Minutes of Green Committee Meeting of IIT Roorkee held on April 14, 2021 at 5.00 pm on Webex Platform

The following members were present:

1. Prof AK Chaturvedi, Director - Chairman
2. Prof M Parida, Dy. Director - Special Invitee
3. Prof Arun Kumar, - Convenor
4. Prof Umesh Kr Sharma, Dean Infrastructure - Member
5. Shri Nepal Singh, Institute Engineer - Member
6. Prof ML Kansal, WRDM - Member
7. Prof Bhanu Prakash Vellanki, CED - Member
8. Prof Ram Manohar Singh, HSS - Member
9. Ms. Dyutisree Haldar, RS - Member
10. Prof Deepak Khare, WRDM - Special Invitee
11. Prof Bihu Suchetana, CED - Special Invitee
12. Shri Harindra Baraiya, WII - Special Invitee

Dean Saharanpur campus, Associate Dean (Bhawan & Mess), Institute Architect, Prof Avlokita Agarwal and Shri Vaibhav Jain Student could not join the meeting.

Prof AK Chaturvedi, Director while welcoming the members of committee, desired that the initiatives taken by Green committee should become the regular function of the respective units/offices of the institute for campus sustainability. He asked Prof Arun Kumar to present the agenda scheduled for the meeting. At the onset of the meeting, Prof Arun Kumar gave an over-view of all the items to be presented as well as about the special invitees for presenting the plans of action on different aspects of the sustainability before the Green Committee.

Agenda 1. Actions Taken Report:

The action taken report on the minutes of meeting held on Nov 18, 2020 were deliberated. To discuss in detail, presentations were also made by the faculty who are champion for the aspects including wildlife institute of India who are engaged for bio diversity inventory survey, especially invited for the meeting.

No.	Reference	Title / Matter	Actions Taken and deliberated
01	Nov 18, 2020 (Agenda 1.a)	**Biodiversity on campus:** Institute Architect informed that an agency has been hired to conduct the topographical survey of the institute and almost 60% of the work has been completed. However due to the COVID-19 scenario, the work could not be completed and the agency will take time. A detailed study on the flora and fauna of the campus may be carried out by hiring externally agencies viz 'Wildlife Institute of India' and	Based on the request sent by Director IITR, Wildlife Institute of India has submitted a proposal and the same has been approved and required funds transferred to WII in Feb 2021. WII has started the work and undertaken few visits to the campus. WII presented the initiatives taken by them including progress made by them during first 2 months of this study. Dr. Suresh R. Kumar from Wildlife Institute of India is heading the team on assignment on flora fauna survey of IITR campus. Shri Harindra Baraiya, PhD Scholar from Wildlife Institute of India, Dehradun presented on his behalf. A detailed presentation

No.	Reference	Title / Matter	Actions Taken and deliberated
		'Forest Reserve Institute'. They shall be contacted for the same. Prof Arun Kumar shall take necessary action and submit the same to Prof AK Chaturvedi for contacting the institution to get the study done.	for the same has been attached in Annexure 1. The study is expected to be completed in 8 months. **Further Action** It was suggested that to create awareness among the campus residents, activities related to this can be planned with the students of eco club (e.g. Bird watching, etc.). Since IITR is conducting the inventory of flora and fauna for the first time, it would be helpful to IITR and shall provide a good database for many years to come. It was also decided that the list of species of the flora and fauna found on the IITR campus through this survey, shall be added on the IITR's website so that the campus fraternity can view the same and also add pictures new species if found by them. The images received will be initially screened and refined by WII before they are uploaded on the IITR database.
02	Nov 18, 2020 (Agenda 1.b)	**Water:** To reduce the water consumption, water meters to be placed at the users end where the consumption is more than 500 m3 out of a total consumption of 5000 m3 per day. Prof ML Kansal proposed that all the major pipelines to be computerized. Further, it was also suggested that a faculty is assign to prepare a comprehensive doable plan to reduce the water consumption in IITR. For carrying out such efforts, the activities and staff shall be funded under project mode. Prof Bihu Suchetana (CED) shall take the lead and may opt other colleagues. Shri Neeraj Kohli, AEE, Electrical and Water Supply, Shri Navneet, JE, Water supply shall provide the necessary inputs to the team.	Prof Bihu Suchetana, CED was assigned to undertake the water consumption issue and prepared a plan for the campus. She submitted the plan to Dean Infra last month. Prof Bihu Suchetana presented the plans for reduction of water consumption in IITR. The proposal explained how the planning for distribution, monitoring, and maintenance including desired water quality to reduce water foot print, can be done. Presentation for the same is attached at Annexure 2. **Further Action** It was discussed that the testing for the identification of dead zones and other regions within the water distribution system with relative lesser quality of water can be outsourced. Instruments can be deployed to detect water leakage. It was suggested that Prof Bihu should have a meeting with E&W to determine the zones for bulk water metering in the campus as well as the budget for the same, in a phased manner. It was informed that 1 MLD of treated waste-water from the sewage treatment plant is in use for watering of sports grounds and lawns. Prof Umesh Sharma Dean Infra informed the committee that the laying of underground pipeline for the same has been completed. To carry out this matter forward, it is essential to create awareness among the campus fraternity regarding sensible use of water and that the sweepers, gardeners and cleaners should also be part of this survey and awareness. Proposal of Prof Bihu Suchetana to carry out the survey of the water lines and carryout the water distribution quality and
	Nov 18, 2020 (Agenda 4)	**Planning for distribution, monitoring, maintenance including desired water quality to reduce water foot print:** Refer Agenda1.b	

No.	Reference	Title / Matter	Actions Taken and deliberated
			quantity analysis with the required funding of Rs.6.28 Lakh shall be supported by Dean Infra to kick-start the same.
03	Nov 18, 2020 (Agenda 1.c)	**Waste:** Prof BP Vellanki presented the matter of solid waste management on campus. After a detailed discussion on the same, it was decided that segregation of solid waste and Bio-methenation of organic part is considered as the option to reduce the waste contribution to the society and retrieving the energy from the waste. A detailed report on the feasibility, costing and land requirement shall be prepared by Prof BP Vellanki. For locating bio methenation plant the space shall be identified in the campus or otherwise Municipal Corporation of Roorkee shall be requested to provide. Any budget required for preparing the plan and detailed project report shall be provided by the institute.	Prof B.P. Vellanki from CED presented the comprehensive plan for solid waste management on campus. Presentation for the same is attached at Annexure 3. After a detailed discussion on the same it was deliberated that the waste management should be taken up on urgent basis. Points were also discussed on how to make IITR a zero-waste campus (e.g. in addition to organic waste, inert and plastic and paper waste potential vendors can be identified, factories can be consulted to take away the cloth waste, etc.). **Further Action** It was suggested to develop and design the program to educate the campus fraternity to segregate the waste at the source itself. Awareness program for the same may be carried out by NSS and any financial support may be provided for the same by the institute if required. It was suggested that two separate proposals be prepared and finalised; 1) to carry out the detailed study on all components and 2) to implement the program including capital and O&M expenses. Any financial assistance for preparing the plans if required shall be supported by Dean infrastructure. A team comprising of Prof Vellanki, and Prof Rachita Gulati, NSS Coordinator may be formed to create this awareness plan especially for segregation at the source (household) and Prof Parida, Dy Director may resolve issues, if any. As proposed by Prof Vellanki the plan for bio-methenation plant on pilot basis, with detailed cost, locations and O&M, shall be prepared so that the same is being in place by 2022. Prof ML Kansal also suggested that the pilling of construction materials by the side of the road should be avoided by the contractors and there should be a proper area designated for its safe disposal/storage. Further issue of dry leaves burning was brought in the discussion and it was resolved that E&W may procure few leaves shredders and place them at some places which can be used by the residents and thus will reduce the volume.
		Under the guidance of Prof BP Vellanki, Shri Praharsh and Shri Devesh students from the ECO Group presented the study conducted by them on the Paper,	Since 1st and 2nd year students are not back on campus due to the pandemic situation, the initiative did not take off. **Further Action** This shall be taken up in due course.

No.	Reference	Title / Matter	Actions Taken and deliberated
		Plastic & Styrofoam Cutlery problems and substitutes. It was decided that this idea can be initiated by Student's council along with the co-operation of Bhawans and Mess, with the support of Associate Dean (Bhawan and Mess) and guidance of Prof BP Vellanki. This issue can be addressed in stages. One bhawan can be targeted in the first instance. Further decisions can be taken after seeing the results stage-wise. Prof. Avlokita Agarwal also suggested about an organization 'Maathi' who make clay/earthenware cups. This option might be considered after studying the feasibility of this proposal and looking at the stage-wise results.	
04	Nov 18, 2020 (Agenda 1.d)	**Energy:** An order has been placed for the installation of 1 MWe Solar photovoltaic on hostels roof 1.89 per kWh for a power purchase agreement of 25 years expected to be completed by March 2021 and the work on Opex basis from a RESCO (Renewable energy sources company) recently. DPR prepared by PGCIL has been agreed by the institute and implementation work is under progress and expected to be completed by March 2021.	As informed by Associate Dean Infra (El), due to the delay in finalizing the contractor by the Revi Power Projects Pvt. Ltd, the project may be completed by May 2021.
	Jan 14, 2020 (Point 7)	**Energy:** Use of energy efficient appliances and systems for reduction in electricity: Use of energy efficient appliances in the campus is being practiced for several years. However this is being done in piecemeal. Recently a MOU has been signed by IIT Roorkee with Power Grid Corporation where they agreed to support the activities of energy efficiency and reduction in power consumption. A report has been received from Power Grid Corporation and shall be shared by institute engineer with green committee convener. It was decided to conduct an energy audit especially of non-residential areas.	The DPR and BOQ have been finalized jointly by the IITR & PGCIL. As informed by PGCIL, tenders shall be invited by April 15, 2021.

No.	Reference	Title / Matter	Actions Taken and deliberated
		As has been done in the past, this can be done by involving the students through internship programmes.	
05	Nov 18, 2020 (Agenda 1.e)	**Vehicles:** Proposal of procuring e-Car has been initially dealt by Prof In charge Vehicle and as per green committee minutes is being dealt by the convener of Green Committee since March 2020. MMS has again proposed the procurement through GEM but no quotations on GEM are being received even after 3 trials. Prof Arun Kumar suggested that the proposal to procure e-cars should be done directly from the manufactures/dealers. Dy Director will discuss the matter with DR MMS and necessary action for early procurement for e-Car / vehicle using the money available shall be taken.	Orders to two e-vehicles and one fast charging station was placed in mid –March 2020 by Deputy Registrar MMS. Delivery is expected by the end of April 2021. It was discussed that it is necessary to make the efficient use of the vehicles to avail great benefits of e-vehicle. **Further Action** It was suggested that Prof Parida, Dy. Director may discuss with Prof. In charge Vehicles for efficient and effective deployment of these two vehicles in the campus. It was also decided that the official announcement of this initiative can be made on the IITRs website for making the campus community aware and a small inaugural function may also be planned.
06	Nov 18, 2020 (Agenda 1.g)	**Subscription to ISCN:** Applications for ISCN was submitted in July 2020. The Chairman Prof Chaturvedi informed that ISCN has accepted IIT Roorkee as member on 18th Nov, 2020.	Following the subscription, IIT Roorkee now receives the communications from ISCN regularly. Recently IITR also participated in the ISCN Awards 2021 under the category of 'Whole Systems Approach' which did not get the favour.
07	Nov 18, 2020 (Agenda 1.h) /Aug 8, 2018 (Point 9)	**Drainage on Campus:** No substantial work has been done in this aspect as reported by the Institute Engineer. Dean Infra shall discuss the matter with immediate past Dean Infra and shall come out with the required action for addressing the drainage issue of the campus. Drainage of the campus, especially Saraswati Mandir road, Old and new teacher's hostel continuing education.	Dean Infra informed that no substantial work has been done in this regard. **Further Action** Prof Arun Kumar, volunteered to undertake the planning of the mitigation for the drainage issue in the next 6 months with the support of E&W personnel as well as data (Topographical survey, details on existing drainage etc.) and other faculty members.
08	Nov 18, 2020 (Agenda 2)	**Implementation of Mini-forests in IITR:** Prof. Avlokita Agarwal presented a proposal on implementation of mini-forests in IIT Roorkee campus. It was decided that a detailed survey should be carried out and doable plan should be prepared and presented. The road network, master plan of the campus and departmental users especially the	Following up with the discussion held in the last GC meeting, a web meeting was held in which Prof Indrajit Ghosh (representative of Transportation group), Administration, NGO, etc were present, to identify potential sites on campus, without affecting various aspects. After the identification of tentative sites, a site visit with NGO personnel, Prof BP Vellanki and Mr. Lal, IA, was held to further narrow down the potential sites. A final site visit was held by the Deputy Director and Prof BP Vellanki, to identify the first

No.	Reference	Title / Matter	Actions Taken and deliberated
		front side were three main parameters discussed in the meeting. Some specific spaces near Saraswati Mandir and behind Institutions Engineers were suggested. It was decided that a core committee comprising of Prof Avlokita Agarwal (Arch and Planning), Prof BP Vellanki (Civil Engineering) and Shri Bhavneesh Lal (Institute Architect) shall study the matter in depth and prepare the plan. The committee may also co-opt any other faculty as per requirements. The crossing of the roads shall be looked into.	location on which we can start the Miyawaki forest. Accordingly, the site which was chosen for initial development is the area beside Temple, along the periphery of the volley ball court-3 or 3.5 m wide strip. Prof B.P. Vellanki from CED presented the document on Implementation of Mini-forests in IITR. A detailed presentation for the same has been attached in Annexure 4. **Further Action** The site for the pilot project may be approved by institute and funding for the same shall be provided by the institute.
09	Nov 18, 2020 (Agenda 3)	**Water Conservation Implementation Plan in IIT Roorkee**: Prof Arun Kumar provided an over-view of the work done till date in this regard. It was discussed that a detailed study should be done on this proposal including the budgets, feasibility, quantity estimates and costing. The same should be piloted by Prof Deepak Khare and Shri Neeraj Kohli (AEE Electrical and Water Supply). It was suggested that they be invited in the next green committee meeting to present their detailed proposal. Any budget required for preparing the plan and detailed project report shall be provided by the institute.	Prof Deepak Khare from WRDM presented Water Pilot Conservation Implementation plan in IITR. The same is attached at Annexure 5. Currently 4 installations are in place in the campus (RT-RWH-Recharge, RT-RWH-Storage, Recharge Shaft and Recharge Pit) for pilot. The work for the same has been done and the filter material is awaited from E&W. **Further Action** As informed by Prof Khare, aggregates are available but are not the ideal choice for the filter material as compared to boulders and pebbles. Since boulders and pebbles are taken from the river bed, there are restrictions from the State Government for their use. Prof Sharma, Dean Infra suggested that the same can be arranged from the adjoining States. Prof Khare to provide Dean Infra with a detailed report along with the type and quantity of filter material needed to process the same. Prof Khare also informed that the testing of the 4 installations for the demonstration would be done in the upcoming monsoon season. It was also decided that the cleaning and maintenance of the roofs for this project can be assigned to the designated JEE of the area pre-monsoon just for these 4 installations. For long term purposes, the caretaker of the respective departments/bhawans as assigned by the institute shall carry out the cleaning and maintenance works periodically. It was also discussed that recharge shafts and groundwater recharge pits should be constructed along the roads, at the lowest points, to avoid the problem of flooding in the monsoons as well as to facilitate the issues of drainage as mentioned in the earlier point of '*Drainage on campus'*. The maintenance and cleaning for the same shall be looked into as

No.	Reference	Title / Matter	Actions Taken and deliberated
			the project progresses further.
10	Nov 18, 2020 (Agenda 6)	**Other Items:** Under the guidance of Prof Ram Manohar Singh, Ms. Saylee Bhogle presented a document on solutions which can be opted as alternatives for burning of leaves on the campus. It was proposed that a survey should be carried out and data is analysed to understand the waste that be segregated against non-segregated waste. A questionnaire may be prepared by Prof Ram Manohar Singh in consultation with Prof BP Vellanki and can be emailed to staff and students. An awareness campaign / notice can be issued to report the burning of the leaves found anywhere on the campus. Posters can be prepared for the same	The awareness campaign of the green committee has been started. E-poster has been sent to all the students, faculties and staff members of the institute. It was also displayed at the LED screen and hard copies of the same are being put up in the notice boards of all the departments and hostels. The poster for the same has been attached herewith. To further facilitate this, an email ID for the Green Committee office has been created where the campus community can share their feedbacks/suggestions/queries. The document with the compiled responses would be presented so that necessary actions can be taken by the concerned faculties. Also the first theme of, "Dry/waste leaves disposal", under this campaign has been rolled out along with the questionnaire to create awareness. Prof Ram Manohar Singh presented the matter on virtual awareness campaign for Environmental aspects in IITR. Presentation for the same is attached at Annexure 6. **Further Action** It was suggested that a mechanism should be developed to collect the dry leaves and waste from the peripheral areas of the campus as per the analysis and responses received in the questionnaire. A separate contact number of a security officer can also be assigned to report the burning of leaves in the campus. Awareness to be raised in this matter among the campus community. Prof ML Kansal would share the specifications for shredders, for the issue of dry leaves, to Estate and Works. Upon approval, E&W can provide them at some strategic locations.
	Nov 18, 2020 (Agenda 6)	**Other Items:** Ms. Dyutisree Haldar raised a concern on the increasing use of one time use hand gloves and masks in hostels due to COVID-19 and their safe disposal. ADOSW (Bhawan and Mess) shall look into the matter and provide adequate bins for its safe disposal.	As per ADOSW, the hostel staff has been instructed to use gloves and masks in the mess and bhawans. The use of Covid precautions has increased in the students by the staff as well as the students. The Chief Wardens and Mess Wardens have been instructed to keep surgical masks in the hostels for the staff and the students. For the disposal of the masks and the gloves, pamphlets and the signboards have been provided at the key places in the bhawans. Prof Umesh Sharma, Dean Infra informed that sanitization staff was not able to collect the waste from the individual households due to covid cases.

No.	Reference	Title / Matter	Actions Taken and deliberated
			To combat this issue, an outside agency has been hired to collect the bio-medical waste in such covid infected areas (houses and hostels). They would be placing big waste containers outside every zone for the safe disposal. The final details of the proposed plan would be shared in the coming few days by the Dean Infrastructure.
	Jan 14, 2020 (Point 8)	**Other Items:** M&M office to provide an update into the purchase of recycled paper. The Departments and Administrative offices to use the same.	As learnt from M&M office regarding purchase of the recycled paper, for the use of departments and administrative offices, the matter is yet to be taken and they shall come back soon. **Further Action** M&M office regarding purchase of the recycled paper, shall take necessary action immediately for the for the people use in departments and administrative offices.
11	Nov 18, 2020 (Agenda 6)	**Hazardous Waste:** Presently solid as well liquid hazardous and chemical waste from different laboratories generated is disposed off in dustbins and normal drains carrying the sewage and others. A comprehensive plan on 'Hazardous Waste Management Program At IIT Roorkee was prepared by Prof BP Vellanki. Thereafter, with the approval of Director, Estate and Works prepared a plan with cost estimates for storage in the campus before disposal to Treatment, Storage, and Disposal Facilities (TSDF). Safety office wrote to Uttarakhand Pollution Control Board requesting the authorization for storing and disposal to TSDF. No progress on the matter has been reported since then this regard. Prof Vellanki mentioned that such approval from state Pollution Board is not required under present Hazardous Waste Management Rules 2016. It was decided that the matter shall be discussed by Dy Director with safety office and Prof Vellanki and shall be taken up for further action.	The Safety office has done multiple discussions with the TSDF (in presence of prof. BP Vellanki) over the finalization of per trip collection cost and smooth collection of HW from the respective four departments. In between the negotiation phase, ground work was carried out by the Safety Office in which all four Departments were provided with different size of HW containers (Different Capacity), HW Tags, HW Identification Stickers, Form-3 & 8 & HW Containers weighing machines. Training session was organized by the Safety Office regarding the HW Collection & Disposal for the designated SPOC members of all departments. After this, regular communications have been done with the departments to collect HW in the said categories on priority. Due to non-confirmation of collection of HW from departments, the Safety office had to postpone the two schedule collection visits of TSDF. In order to review the status of HW collection in between, Prof BP Vellanki visited the Departments for a successful collection of HW and the Safety office is still constantly in touch with the departments so that collection of HW by TSDF can be done at the earliest. They have received final HW collection data only from the Chemistry and M&ME Department, which has been physically verified by the Safety Office. In the current state, they are planning a collection visit of HW by the TSDF in the 1st week of April'21. **Further Action** Chairman informed that Hazardous waste is being successfully collected from the Department of Chemistry and Department of Metallurgical and Materials Engineering. The deputy director has

No.	Reference	Title / Matter	Actions Taken and deliberated
			been requested to review the same in the meeting with the safety office so that this can become a regular sustainable feature in the campus.
12	-	**Solarification of the IITR:** Solar water heating system and solar steam cooking systems have been installed in the campus under the Green initiatives.	Based on the census, a status report prepared by Ms. Saylee Bhogle, Project Associate under guidance of Prof Arun Kumar, for all the 11 Bhawans with Solar Water heating system and 9 Mess areas with Solar Steam Cooking system so that actions can be taken in this regard wherever the systems are not working / non-operational. Reports for the same have already been sent to Associate Dean Electrical for taking remedial actions. E&W started working on the same.

Agenda 3. Any other item with the permission of the chair:

Prof AK Chaturvedi suggested that the reminders for all the agenda points of the Green Committee should be sent to the concerned offices every 15 days by the Green Committee. The next meeting for the Green Committee is tentatively scheduled for the 1st week of the July 2021.

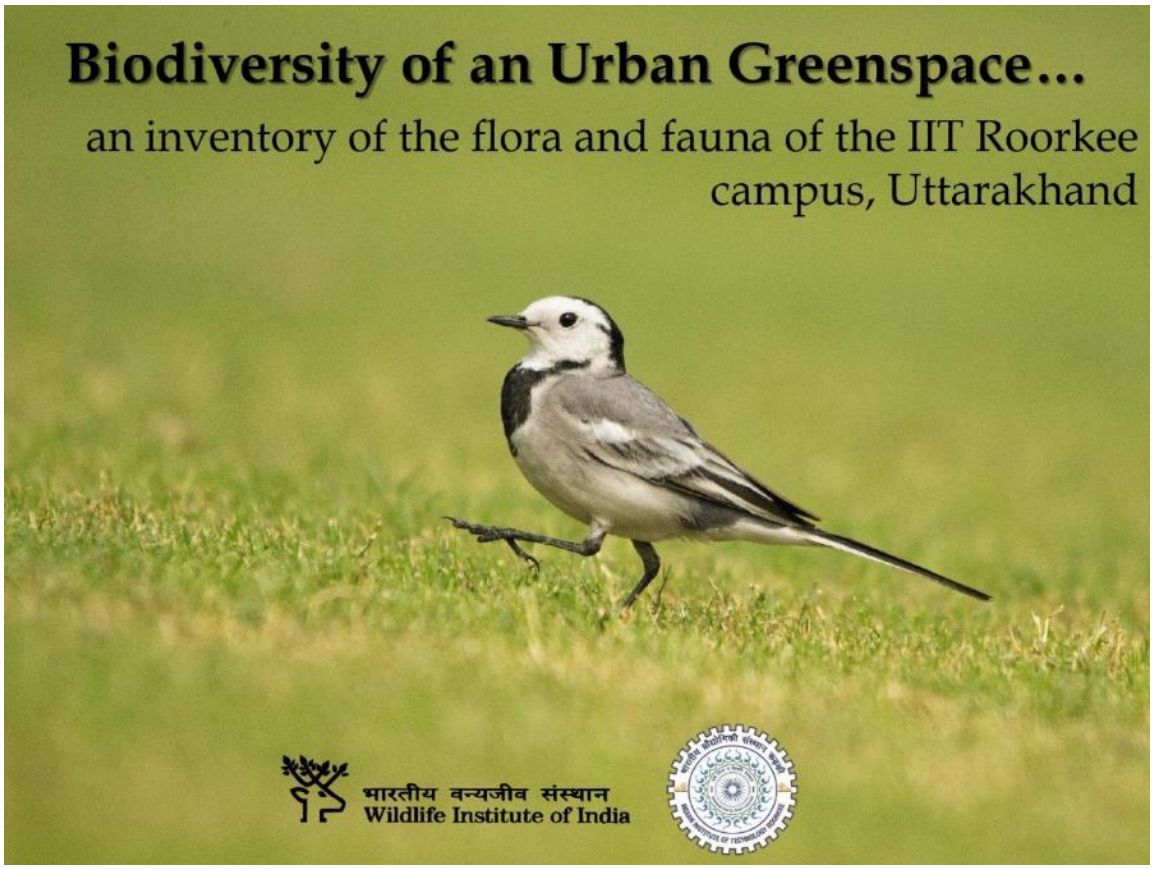
Meeting ended with the vote of thanks to the chair.

Annexure:

1. Presentation on flora fauna survey of IITR campus by WII
2. Presentation on Reduction of water consumption in IITR by Prof Bihu Suchetana
3. Presentation on Solid Waste Management to reduce waste disposal in IITR by Prof BP Vellanki
4. Presentation on implementation of Mini-forests in IITR by Prof BP Vellanki
5. Presentation on Water Conservation Implementation plan in IITR by Prof Deepak Khare
6. Presentation on Virtual Awareness Campaign for Environmental aspects in IITR by Prof Ram Manohar Singh.

Annexure 1

1. Presentation on flora fauna survey of IITR campus by WII



Project duration: 9 months (March to November 2021)

WII Team:

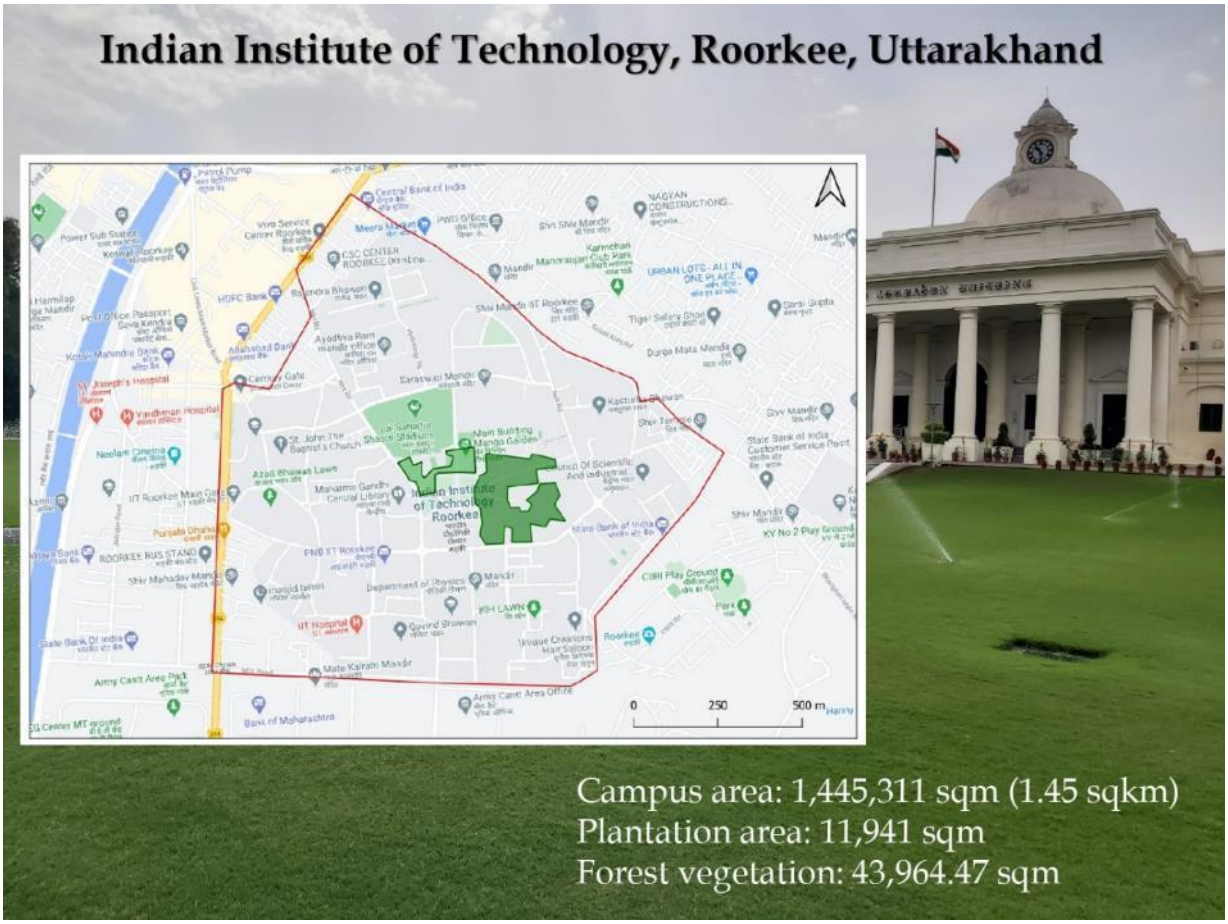
Plants:	Dr. Navendu Page
Butterflies:	Dr. V.P. Uniyal
Herpetofauna:	Dr. Abhijit Das
Mammals:	Dr. R. Suresh Kumar
Birds:	Dr. Dhananjai Mohan
	Dr. R. Suresh Kumar

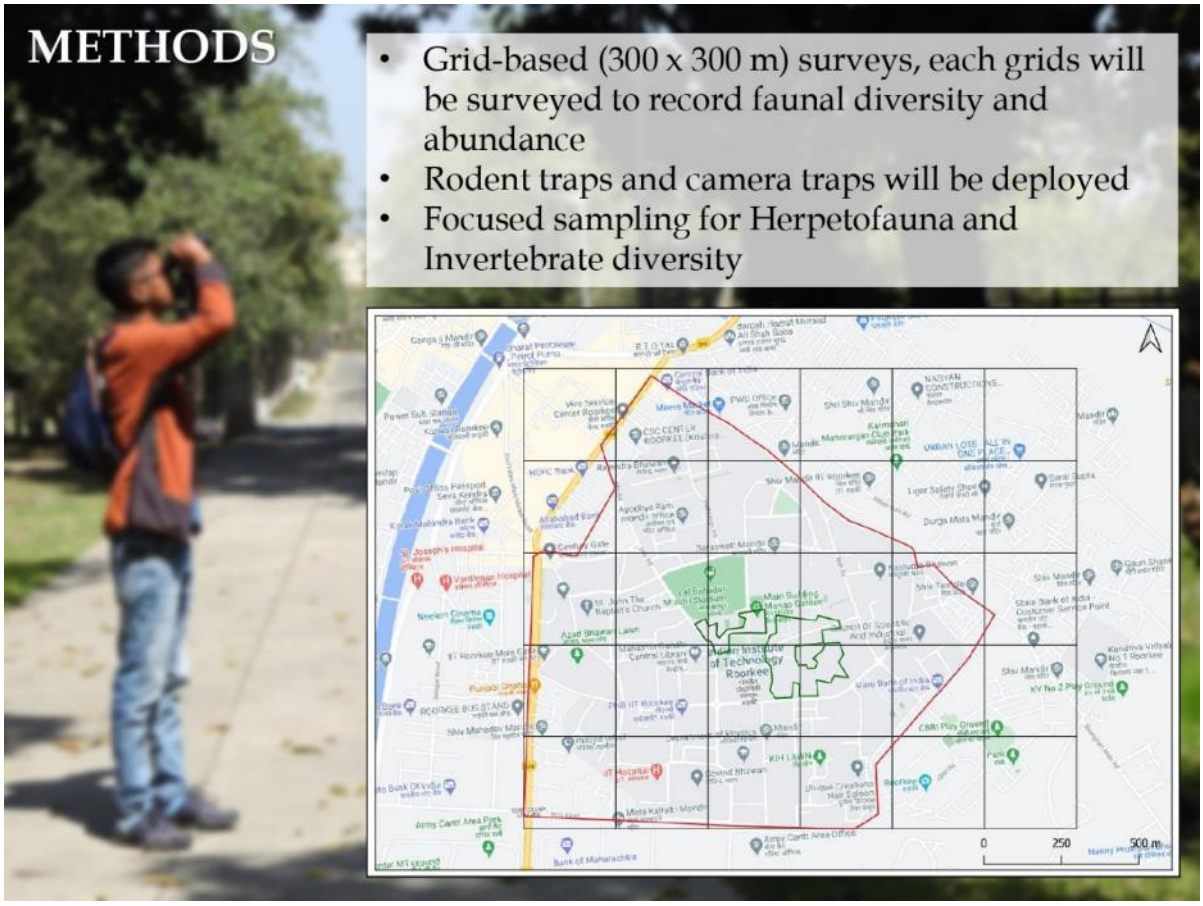
& WII researchers and other taxon experts

INTRODUCTION

- More than 55% of world's population lives in urbanized areas
- Greenspace: vegetation within urban environment
- Prevent biodiversity loss
- Key role in: human physical and psychological health, societal and cultural health, economic health and stability
- Maintains carbon budget in urban ecosystem
- Challenges for biodiversity conservation in urban environment: localized pollution, disruption of ecosystem structure and limited space

- **IIT Roorkee campus: green lung of Roorkee city**





Mapping the Trees

All woody plants above a certain height/ girth cut-off will be geo-referenced along with information on:

- Girth
- Height
- Identity
- Common and vernacular name
- Scientific name and family

Photographs of vegetative and reproductive parts

Inventory of Herbaceous Plants

Documenting the annual/ephemeral Plants

- Herbs
- Climbers
- Epiphytes
- Grasses

Through multi-season repeated surveys of the different parts of the campus

Progress so far…

A total of five visits (60 man-hours of effort) have been made to primarily record Avian diversity of the campus

During these visits: a total of **45** bird species recorded belonging **28** families

A total of **9** species were recorded **nesting** in the campus

Status	No. of Sp.
Resident	37
Winter Migrant	3
Altitudinal Migrant	4
Summer Migrant	1

Black-rumped Flameback

Black Kite

Maroon Oriole

A total of 6 species belonging to 4 families of Spiders were recorded

Telamonia sp. (Salticidae)

Rhene sp. (Salticidae) feeding on *Oxyopes* sp. (Oxyopidae) *Menemerus sp.* (Salticidae)

Menemerus sp. (Salticidae)

Hersilia sp. (Hersiliidae)

Argiope anasuja Thorell, 1887 (Araneidae)

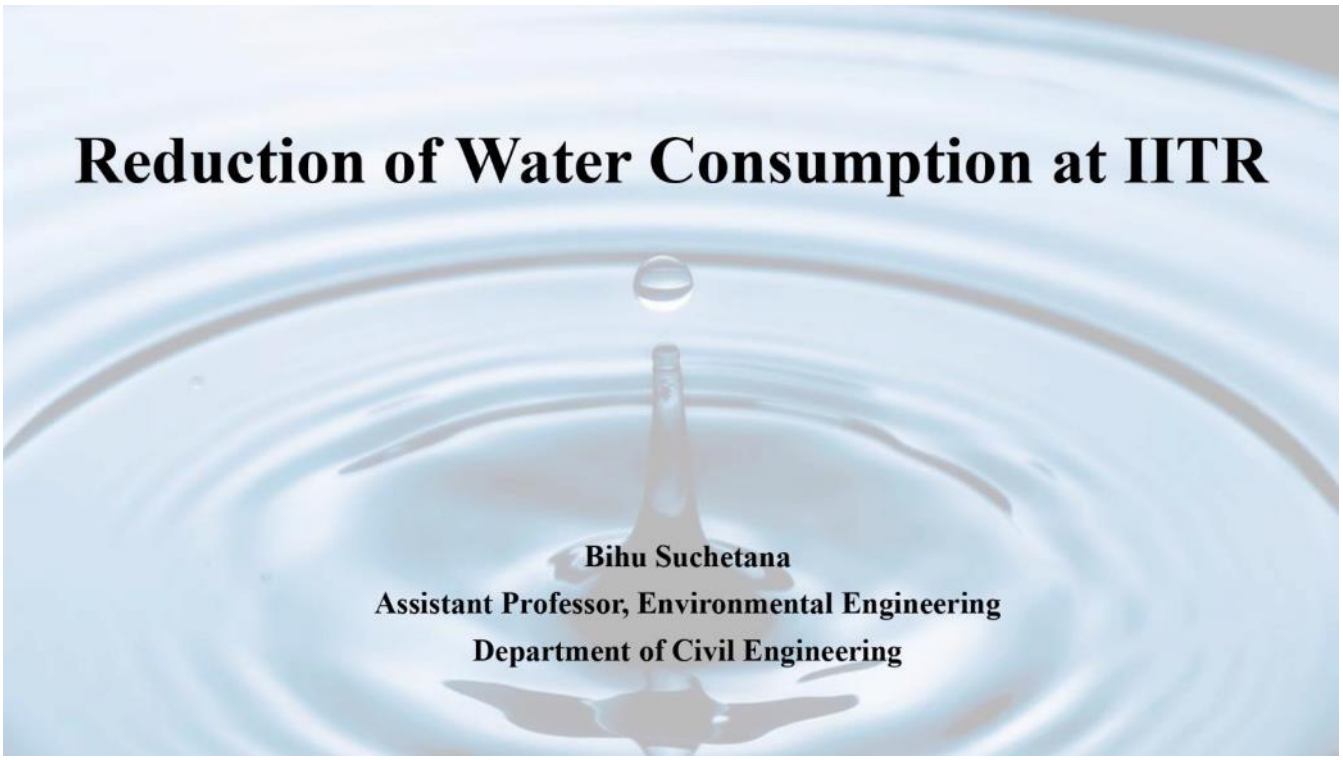
Leucauge decorata (Blackwall, 1864) (Tetragnathidae)

Key Benefits

- First time: Inventory of Flora and Fauna of the IIT Roorkee campus
- Will be helpful to: IIT Roorkee estate management
- May lead to further studies eg. Carbon sequestered, long term monitoring in spatio-temporal change in flora and fauna of the campus
- Awareness

Annexure 2

2. Presentation on Reduction of water consumption in IITR by Prof Bihu Suchetna



Background

- At IITR, per capita water consumption exceeds 300 lpcd
- Excessive consumption is indicative of indiscriminate use, as well as losses or leaks within system
- There are reports of poor quality of water being supplied at dead zones in a network
- Water Supply division of the Office of Estate and Works has installed flow meters and OHT level sensors at certain locations
- A multi-pronged approach of monitoring, testing and outreach is suggested to reduce overall water consumption

A. Monitoring

Preparation of a digital, as well as hydraulic model of the institute's Water Distribution System (WDS)

i. Preparation of a digital model of the Institute's WDS using Ground Penetration Radar (GPR) surveying. The
   - Exact location, depth and length of the pipelines.
   - External vendor(s) will be hired to carry out GPR surveys

ii. Preparation of a hydraulic model of the Institute's WDS using WaterGEMS
   - Determining the location for placement of water meters, and thus down the line, can be useful in analysing temporal and spatial trends in water consumption.
   - M. Tech student will be hired for this task

B. Testing

Identification of dead zones and other regions within the WDS with poor water quality

i. WaterGEMS water quality modelling utilizing the hydraulic model
   - Water quality simulations for various chlorine dosages
   - An M. Tech student will be hired to carry out the water quality modelling on WaterGEMS.

ii. Dead-zones or locations with high water age will be identified and the quality will be tested.
   - Environmental Engineering laboratory of the Civil Engineering department.
   - Laboratory staff will be employed to carry out sampling and testing across campus.

C. Outreach

Development and execution of various outreach strategies across campus to improve public awareness towards water conservation and reduce unmindful wastage

i. Design and distribution of an online questionnaire to all email holders within the Institute community to gauge their water usage patterns and level of awareness on water conservation

ii. Delivery of monthly mass emails (for the rest of the year) to Institute community with information on everyday practices that reduce the wastage of water

iii. Installation of eye-catching pamphlets and posters near all wash-basins in departments, hostels, guest houses and messes to serve as a visual reminder to save water.

- An M. Tech student will be hired to prepare these questionnaires, posters and pamphlets.

Budget

HEAD	EXPENSE
Testing	
GPR surveying @ Rs.20,000/km of pipeline[1]	Rs. 5,22,000.00
Water quality testing @ Rs.1,000 per sample*15 samples	Rs. 15,000.00
Manpower	
3 M. Tech students (@ Rs. 12,000 p.m. for 1 month each)	Rs. 36,000.00
Consumables	
Printing of posters and pamphlets	Rs. 30,000.00
Consumables for water quality testing	Rs. 25,000.00
TOTAL	Rs. 6,28,000.00

[1] Length of institute pipeline is 26.1 km

Next steps

Installation of consumer water meters for bulk measurement, and eventually household-level measurement

- Measurement of water consumption is key to reducing it
  - Installation of water meters at bulk consumption points
  - Household level measurements

- Estate & Works can decide on location and phase-wise implementation of such schemes

Annexure 3

3. Presentation on Solid Waste Management to reduce waste disposal in IITR by Prof BP Vellanki

SOLID WASTE MANAGEMENT ON CAMPUS

14th April 2021

Data

1. **Waste**
   1. **Quantity**
   2. **Characterisation**
2. **Experiments**
   1. **Quantum of gas**
   2. **Composition of gas**
   3. **Optimisation of feed waste**

Technical personnel

- Dr. Muntjeer Ali, (Postdoctoral Fellow),
- Banafsha Ahmed (PhD)
- Rahul Rao (M.Tech)

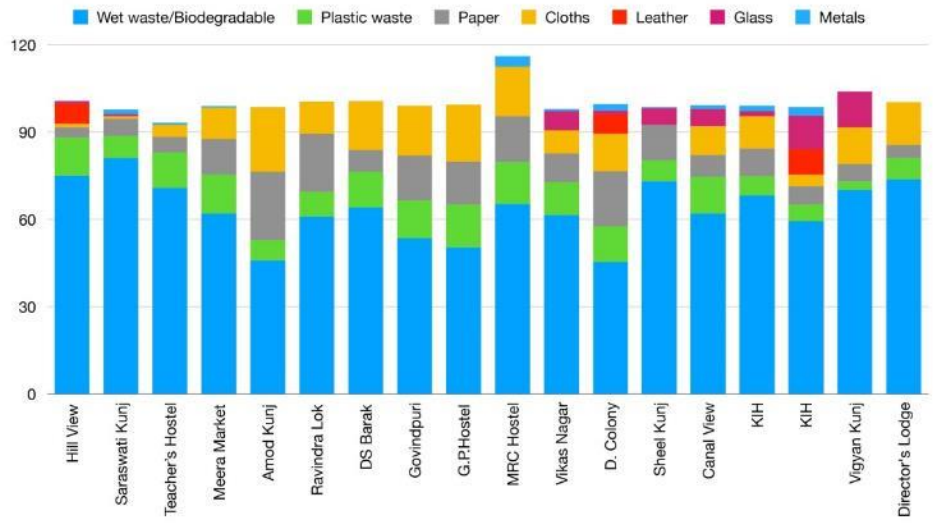
Quantification of Waste

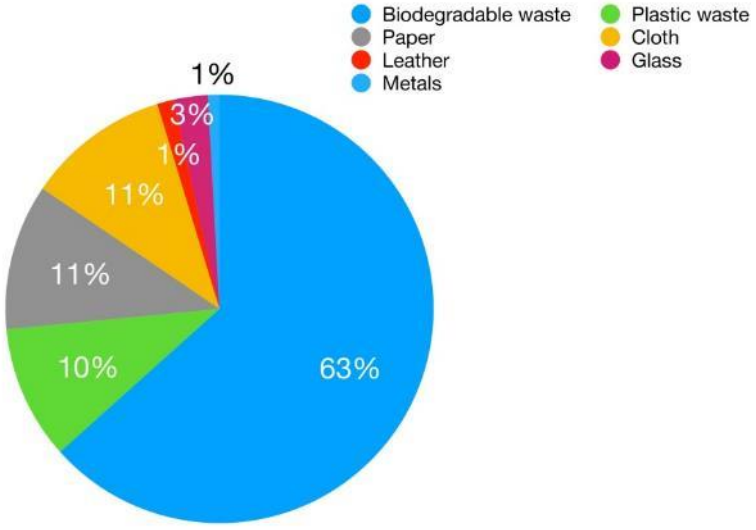
Vehicle 1		Vehicle 2	
Dated	Waste generated (kg)	Dated	Waste Generated (kg)
15.02.2021	1915	15.02.2021	2435
16.02.2021	1600	16.02.2021	1960
17.02.2021	2175	17.02.2021	2345
18.02.2021	3095	18.02.2021	2515
19.02.2021	2315	19.02.2021	2515
Total Waste in each Vehicle per day	2220 kg		2354 Kg
Total waste generated in the campus per day	**2220 + 2354 = 4574 Kg or 4.6 tons**		

Waste per day: 4.5 tonnes

- Household waste: 3 ton
- Tree waste: 1.5 Ton

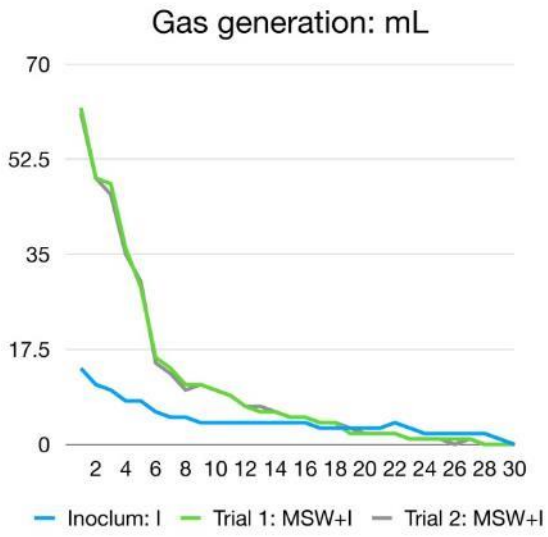
Characterisation of waste





Experiments

Only kitchen waste

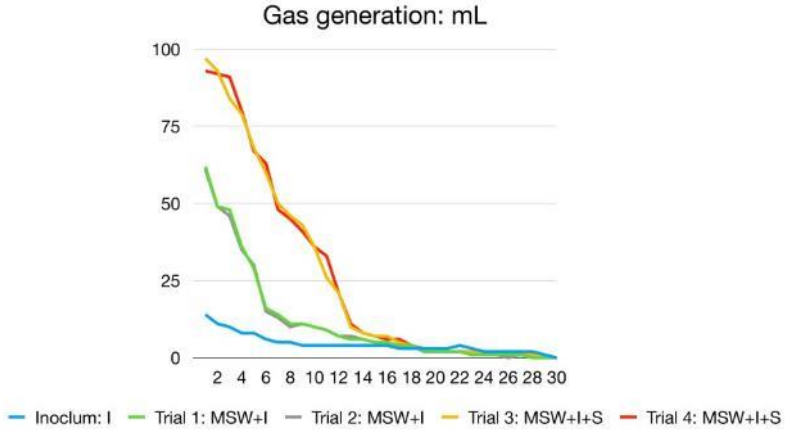


STP sludge: High N

Inefficient

- Energy equivalent is less
  - C/N ratio is too high

Optimised kitchen waste and sludge



Composition of Biogas

Tedlar bags (500 mL)

Fixing of tedlar bag for gas collection

AD bottles with tedlar bags inside the cabinet at temperature 35°C

S. No.	Parameters	Unit	MSW+I	MSW + I+ S
1.	Methane (CH_4)	% v/v	55.82	57.54
2.	Carbon Dioxide (CO_2)	% v/v	24.70	22.31
3.	Oxygen Content (O_2)	% v/v	0.01	0.01
4.	Hydrogen Sulphide (as H_2S)	% v/v	6.02	4.09
5.	Nitrogen (N_2)	% v/v	4.12	6.01
6.	Hydrogen (H_2)	% v/v	4.92	4.62
7.	Ammonia (NH_3)	% v/v	4.40	5.40

Setup	Energy (MJ/ton waste)	Energy per day based on 1.8 ton per day biodegradable waste (MJ)
MSW+I	67,905	1,22,229
MSW+I+S	2,39,581	4,31,246

Tree leaves: 1.5 ton

Currently being burnt off campus by waste collection vendor

Tree leaf degradation: In progress

Cost of Biomethanation unit

- Around 70 lakhs

Annexure 4

4. Presentation on implementation of Mini-forests in IITR by Prof BP Vellanki

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

Green Committee

Implementation of Mini Forests in IIT Roorkee

Time line

- Meeting with representatives of:
  - Institute (IA)
  - Transportation Engineering Group
  - NGO
- Preliminary sites identified
- Site visit with NGO
  - Sites shortlisted
- Site visit with DD
  - Site finalised

PROPOSED SITE

MIYAWAKI FORESTS : CASE STUDIES (SayTrees Organisation)

Forest at : Diesel Loco Shed, KR Puram, Bengaluru, India.
No.of Saplings : 2000, Date of plantation : September 24, 2016

Forest at : Kyalasanahalli Lake, Bengaluru, India.
No.of Saplings : 9400, Date of plantation : July 29, 2017

Costs

saytrees — Miyawaki Afforestation Budget Sheet (IIT Roorkee Campus)

Sr. No	Account Head	Budget Item	Units	Unit Budget	Total Budget(₹)	Remarks
A		Non Recurring				
		Fencing	0	0	0	Already secured
Total					0	
B		Programme Activity Costs				
		Plantation				
		Saplings	1000	40	40000	Sapling Cost + Transportation + Labour Charges
		Soil Bed Preparation (100m²)	300	140	42000	Preparation of Bed using JCB
		Vermi-Composte	2000*	0	0	*Dry Sludge (from the Sewage treatment plant)
		Manure(2000Kg)	1000	6	6000	Cow dung
		Rice Husk (1500Kg)	1500	7	10500	
		Mulching (2500Kg)	1500	0	0	Will be done using dry leaves (from Campus)
		Jaggery and Neem Cake	125	45	5625	
		Organic liquid (25 Litres)	25	80	2000	गण - जीव-अमृत & EM solution
		Support Sticks	1000	12	12000	
		Coconut/Wood Dust (3000Kg)	3000	12	36000	
Total					154125	
C		Maintenance for 24 months				
		Water (50k ltr/week)			0	Will be provided by Campus
		8000 kg of mulching material	8000	0	0	Will be done using dry leaves (from Campus)
		Sludge (*800 ltr)	800*	0	0	from the Sewage treatment plant
		100 Litres of organic liquid	100	80	8000	गण - जीव-अमृत & EM solution
Total					8000	
D		Travels				
		Traveling & Accomodation	10000	1	10000	
Total					10000	
E		Office Administration				
		Admin Cost : Office administration, Documentation, reporting, internal audits, Accounting, Financial audit fee etc.	1		20000	Project Execution Cost
Total					20000	
F		Misc.				
		Overhead 5 %	1	5%	8106.25	For unplanned activities
Total					8106.25	
BUDGET TOTALS			1000	200.23	2,00,231.25	

* Exact Quantity will depend upon material quality & soil report

Funds

- Ms.Shweta Arya, Outreach Director, Delaware Interfaith Power and Light
  - Will contribute Rs.2,00,000/.

- Condition/Request
  - Informational Signage with a plaque engraved in memory of her father, an alumni of UoR

- If materials are not available: Around Rs. 60,000 costs for IITR

Initiation of project

- Preferably early June (pre monsoon)

Annexure 5

5. Presentation on Water Conservation Implementation plan in IITR by Prof Deepak Khare

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

"Rainwater Harvesting in IIT Roorkee Campus"

Prof. Deepak Khare

Department of Water Resources Development and Management

Indian Institute of Technology Roorkee

Background

- Discussions with Dean Infra Prof. Zulfikar Ahmed for RWH (Feb., 2020)
- Do Letter from National Water Mission (June, 2020)

- **Rainwater Harvesting is not New**

G. ASOK KUMAR, IAS
Addl. Secy. & Mission Director
National Water Mission

भारत सरकार/GOVERNMENT OF INDIA
जल शक्ति मंत्रालय/MINISTRY OF JAL SHAKTI
जल संसाधन, नदी विकास और गंगा संरक्षण विभाग
DEPTT. OF WATER RESOURCES,
RIVER DEVELOPMENT & GANGA REJUVENATION
राष्ट्रीय जल मिशन/NATIONAL WATER MISSION

D.O. No M 65022 / 01/2020 -NWM/1349

Dated 10th June, 2020

Dear Prof. Chaturvedi,

Greetings from the National Water Mission (NWM).

National Water Mission (NWM) is one of the 8 missions set up in 2011 under the National Action Plan for Climate Change (NAPCC) guided by the Prime Minister's Council. The main objective of NWM is to *"conserve water, minimize wastage & to ensure its more equitable distribution both across and within the states through integrated water resource development and management"*. Promotion of citizen and state actions for water conservation, augmentation and preservation is one of the goals of NWM.

2. Water is a prime life-sustaining natural resource that cannot be created. India is having 18% of world's population, but has only 4% of its fresh water resources. The per-capita per-year availability of water has come down from 5177 cubic-meters in 1951 to 1545 cubic-meters in 2011. Though unevenly spread temporarily and spatially, India receives sufficient rainfall to cover most areas of the country. However, presently India stores approximately 8% of this water. With the increasing demand, this is leading to water crisis year after year. Effectively managing the fast depleting water resources is also of strategic importance. Prime Minister has from many platforms and many times exhorted citizens to join hands to conserve water to secure the future.

3. National Water Mission's campaign "***Catch the rain***" is to nudge all stake-holders to create Rain Water Harvesting Structures (RWHS) suitable to the climatic conditions and sub-soil strata, by first week of June itself- ie before the onset of monsoon, to catch the rains. Drives to make water harvesting pits, rooftop RWHS, check dams etc, removal of encroachments and de-silting of tanks to increase their storage capacity, removal of obstructions in the channels which bring water to them from the catchment areas etc, repairs to step-wells and using defunct bore-wells to put the water back to aquifers etc are some of the activities suggested to be taken up with peoples' active participation under this campaign.

4. Rainwater harvesting (RWH) and Artificial Recharge structures are water conservation practices that can be used to expand the existing water supply. Rainwater 'harvesting,' or the capture of rainfall runoff from roofs or similar hard surfaces of the campus that would normally escape to sewers or overland flow, provides a high-quality source of water that can be used to extend an installation's water supply.

5. IITs have large land areas and hence it is requested that all the rain water falling in the campus be impounded in or under the ground within the campus by creating appropriate RWHS.

6. Further, it is also advised to move towards the dual piping systems inside the campus buildings so that greywater from kitchens & bathrooms after primary filtration can be used for flushing systems and irrigation in parks & gardens of the campus. This can reduce the use of potable water for non-potable uses.

7. I request you to take steps to ensure appropriate rainwater harvesting and artificial recharge measures before the onset of the monsoon season.

8. You may please inform the action taken and send relevant pictures by email to md.nwm@gov.in or catchtherain.nwm@gmail.com.

With kind regards,

Yours sincerely,

(G Asok Kumar)

Prof. A. K. Chaturvedi
Director, Indian Institute of Technology, Roorkee
Directorate Office, IIT Roorkee, Roorkee-247667

द्वितीय तल, ब्लाक न. तृतीय, सी.जी.ओ. कॉम्प्लेक्स, लोधी रोड, नई दिल्ली-110003
2nd FLOOR, BLOCK No. III, CGO COMPLEX, LODHI ROAD, NEW DELHI-110003
ई-मेल / Email: md.nwm@gov.in, वेबसाइट / Website : http://www.nationalwatermission.gov.in/www.nwm.gov.in;
टेलीफैक्स/Telefax : 011-24365200 ; फैक्स/Fax : 011-24364568

G. ASOK KUMAR, IAS
Addl. Secy. & Mission Director
National Water Mission

भारत सरकार/GOVERNMENT OF INDIA
जल शक्ति मंत्रालय/MINISTRY OF JAL SHAKTI
जल संसाधन, नदी विकास और गंगा संरक्षण विभाग
DEPTT. OF WATER RESOURCES,
RIVER DEVELOPMENT & GANGA REJUVENATION
राष्ट्रीय जल मिशन/NATIONAL WATER MISSION

DO No. M-65022/01/2020-NWM/1545

Date: 31st July 2020

Dear Prof. Khareji,

Greetings from the National Water Mission (NWM)

2. As you are aware, National Water Mission (NWM) is one of the 8 missions set up in 2011 under the National Action Plan for Climate Change (NAPCC) guided by the Prime Minister's council. The main objective of NWM is to "Conserve water, minimize wastage & to ensure its more equitable distribution both across and within the states through integrated water resources development and management". Promotion of citizen and state actions for water conservation, augmentation and preservation is one of the goals of NWM.

3. National Water Mission's campaign "Catch the rain" is to nudge all stake-holders to create Rain Water Harvesting Structures (RWHS) suitable to the climatic conditions and sub-soil strata.

4. In view of your vast experience in the areas of Water Resources Management andRainwater Harvesting, NWM will be happy to invite you to associate with the "Catch the Rain" campaign. You may please help in creating appropriate Rainwater Harvesting Structures in your region and in creating awareness for rainwater harvesting including providing technical know-how to different end users. You can also help in spreading the concept of "Catch the rain" among the Technical Institutions/ Schools/ student's community and society.

5. Your cooperation for joining hands with the National Water Mission's campaign "Catch the Rain" is appreciated.

With regards,

Yours sincerely

(G Asok Kumar)

Prof. Deepak Khare
Department of Water Resources
Development & Management
Indian Institute of Technology
Roorkee - 247667
khare1wi@iitr.ac.in

द्वितीय तल, ब्लाक न. तृतीय, सी.जी.ओ. कॉम्प्लेक्स, लोधी रोड, नई दिल्ली-110003
2nd FLOOR, BLOCK No. III, CGO COMPLEX, LODHI ROAD, NEW DELHI-110003

Background Cond.....

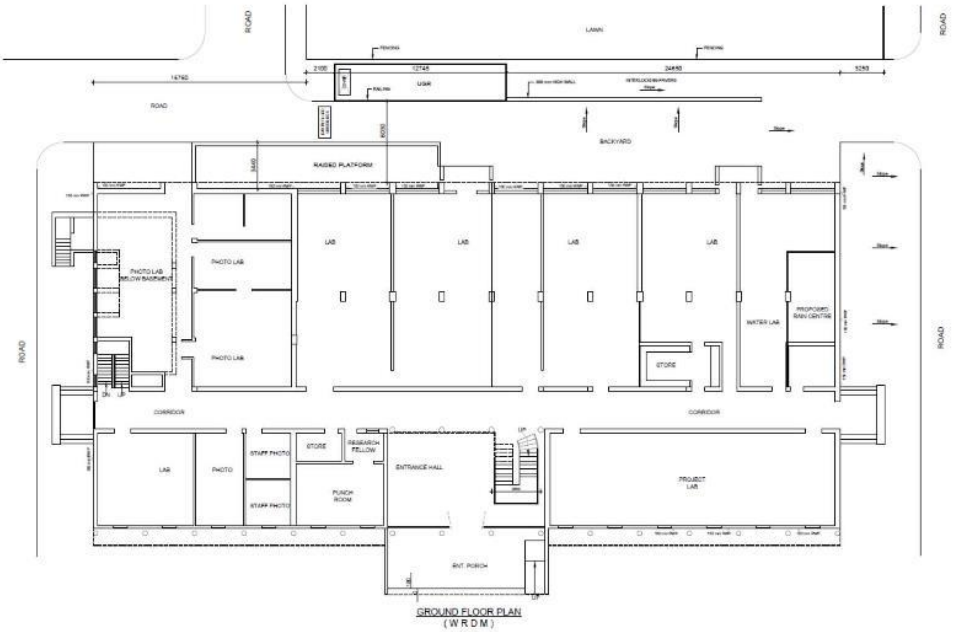
- **It was proposed to establish first few working models and proposed:**

- Meeting was held in early July, 2020 with Dean Infra and Team
- Visits were made and decided to Start few installations in WRDM and Kasturba Bhawan

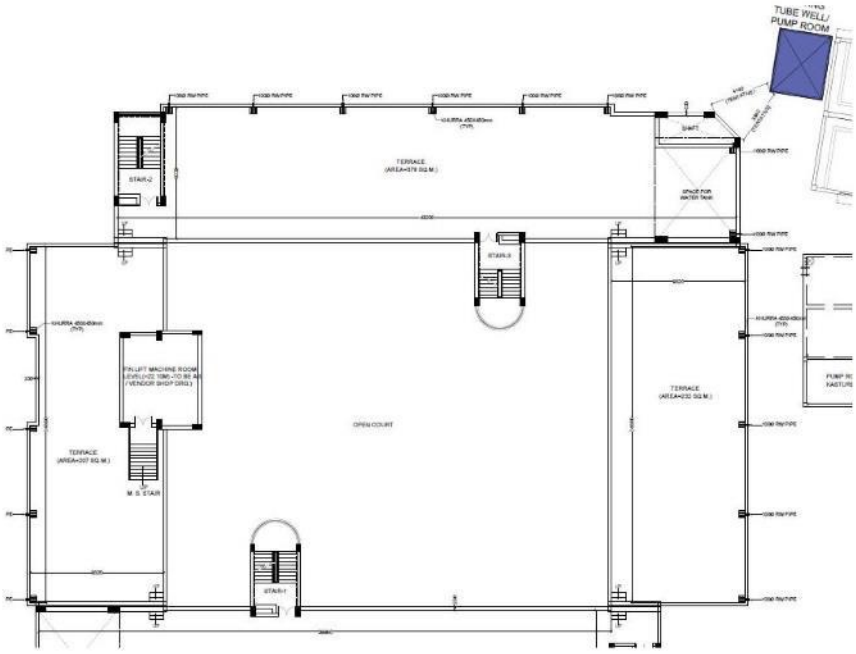
- During Nov., 2020 Recharge Shafts/Pits were constructed
- Dec/Jan, Installations in WRDM were done
- Feb., 2021, Installations in Kasturba Bhawan were done

- **During the execution meetings were held with Dean Infra Prof. Umesh Sharma and Shri Neeraj Kohli (AEE Electrical and Water Supply).**
- Models:
- **(i) RT-RWH---Recharge**
- **(ii) RT-RWH---Storage**
- **(iii) Recharge Shaft**
- **(iv) Recharge Pit**

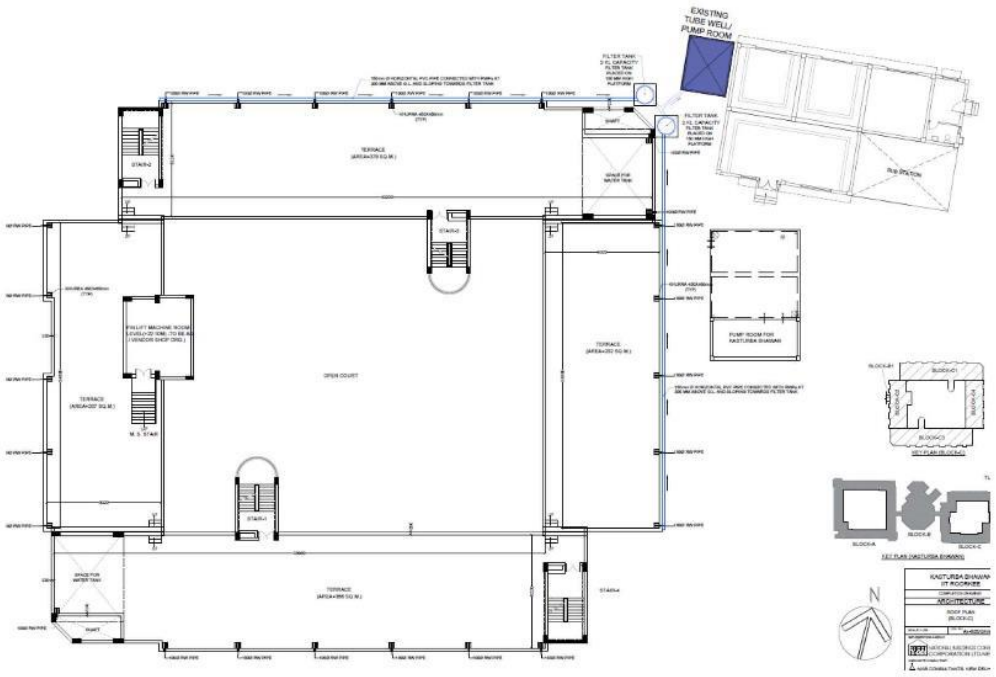
FLOOR PLAN OF WRDM



FLOOR PLAN OF KASTURBA BHAWAN

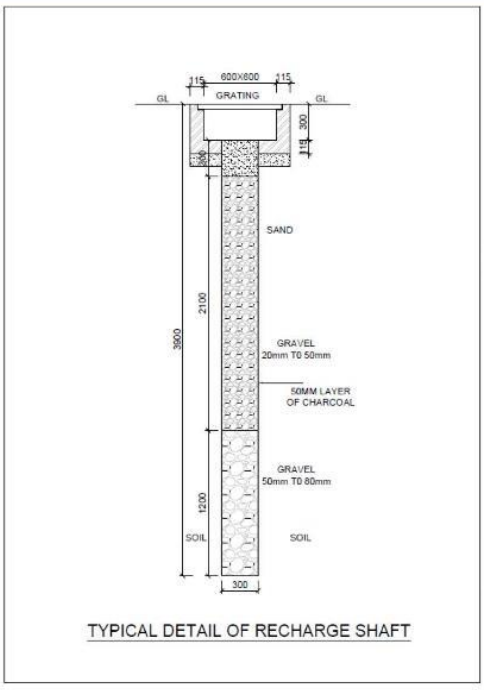


FLOOR PLAN OF KASTURBA BHAWAN

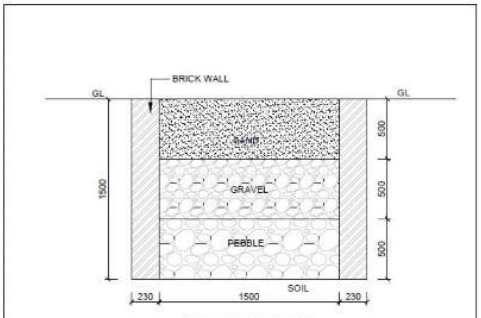


Roof Top-Rainwater Harvesting at WRDM

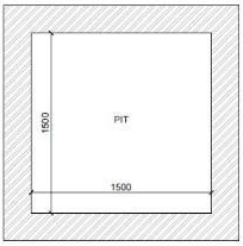
Recharge Through Recharge Shaft



TYPICAL DETAIL OF RECHARGE SHAFT



SECTION OF PIT



PLAN OF PIT

TYPICAL DETAIL RECHARGE PIT

Roof Top-Rainwater Harvesting at WRDM

Recharge Through Recharge Shaft

Roof Top-Rainwater Harvesting at WRDM

Storage of Roof-Top Rainwater

Roof Top-Rainwater Harvesting at Kasturba Bhawan

Roof-Top Rainwater Harvesting Ground Water recharge Through Abandoned Well

Roof Top-Rainwater Harvesting at Kasturba Bhawan

Roof-Top Rainwater Harvesting Ground Water recharge Through Abandoned Well

Status of Work:

- Almost Complete
- Filter material is awaited, then Filters will be prepared
- Then in Monsoon Working/Testing will be done

Annexure 6

6. Presentation on Virtual Awareness Campaign for Environmental aspects in IITR by Prof Ram Manohar Singh.

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

Green Committee

Theme based Communication plan

Awareness campaign updates

INTRODUCTION

- Communication plan
  - One campaign per month
  - Includes a survey
  - Online & offline mode
- Campaign updates
  - 2 campaigns (1 missed)
- Opportunity to showcase our initiatives
  - Departments/offices - Please provide inputs

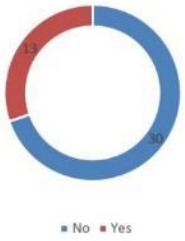
Posters used for the Campaign

Feedback – Campaign 1

- Electronic waste disposal
- Segregation of waste
- Campus transportation
  - Any institute facility for transportation?
  - Pavement for pedestrians
  - Speed limit
- Water wastage
  - Toilet
  - Leaking taps
- Disposal of chemical waste

Feedback - Campaign 2

Do you ever notice burning of waste/dry leaves in your area for the past 1 month?



Old Teachers Hostel
Around Biotech dept and near Azad bhawan area
around the sport complex
G P Hostel Gate
residential area of SRE Campus
4/1 Niti Nagar
31/2 Niti Nagar
NEAR MY HOUSE BY SWEEPERS, THEY BURN WASTE.