrix interactions, 2
- iv. To study the effects of basalt scale fibres filled with red mud particulate on mechanical properties, to conduct drilling studies and the erosion study on the produced composite materials,
- v. To compare the mechanical properties of different natural fibre composites filled with red mud particulate, and
- vi. To determine the effects of environmental exposure on natural fibre composites filled with red mud particulate behaviour.

PI had made a presentation on the progress of the study to the Steering Committee. It was stated that 80% of fabrication was finished, Mechanical test was performed on sisal red mud composites and for remaining composites mechanical testing is going on, Erosion study is finished for fabricated composites, Abrasive water jet machining was performed and analysed on 20% red mud and 30% sisal fibre reinforced composite and Water absorption test was conducted on sisal red mud composites.

The major findings of the study are:

- Filled composite with 10% red mud addition showed better water resistance than the unfilled composite which has 20%, 25% and 8% reduction in water absorption when compared to unfilled composite at distilled, normal and sea water respectively.
- Composite with 20% and 30% red mud percentage increases the water intake.
- Analysis on the water absorption tested specimens revealed the development of cracks in the matrix surface and fibre delamination and damage. Prolonged immersion in water caused separation of fibre layers. Based on the experimental result and findings it is recommended that the polymer composite with 10% red mud can be used in composite structures in aquatic application.

Further Work to be done in the balance period of study:

- Erosion and mechanical test will be completed by December 2018 and analysed for selecting better performing combination.
- From result analysis, a new set of specimen is planned to be fabricated for conducting drilling and water jet cutting study. The Committee agreed to the completion of the balance activities to be undertaken, however this may be completed by March 2019 and FTR submitted by April 2019. The Committee requested the PI to analyse the water for heavy metals wherein the material was dipped. The Committee stated that Redmud being a hazardous waste, its use may require prior approval of SPCB/CPCB/MoEFCC.

PI made presentation, before 8th TFAC meeting held on 26.09.2019. It was informed the major findings of the project are:

1. Red mud, the waste generated from alumina plant can be successfully used as a reinforcing material to produce Polymer-Matrix Composite. There is good dispersion of red mud particles in polyester matrix which improves the hardness of the matrix material and also the mechanical, erosion wear behaviour of the composite.
2. The mechanical properties of the composites were increases with the addition of redmud. Superior properties were noted at 20% redmud composite. At 30% redmud addition showed negative impact in mechanical properties when compared to 10% and 20% redmud addition. The strong bonding between fibre and matrix witnessed for the improved in mechanical strength of the composite. The same also observed through SEM images.
3. Surface treatment of fibre with NaOH and silane produced effective results than the untreated fiber composites. Maximum strength is noted for the silane treated composites due to the development of effective bonding between the fibre and matrix. The addition of redmud fillers along with surface modified fibres also shows enhanced mechanical strength due to the better fibre matrix bonding and the dispersion of redmud.
4. The erosion resistance of the composites increases with more addition of red mud. 10% and 20% redmud addition showed good erosion resistance property while at 30% redmud addition the erosion resistance is poor. Hence it is identified better filler addition gives maximum wear resistance to the composite. Also, chemical treatment improved the erosion resistance behaviour of the composites through improvement in the bonding behaviour.

5. The addition of redmud filler and chemical treatment doesn't shows significant improvement against the chemical resistance test. Although all the composites showed positive results against.
6. The specific properties of the red mud filled hybrid composite signify the potentiality of industrial waste red mud as reinforcement. The results evident that the redmud a waste material can be used for making composite thus the air pollution and environmental problem caused by redmud can be reduced.
7. The drilling properties of the composites was analysed with varying drilling parameters. The composites exhibit lower thrust force at the spindle speed 1000 rpm, feed 100 mm/rev, and point angle 90° for silane treated sisal red mud composite and forsilane treated jute red mud composite, but for silane treated coconut sheath red mud composite it is at the spindle speed 1000 rpm, feed 100 mm/rev, and point angle 118°. Delamination of the composites increases with the increase in spindle speed, the feed and point angle. The delamination was minimum at the spindle speed 1000 rpm, feed 100 mm/rev, and point angle 90°.
8. AWJM on the redmud filled sisal polyester hybrid composite was successfully done. The experiment results were analysed with the second order linear regression analysis. Transverse speed was the most dominating parameters in affecting the material removal rate and for kerf taper it is SOD. Water pressure = 264 Bar, stand-off distance = 3 mm, and traverse rate = 40 mm/min are considered as the optimum AWJ process parameters for getting quality Kerf taper and MRR.
9. From all the results, it is proposed that the composites developed from redmud and natural fibre can be used as fabricating wall panels, building roofs, automotive parts, body panels, and industrial fans.

With red mud and natural fibre the composite products in slab form were successfully fabricated. This plate like slab can be used for making doors, panels, roof structures which are resistance to erosion, water and chemicals attack; Using red mud and sisal fibre, sports equipment skating board is fabricated, which posses good strength and machining quality; Further, the application of red mud composite in automobile parts is discussed with Sundaram Auto Components, Hosur and HaritaFehrer, Hosur. Regarding this, it is planned to sign an MoU between these two companies and the university.

The Committee noted that the Red Mud fabricate should also be used in the manufacture of plywood and for making furniture etc. The Committee advised that the PI should present his findings and Outcome of the study at the District Industry Centre for entrepreneurs and also for MBA students to take up the technology developed for manufacture of red mud fabricates in a commercial scale with start up grant. The SPCBs may also be consulted as Red Mud has been categorised as a Hazardous Waste.

The Committee after deliberations decided that the Ministry should release the balance amount subject to receipt of all requisite documents and close the project.

15. F.No.14/25/2011-ERS/RE: Project on “**Fragmentation of humid subtropical broad-leaved forest and its impact on plant diversity and ecosystem function in Meghalaya, Northeast India**”. PI: Dr. Krishna Upadhaya, Department of Basic Sciences and Social Sciences, NEHU, Shillong

PI did not attend the meeting and hence the project was deferred.

16. F.No.14/25/2013-RE: Project on **“Study of Plant Diversity of Udaipur wetland of West Champaran and Conservation of its water quality”**. PI: Dr.R.N.Yadava,Head Botany Department, Ram Lakhan Singh Yadav College, Bihar

Project Details: The project was started on 13th February, 2014 for a period of 3 years with a total cost of Rs. 15,75,000/-. Tenure of the project was over on 12th February, 2017. A total of Rs 8,12,000/- has been released so far out of approved project cost of Rs 15,75,000/-. FTR & other documents are awaited. PI was invited to present the progress report before the PAC (EcRP) in the 15th meeting held on 29th February and 1st March, 2016 and in the 17th meeting held on 6th October, 2016, but PI has never attended the meeting of PAC (EcRP) for review of ongoing research project and has not sought more funds. Letters and Emails have been sent on 08.05.2015, 17.02.2016, 16.09.2016, 13.06.2017 and 02.11.2017, 03.11.2017, 28.02.2018 for ES & UC, Progress Report and other documents, but PI has not submitted so far.

The Audit Party of the MoEFCC had made the following observations:

PI never attended the monitoring meetings of Ministry’s Advisory Committee for Ecosystem Research Programme (EcRP) held in Feb/March and October 2016 for intimating the progress of project activities which continued during the entire tenure of the project duration. However, no stern action was taken by the project division against the PI/institution. After the release of the first instalment in February 2014, PI neither furnished any UC/SoE till date nor reported any progress of the project work even after 26 months of the expiry of the project duration of 3 years from the release.

The TFAC had stated that a stern letter should be issued by Ministry to the PI with copy to HOD, Registrar and VC giving a time limit of two months for submission of FTR and other requisite document such as consolidated UC, ES, etc failing which action to blacklist the PI will be initiated by the Ministry. UGC, MoHRD and NITI Aayog may also be intimated in case of failure of PI to comply with furnishing of all the necessary documents and Reports and refund the balance unutilised funds.

PI did not attend the meeting. It was decided that the response received from VC and HOD should be put up by the Division for further necessary action on the matter by Ministry.

17. F.No.14/89/2013-RE: **Project on “Diversity of benthic communities and their response to organic carbon sedimentation in the Vembanad estuary, a tropical Ramsar site in Kerala, India”**. PI: Dr. V. SalomGnanaThanga, Professor, Department of Environmental Sciences, University of Kerala, Kariavattom-695581

The project was placed for consideration in the 7th meeting of TFAC but could not be considered as the PI did not attend the meeting.

Project Details

Objectives:

1. Analyse the source and extent of organic matter (allochthonous and autochthonous) sedimentation in the vembanadlake ;
2. Examine the spatial and temporal variation in the structure of benthic communities (macrofauna, meiofauna and microflora) in selected reaches of vembanad estuary;

3. Evaluate the influence of trophic status, morphometry and hydrodynamics on pelagic-benthic coupling of organic matter;
4. Analyse the quality and quantity of carbon food sources and the trophic level of macrobenthic invertebrates;
5. The hypothesis to be tested in this study is whether eutrophication influences the natural seasonal pattern of benthos (number of species, density and biomass) in certain areas, resulting from changes in sediment conditions.

PI made a presentation before the Committee. It was informed that the work done during the period April 2017 to March 2018 pertained to water sampling, on site recording of parameters in water, other analyses in water for phosphate, nitrate, Sediment, TN %, TC %, etc; Plant samples -N %, C %, etc. Numerical abundance of meiofauna in Vembanad lake- August 2017 for species like *Amphipoda*, *Legenamarginata*, *Gastropod*, *Angelieraphreaticola*, *Isopoda*, *Nematode*, *Eurystominachilensis*, *Parheteromastus tenuis*, *Heteromastus Similis*, *Fabriciaspongicola*, *Minuspiocirrifera*, *Apseudes sp.* Numerical abundance of Meiofauna in Vembanad lake assessed in November 2017.

The Committee noted that if there is a decline in aquatic biodiversity that are particularly important in the aquatic food chain, the details of population of such aquatic communities such as fish, prawns, mollusc etc. which are important for Fishery should be detailed in the FTR. Secondary data may also be used for time-series assessment of populations over a period of time.

The Committee after deliberations decided that the next instalment should be released to PI subject to receipt of all requisite documents. The progress of work done was rated as satisfactory

2.0 Any Other Matter with Permission of the Chair

- 2.1 (Item No.18) F. No. 19-27/2009-RE: Response of BSI on project “**Investigations on Active Constituents of High Altitude Medicinal Plants traditionally used as Non-Toxic Drugs**” by Dr. D. D. Joshi/ Dr Harsha Kharkwal, AMITY Institute of Phytomedicine and Phytochemistry & Amity Centre for Carbohydrate Research, Noida (Internal Consideration).

The project was considered in 5th TFAC meeting held on 3rd July, 2019, wherein the TFAC had sought the comments of Director, BSI on the FTR. Comments of BSI were received vide e-mail dated 13th June 2019 which was forwarded to PI for comments and for preparation of a Report thereon. The response of PI, received vide email dated 25th September 2019, was considered internally by the Committee.

The TFAC Committee after deliberations decided to close the project in the light of Report given by PI on the comments of BSI. The TFAC recommended the release of the balance amount of money, if any, required to be released for project subject to receipt of all requisite documents from the PI.

2.2 Revision of Revised Guidelines on Emoluments of Research Fellows:

It was informed by Adviser (RE) regarding the issue of 'Revision of emoluments to the Junior Project Fellow and Senior Project Fellow (After two years as Junior Project Fellow) under R&D Projects of the Ministry/its institutions: Consequent upon revision of

emoluments in respect of JRF, SRF and M5 by the DST vide OM No. SR/S9/Z-08/2018 dated January 30, 2019 and by this Ministry vide OM No. 38/ 1/2017—RE dated 24th July 2019, number of RTI Applications are being received seeking revision of emoluments to the Junior Project Fellow(JPF) and Senior Project Fellow(SPF).

The category of JPF/SPF was introduced by this Ministry as a distinct and separate category of Research Personnel vide 'Guidelines for Support to Environmental Research-2012' and also included in Ministry's OM No. 2—6/2013-RE dated 2nd Sep 2015. It had been also decided that this category of JPF/SPF would be applicable only when NET qualified candidates are not available for the projects sponsored by the Ministry under its various schemes under their projects funded by Ministry. Emoluments of JPF/SPF since implementation of the scheme are given below:

Category	Emoluments since introduction in July 2012 in Rs.	Revised emoluments 01 .10.2014 in Rs. (revised Vide Ministry's OM No. 2—6/2013-RE dated 2 nd Sep 2015)	
JPF (for first two years of project)	10000	16,000	No revision after ward
SPF (after two years)	12000	18000	

It was informed that individual institute are conducting their own examination which is equivalent to NET and therefore institutes engaging JPF/SPF should conduct test separately for recruitment of JPF/SPF under projects of various schemes/institutions of the Ministry.

The Committee after deliberations on the various options suggested by the members of TFAC desired that a draft OM on the above issue may be prepared by Ministry and circulated by MS to the Committee members for their inputs/suggestions for consideration in the next TFAC meeting.

The meeting ended with a Vote of thanks to the Chair.

ANNEXURE-1**LIST OF PARTICIPANTS OF EIGHTH MEETING OF TECHNICAL & FINANCIAL APPRAISAL COMMITTEE (TFAC) OF R&D SCHEME HELD ON 26.09.2019 IN MoEFCC**

- | | | |
|----|--|------------------|
| 1. | Prof. C. R. Babu (Retd.), Prof Emeritus and former Pro-VC, University of Delhi | Chairperson |
| 2. | Dr.M.Dwarkanath | Member |
| 3. | Shri V.P.Yadav, Scientist, Central Pollution Control Board, New Delhi | Member |
| 4. | Dr.V.K.Soni, representing Director, India Meteorological Dept., New Delhi | Member |
| 5. | Dr.Jayashree Dubey representing Director, Indian Institute Of Forest Management (IIFM), Bhopal | Member |
| 6. | Dr. T. Chandini, Advisor (RE), MoEFCC | Member-Secretary |

MOEFCC

1. Dr. Rubab Jaffer, Joint Director (RE)
2. Shri NareshJaiswal US(RE)
3. Ms. AkankshaSanchan, ASO (RE)
4. Shri Goldee, Office Assistant

LIST OF PROJECT INVESTIGATORS (PIs) PARTICIPATED IN THE 8th TFAC MEETING

1. Dr.S.Jayakumar, Department of Ecology and Environmental Sciences, School of Life Sciences, Pondicherry.
2. Dr. Ajay Kumar, Scientist C, Forest Ecology and Climate Change Division, Rain Forest Research Institute Deovan estate, Sotai Ali, A.T. Road (East), Jorhat, Assam.
3. Dr.B.Shanthini, Department of Electrical and Electronics Engineering, St. Peters Institute of Higher Education and Research, Avadi, Chennai -600 054 Tamil Nadu
4. Dr.D.Brindha, Assistant Professor, Department of Civil Engineering, ThiagarajaraCollege of Engineering, Madurai 625105.
5. Dr.Ms S.Sivasangari, Department of Civil Engineering, ThiagarajaraCollege of Engineering, Madurai 625105.
6. Sh L. Sasikumar, Solaimalai College, Madurai.
7. Dr. Robin Vijayan, Assistant Professor, Indian Institute of Science Education and Research Tirupati (MHRD Institution), Karakambadi Road, Tirupati 517501.
8. Dr. S. Babu, Senior Scientist, Salim Ali Centre for Ornithology and Natural History, Anaikatty, Coimbatore 641108, Tamil Nadu
9. Dr. ManchiShirish S., Senior Scientist, Salim Ali Centre for Ornithology and Natural History, Anaikatti P.O., Coimbatore 641108
10. Dr.Navendu Page, Scientist – C, Wildlife Institute of India, Chandrabani, Dehradun, Uttarakhand. Co-PI: Dr. GautamTalukdar, Scientist – E, Wildlife Institute of India.
11. Dr. Anju Baroth Scientist C, Department for Habitat Ecology, Wildlife Institute of India, Dehradun.
12. Dr. Amit Kumar, Scientist – C, Wildlife Institute of India, Chandrabani, Dehradun, Uttarakhand.
13. Dr. Alok Sinha, Centre of Mining Environment, Indian School of Mines, Dhanbad
14. Dr.AnjalaiKumari, Centre of Mining Environment, Indian School of Mines, Dhanbad
15. ShAbhinav Raj, Centre of Mining Environment, Indian School of Mines, Dhanbad
16. Dr. M. Uthayakumar, Department of Mechanical Engineering, Kalasalingam University, Virudhnagar, Tamil Nadu
17. Dr. V. SalomGnanaThanga, Professor,Department of Environmental Sciences, University of Kerala, Kariavattom-695581.

ANNEXURE-2**AGENDA FOR THE 8th MEETING OF TFAC HELD ON 26.09.2019**

I RECONSIDERATION OF R&D PROJECTS RECEIVED ONLINE UNDER NEW R&D SCHEME:

S. N.	Registration No.	Thematic Area	Title of project	Details of P.I.
1.	24/2018/RE	Wildlife Conservation	Spatial mapping and change analysis of Elephant habitat and corridors in Sathyamangalam Tiger Reserve using remote sensing and GIS for conservation and management	Dr. S Jayakumar, Professor, Department of Ecology and Environmental Sciences, School of Life Sciences, Pondicherry University (A Central University), Puducherry
2.	95/2018/RE	Conservation of Ecosystems -Assessment of Ecosystem Services	Assessment of Ecosystem Services from Manas National Park, Assam	Shri Ajay Kumar, Scientist C, Forest Ecology and Climate Change Division, Rain Forest Research Institute, Deovan estate, Sotai Ali, A.T. Road (East), Jothat, Assam
3.	152/2018/RE	Waste Management	Design and Implementation of an UAV-based Platform for Environment Quality monitoring and data analysis using Deep Learning at Solid Waste Disposal Sites	Dr. R. Rani Hemamalini, Professor and Head, Department of Electrical and Electronics Engineering, St. Peters Institute of higher Education and Research (Deemed University of UGC), Avadi, Chennai 600 054
4.	151/2018/RE	Waste Minimisation	Assessment of LFG recovery, utilization and reduction in GHG emission at Madurai Landfill site, Tamil Nadu, India.	Dr.D.Brindha, Department of Civil Engineering, Thiagarajara College of Engineering (Anna University), Madurai 62510
5.	40/2018/RE	Conservation of Ecosystems & Landscapes	Emerging infectious disease in birds across a gradient of alien invasive trees mapped using Remote Sensing, on Shola Sky Islands	Dr. Robin Vijayan, Indian Institute of Science Education and Research Tirupati
6.	317/2018/RE	Biodiversity Conservation	Ecological assessment of endemic and threatened laughingthrushes of the Western Ghats to develop conservation plan for securing their population and habitats	Dr. S. Babu, Senior Scientist, Salim Ali Centre for Ornithology and Natural History, Coimbatore
7.	313/2018/RE	Biodiversity Conservation	Population Status, Ecology, and Conservation of the Indian Swiftlet Aerodramus unicolor in the Western Ghats, West Coast and Offshore Islands of Maharashtra	Dr. ManchiShirish S., Senior Scientist, Salim Ali Centre for Ornithology and Natural History, Coimbatore
8.	275/2018/RE	Wildlife Conservation	Tracking and assessment threats of highly critically endangered scaly giant (<i>Manispentadactyla</i>) with special reference to sensitization of local communities for its long-term conservation in north-eastern states of India	DrJanmejaysathy, Amity University, GautamBudhh Nagar, Noida 201303
9.	249/2018/RE	Biodiversity Conservation	Assessment of the status of endemic and threatened plants across the protected areas of Arunachal Pradesh	Dr. Navendu Page, Scientist C, Department for Habitat Ecology, Wildlife Institute of India, Dehradun.

10.	247/2018/RE	Ecosystem Conservation	Quantification of Plastic debris in the Coastal Ecosystem of Gulf of Kachchh Marine Protected Area (GOKMPA) and assessing the Environmental Damage	Dr. Anju Baroth Scientist C, Department for Habitat Ecology, Wildlife Institute of India, Dehradun.
11.	250/2018/RE	Ecosystem Conservation	Ecological impacts of major Invasive Alien Species on native flora in Pakke Tiger Reserve, North-East India	Dr. Amit Kumar, Scientist C, Dept. of Protected Area Network, Wildlife Institute of India, Dehradun.

II CONSIDERATION OF ON-GOING PROJECTS UNDER OLD R&D SCHEME:

S. N.	File No.	Thematic Area	Title of project	Details of P.I.
12.	19-68/2012-RE	Pollution Prevention	Development of Hybrid nanomaterials – based water filters for affordable potable water	Dr. V. Alexander, Department of Chemistry, Loyola College, Chennai
13.	19-79/2013-RE	Water Pollution	Remediation of Ground Water Contaminated with Hexavalent Chromium in Sukinda Valley, Odisha, Using Nano Zero Valent Iron (n-ZVI) Technology	Dr. Alok Sinha, Centre of Mining Environment, Indian School of Mines, Dhanbad
14.	19-20/2012-RE	Waste Minimisation	Machining and Erosion studies of Red mud an Industrial waste-based Polymer matrix Composite	Dr. M. Uthayakumar, Department of Mechanical Engineering, Kalasalingam University, Virudhnagar
15.	F.No.14/25/2011-ERS/RE	Ecosystem Conservation	Fragmentation of humid subtropical broad-leaved forest and its impact on plant diversity and ecosystem function in Meghalaya, Northeast India	Dr. Krishna Upadhaya, Department of Basic Sciences and Social Sciences, NEHU, Shillong
16.	F.No.14/25/2013-RE	Ecosystem Conservation	Study of Plant Diversity of Udaipur wetland of West Champaran and Conservation of its water quality	Dr. R.N. Yadava Head Botany Department, Ram Lakhan Singh Yadav College, Bihar
17.	14/89/2013-RE		Diversity of benthic communities and their response to organic carbon sedimentation in the Vembanad estuary, a tropical Ramsar site in Kerala, India	Dr. V. Salom Gnana Thanga, Department of Environmental Sciences, University of Kerala, Kariavattom-695581

2.0 Any other matter with the permission of the Chair.

2.1 (Item No. 18.) F. No. 19-27/2009-RE: Response of BSI on project “**Investigations on Active Constituents of High Altitude Medicinal Plants traditionally used as Non-Toxic Drugs**” by Dr. D. D. Joshi/ Dr Harsha Karkwal, AMITY Institute of Phytomedicine and Phytochemistry & Amity Centre for Carbohydrate Research, Noida (Internal Consideration).

2.2 Revision of Emoluments of Research Fellows engaged as Junior Project fellow (JPF)/Senior Project fellow (SPF)
