



Regional Dialogue on the Green Campus Initiative 5th June 2020

SDG's and How Green is Your Campus

Presented by,

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Theme of World Environment Day 2020

According to UN, the theme for 2020 is biodiversity—a concern that is both urgent and existential. "Recent events, from bushfires in Brazil, the United States, and Australia to locust infestations across East Africa — and now, a global disease pandemic — demonstrate the interdependence of humans and the webs of life, in which they

exist," the UN said in a statement.







What does the Bible say about locusts?

Contributed by Rajat Ghai, CSE India



• In the Bible, God afflicts ancient Egyptians with ten plagues for their sins. One of them was the plague of locusts https://www.downtoearth.org.in/news/young/what-does-the-bible-say-about-locusts--71519

Of the ten plagues, the eighth one was that of locusts.



Google Earth - Gurgaon



























AAETI Hyderabad









Sustainable Development Goals

























17 PARTNERSHIPS FOR THE GOALS















Sustainable Development Goal No. 11

The Sustainable Development Goal (SDG)No. 11 is the one of the 17 goals that provide targets for sustainable urban development. It aims to make cities inclusive, safe, resilient and sustainable and provide key criteria.

It is but reasonable to check how the country is performing on few of the urban criteria







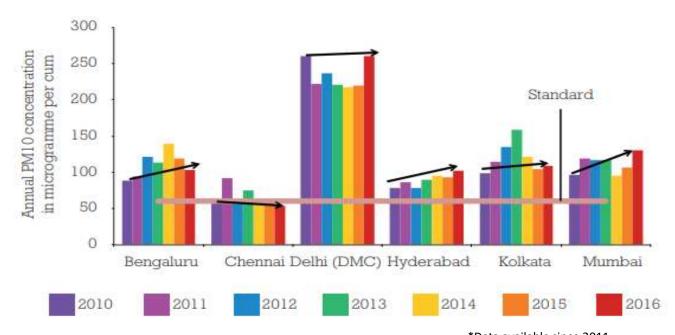
How are the urban (physical) systems performing?

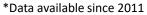
Air quality: The disease burden of polluted air is constantly on the rise. The population-weighted annual average $PM_{2.5}$ concentration in India was 76 µg/m3 in 2016, while the safe limit suggested by World Health Organisation is 10 µg/m3. - State of Global Air report 2018



Toxic Air

PM10 concentration in six mega cities—way above the standard



















http://oldstersview.files.wordpress.com/2008/07/picture-5.jpg



How are the urban (physical) systems performing?

<u>Solid waste management</u>: India produces about 65 million tonnes of solid waste annually. The amount of waste generated per annum is increasing two-three times faster than the population growth rate. Only 20 per cent of collected waste is treated!







Solid waste Snapshot





Data does not include the waste generated by 250,000 Gram Panchayats of the country.

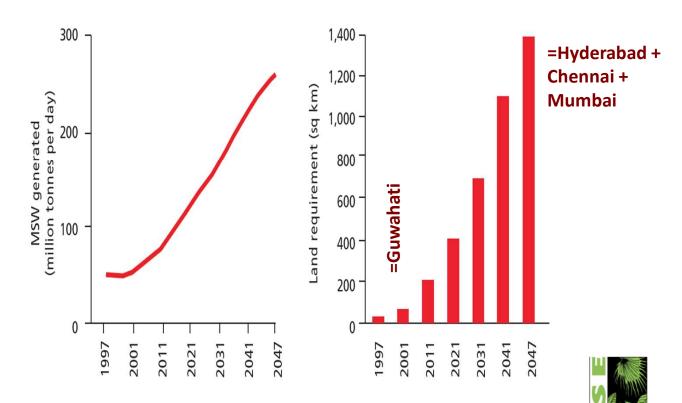






SOLID WASTE GENERATION AND LANDFILL REQUIREMENTS

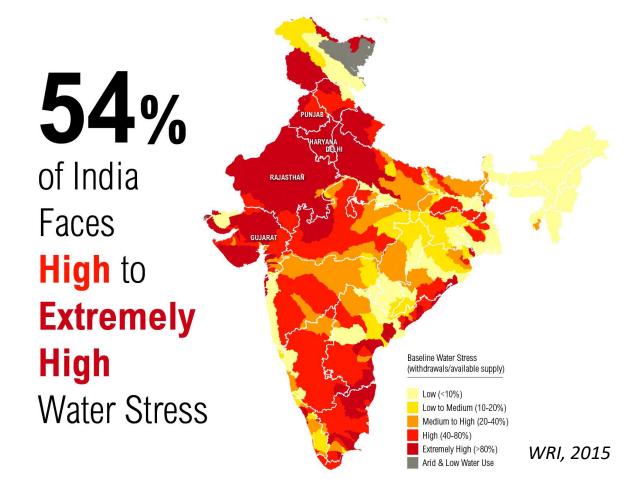
There has been an exponential increase in the volume of MSW and, therefore, the area of land needed to dispose it



Source: DEA 2009, *Position paper on solid waste management sector in India*, Department of Economic Affairs, Ministry of Finance, New Delhi













Mumbai







Chennai







Delhi







Bangalore







Jaipur



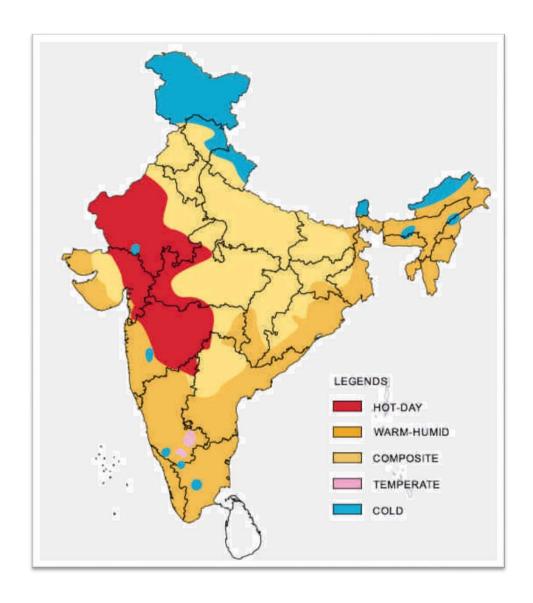




Chandigarh







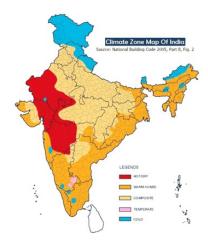
AAETI **AAETI**



What is this paradigm? Five climatic zone and yet climate insensitive.....



























Where does this belong?

CAMPUS AND SDG'S OVERLAP









WHY GREEN CAMPUS?

 Estimated 231 Million Tons Equivalent CO₂ emission every year from campuses.

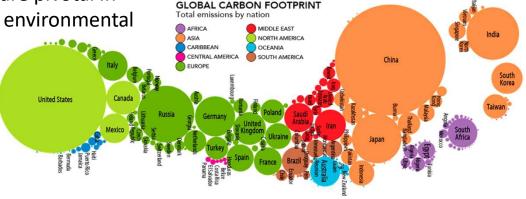
 Need for water, land and biodiversity will be equally enormous.

Educational institutions are pivotal in laying the foundation of environmental ethics

185 Pvt. 318 129 37204 Central State deemed autono Uni. regd. Uni. Uni. to be colleges mous Uni. inst.

Graphic not to scale; Source: MHRD 2013





GREEN CAMPUS

Kakodkar Committee Report - May 13, 2011

GREEN INITIATIVES

The Council of IITs decided that each IIT would establish a Green Office, which would carry out Green Audit and ensure inclusion of green technology related topics/courses in the curriculum. The Kakodkar Committee Report also emphasizes the need for IITs to be in the forefront of development of technology for sustainable growth. Most of the education and research institutions in Europe and America have adopted Sustainability Agenda and are implementing programs to reduce their Caron footprint, recycle the resources, adopt energy efficiency measures and include sustainability issues in the teaching programs. As part of this, every student will be required to complete at least one project of technology application relevant to local neighbourhood development and related to his/her area of expertise/concern.





GREEN CAMPUS INITIATIVE

Objectives:

- ✓ To bring environmental education into practice.
- ✓ To encourage efficient and transparent monitoring of resource consumption patterns and waste generation to benchmark environmental performance of campuses.
- ✓ To weave committed communities for on-ground environmental action.
- ✓ To foster an environmentally aware and responsible generation of citizens, starting from campuses.
- ✓ To bring the achievers onto the national center-stage and enable mutual learning.





- First workshop in Delhi in March 2017.
- Demand for an organized process to understand campuses, their resource footprints and conduct green audits



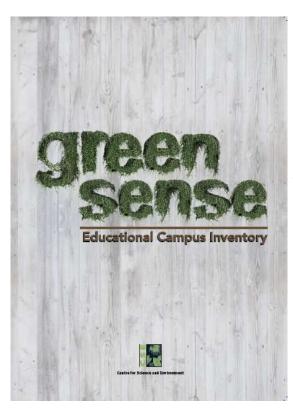


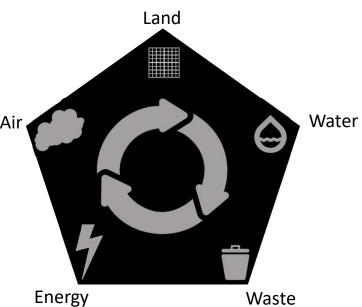
St. Xavier's, Kolkata August 2017



CSE's Green Campus Initiative

- First workshop in Delhi in March 2017.
- Demand for an organized process to understand their campus and conduct green audits





- Consumption
- Conservation
- Operations &Maintenance













AAETI, January 2018



Audit protocol dissemination: Nationwide engagement at AAETI



Audit protocol dissemination: Regional engagement at Mysuru



Mysuru, September 2018





AAETI, March 2019



Audit protocol dissemination: Nationwide engagement at AAETI





About the Green Campus Initiative

This initiative tries to showcase the efforts made by educational campuses in the country, it consists of green initiatives taken in five sections: Energy, Land, Air, Water and Waste. Each section is assessed through a wide range of parameters some of which are mentioned below.

Each category has 3 sub sets:

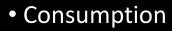
- **Efficient Consumption**: To ensure the optimum utilization of resources.
- Conservation: To ensure that the replenishment potential of the resource is met and to award the generation of a resource being produced in a sustainable manner.
- Operation/Maintenance and Policy: To ensure that losses caused due to faults maintenance issues are minimized and good policies are rewarded.



LAND

Harnessing/h arvesting Natural Resources





Conservation

Operations & Maintenance









Operation/M aintenance and Policy









Tree Density







Impervious Open





Pervious Open













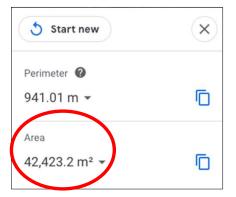
STEP 1: Locate your campus on Google Earth or a similar software



STEP 2: Mark your campus using the measure tool



STEP 3: Note the Total Site Area









Total Covered area



Total Impervious paved area

Total Site Area - Total Covered area - Total Impervious paved area = Pervious open area

Subtract the Total Covered area and the Total impervious area from site area to arrive at pervious open area

AAETI **ENERGY** Consumption Conservation Operations & Maintenance





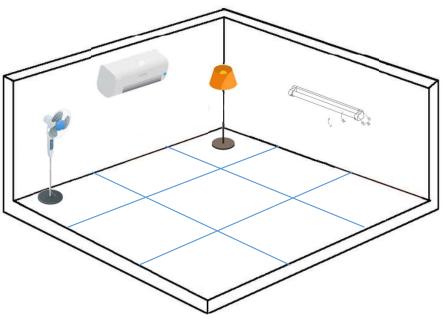








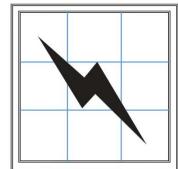
EPI – Energy Performance Index



Energy
Performance =
Index

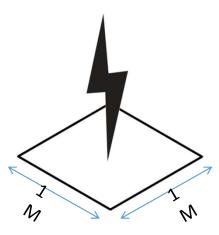
Energy Consumed Annually (KWh)

Built Up Area (sq.m.)



AAETI

62.7 KWh/sq.m./yr.







Meter No Time	Previous Present Reading Reading	MF	Uni	- Docamacca,	Max Demand
GTE00005 N GTE00005 E	110382.00 127336.00 18143.00 20910.00	1.00	16954.0 2767.0		
Amount due after	Bil Monthly Pohates	MAR, 2 11918 29.08.	2.00 2017	APR, 2017 39374.00 09.10.2017	0.00

RMVCC Kolkata =
$$\frac{54267 \text{ KWh}}{2160 \text{ Sqm}} = \frac{26}{\text{KWh/Sq}}$$
 = KWh/Sq m/yr.

Meter No Time GTE00005 N GTE00005 E Bill Month	Previous Present Reading Reading 138026.00 147421.00 21380.00 21804.00	MF Unit Estimated/ Max Demand Consumed Adj. Unit (KVA) 1.00 9395.00 0.00 1.00 424.00 0.00
Amount due after	due date(Rs.) il Monthly Rebates	DEC, 2017 JAN, 2018 XXX 26334.00 26334.00 0.00



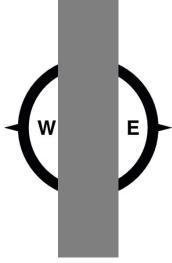
Passive Features



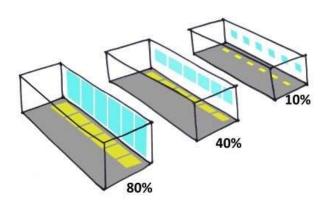
Orientation

Shading

Window Wall Ratio



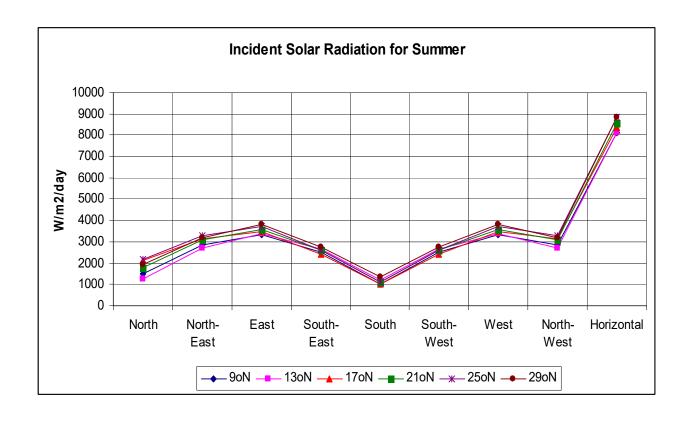








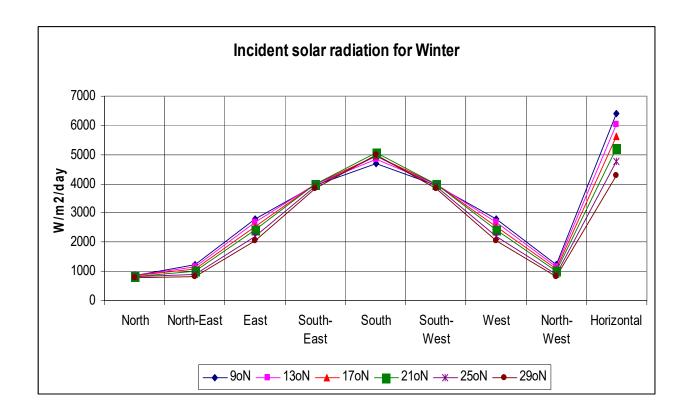
Incident solar radiation in summer for India







Incident solar radiation in winter for India









Click on this circular icon to orient the image in a way that north faces up.

North is not facing up



North is facing up



Tell me 3 things wrong with this?



Window Wall Ratio





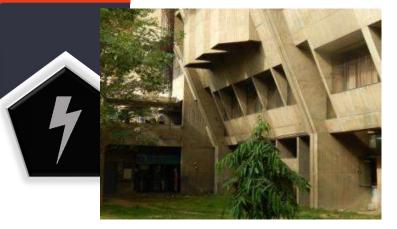






Effect of A High Window-Wall-Ratio

Guru Nanak Dev University, Amritsar



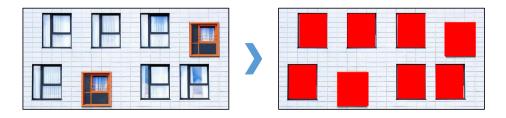




Crevices and shading elements in built form





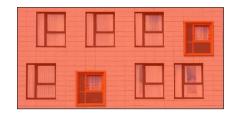


Window Wall Ratio Window Area on a facade

Total exterior exposed Surface of wall





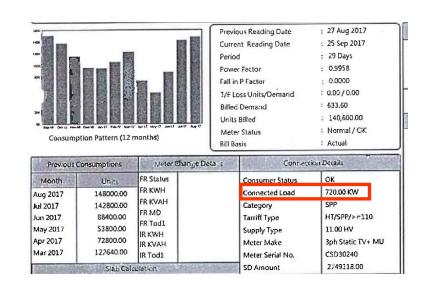


1

Renewable Energy

Xavier's Bhubaneswar

Solar =
$$\frac{180 \text{ Kwp}}{720 \text{ Kw}}$$
 = 25%





Guru Nanak Dev University, Amritsar

Don Bosco University, Assam





Solar energy plant of 3 MW capacity privately operated and maintained at no cost as identified by the Solar Energy Corporation of India Power sold at a subsidized rate of Rs. 3.32 per unit to the campus.



The campus has installed a Solar PV plant of 320 kwp





ENERGY

Consumption – Passive Techniques

Solar Penetration

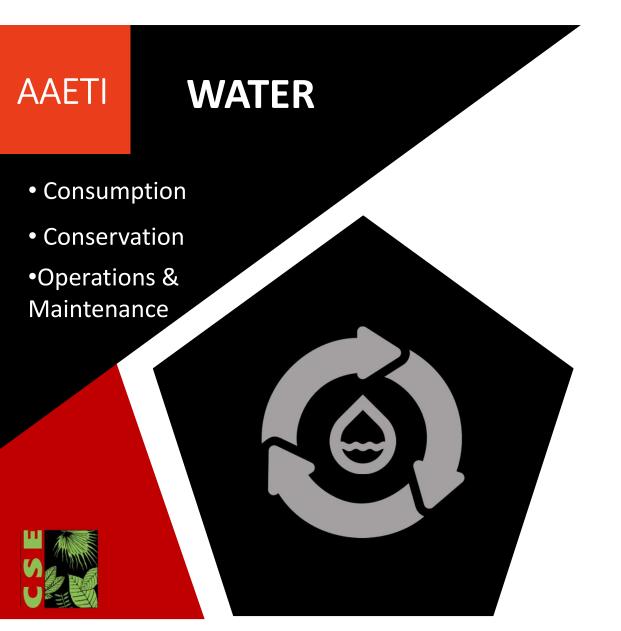
AAETI current solar penetration

Solar =
$$\frac{72 \text{ KWp}}{350 \text{ KW}}$$





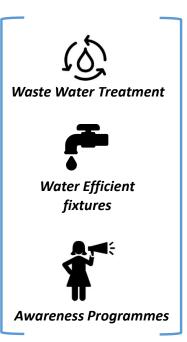




Harnessing/ harvesting Natural Resources



Efficient Consumption



Operation/M aintenance and Policy

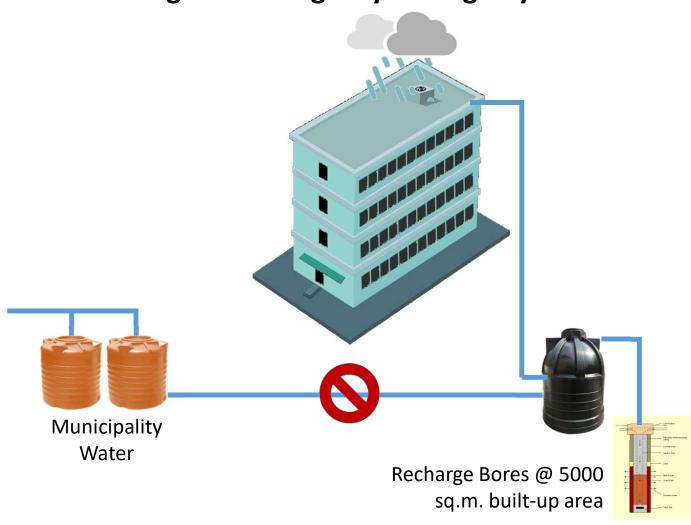


Policy





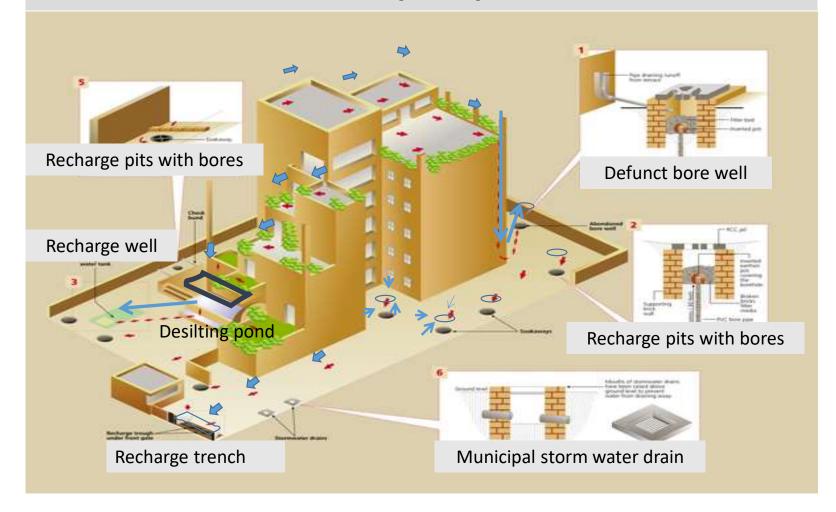
Regulate stringency through byelaws







RWH-Centre for Science and Environment (CSE), New Delhi

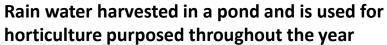


Ramakrishna Mission Vivekananda College, Kolkata

Don Bosco University, Assam









The campus has one artificial lake and 5 minor reservoirs to conserve water.



St. Edmunds Shillong





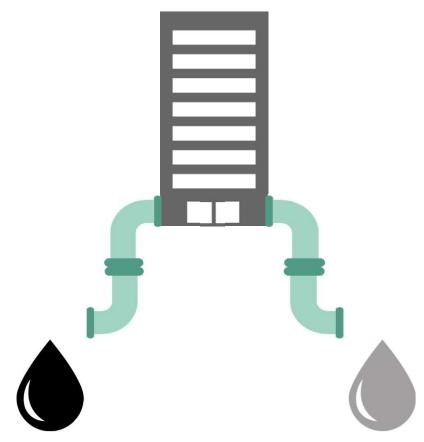






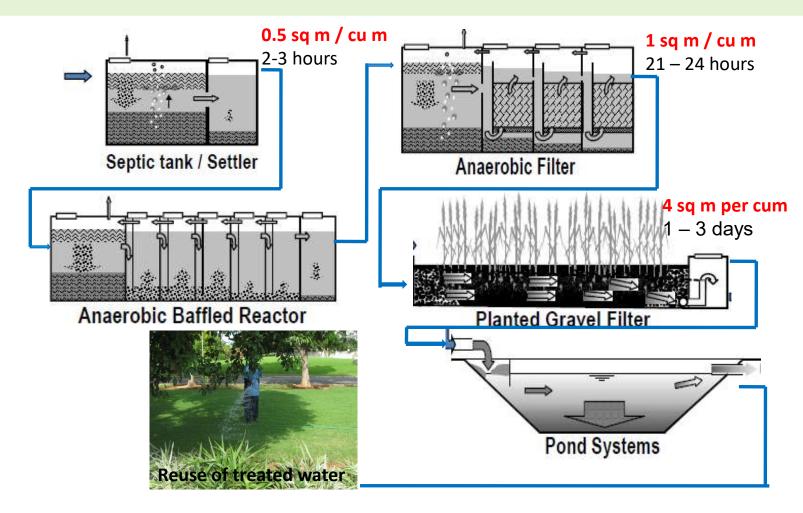






Separation of grey and black water should be done by the use of dual plumbing system.

DWWT – The Elements





DWWT – INSTITUTIONAL BUILDING, CSE







DWWT-CSE











Oil Trap (Preliminary Treatment)

Settler (Primary Treatment)

Anaerobic **Baffled Reactor** (Secondary Treatment)

Planted Gravel Filter Bed (Secondary and **Tertiary**

Oil Removal from the wastewater coming out from the canteen

- Suspended solid removal
- Two chambered
- Organic Degradation (BOD/COD Removal)
- 10 chambered with anaerobic filters in 2 chambers
- Pebbles used as filter material
- Organic Degradation, Nitrogen and phosphate removal
- Gradient of about 1% to facilitate gravity flow
- Media River bed pebbles
- Plant species Canna, Typha





DWWT - CSE









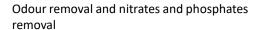


Vortex



Storage capacity of 12KLD (approx. One and a half days of storage)

Treated water Reuse





Water Efficient Fixtures

Retrofit & Controls:



Flow restrictors: 5.6 -8.3 litres per minute.



Automatic faucet: Saving potential – 75%. per minute. Saving Saving potential – 80% Reduces vandalism and potential – 30% damage.



Aerators: 2-8 litres







Water Efficient Fixtures

Guru Nanak Dev University











Harnessing/h arvesting Natural Resources

Efficient Consumption







Non Motorized Vehicles
/ Shared Mobility



Green Transport Infrastructure



Awareness Programmes

Operation/M aintenance and Policy



Policy

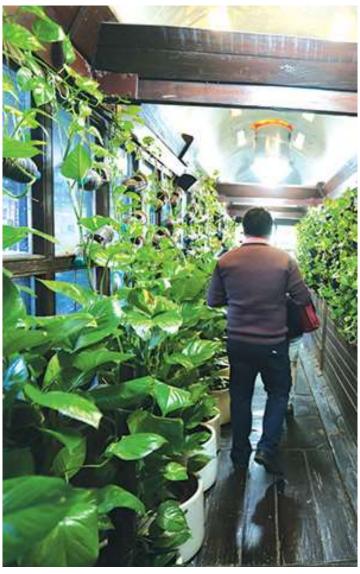


Indoor Air quality











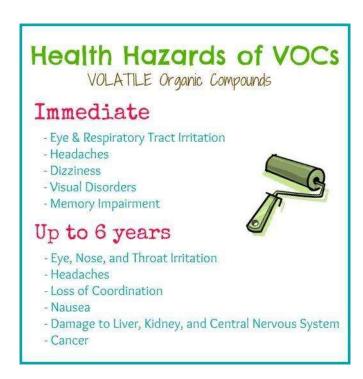
Indoor Air quality



Housekeeping and pest control activities



Paints & Varnishes



Policy

Guru Nanak Dev University, Amritsar







Under a car free campus policy, lane demarcation and circulation completed

Shared Mobility





National CPWD Academy, Ghaziabad



Guru Nanak Dev University, Amritsar





Public Bike Sharing



Battery operated vehicle



Battery operated ride hailing service Facilitates intra-campus low-carbon mobility

Green Transportation Infrastructure













Cycling Unit Eco-Club

Awareness Campaigns

St. Edmund's, Shillong



St. Xavier's Bhubaneswar



No vehicle day







Operation/M aintenance and Policy



Efficient Consumption



Segregation













St. Edmund's, Shillong



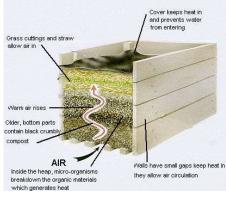
SOLID WASTE

Organic Waste









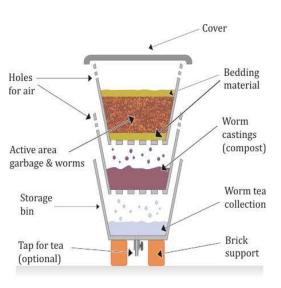


Organic Waste On-site Treatment





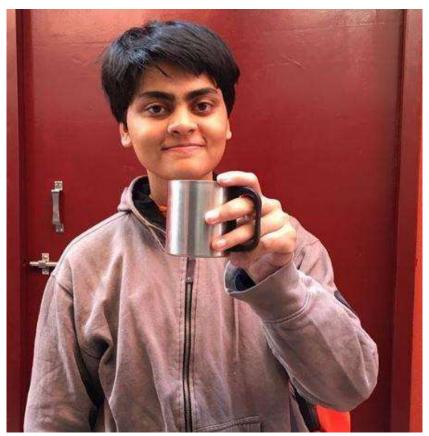






Gargi College, New Delhi

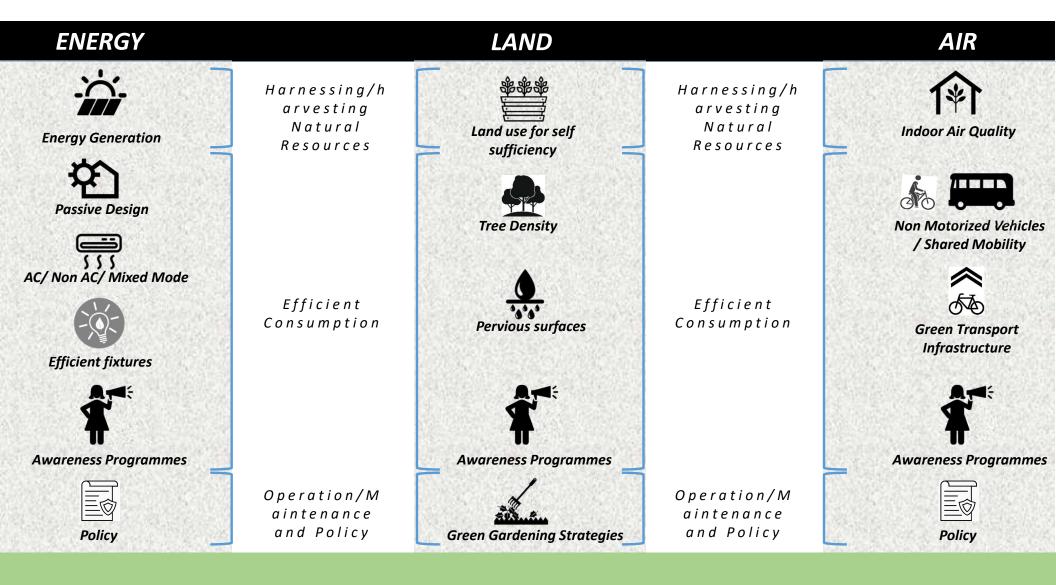








As an initiative to ban single-use plastic in the campus, "Bring Your Own Mug" has been launched as a campaign that encourages students to bring their own mugs into the campus



WATER WASTE **COMMON** Harnessing/ha rvesting Natural **Waste Segregation** Rainwater harvesting Resources **Organic Waste Treatment** Aims/Goals Waste Water Treatment The assessment **Plastic Free Campus** encourages Operation/M Efficient campuses to set a aintenance Water Efficient Consumption and Policy goal for each of fixtures the category, this E-waste & paper recycling

Operation/M aintenance Uppolicy



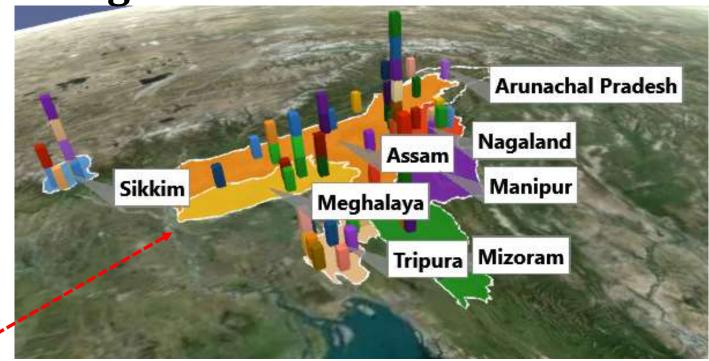
Awareness Programmes



Efficient Consumption encourages
campuses to set a
goal for each of
the category, this
is important so as
to have a clear
vision on the
basis of which
concrete steps
can be taken.

Institutional Sustainability Reporting for NE Colleges based on NAAC Data









AAFTI



Sustainability Indicators considered in the Pilot Study

- Chemical/hazardous waste management
- Disposal of E- waste via engagement of registered E-Waste recyclablers
- Disposal of recyclables via engagementof local recyclablers/dealers
- Hospital/bio-medical waste
- Installation of alternative sources of energy
- Installation of Rain Water Harvesting Infrastructure
- On-site installation of STP and water reuse
- On-site treatment of bio-degradable waste
- Paper waste Management
- Plastic Waste Management
- Use of LED bulbs/ power efficient equipment



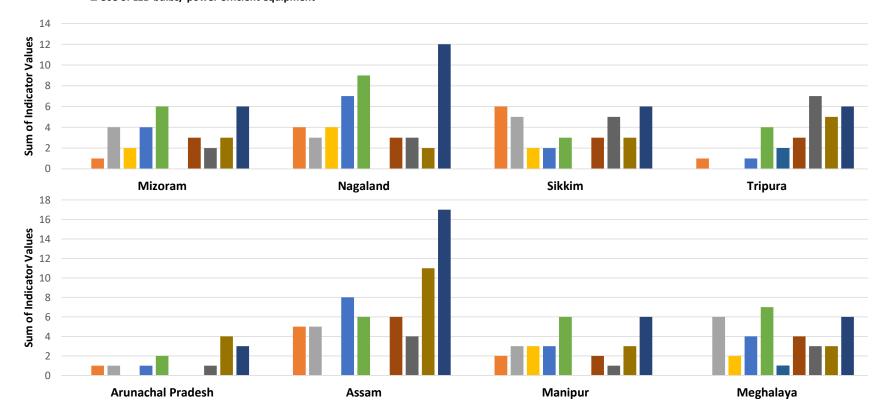
Sustainability Indicator Mobility and Green space are not analyzed in the Pilot Study as interpretation of these aspects was found common among all institutions.

AAFTI

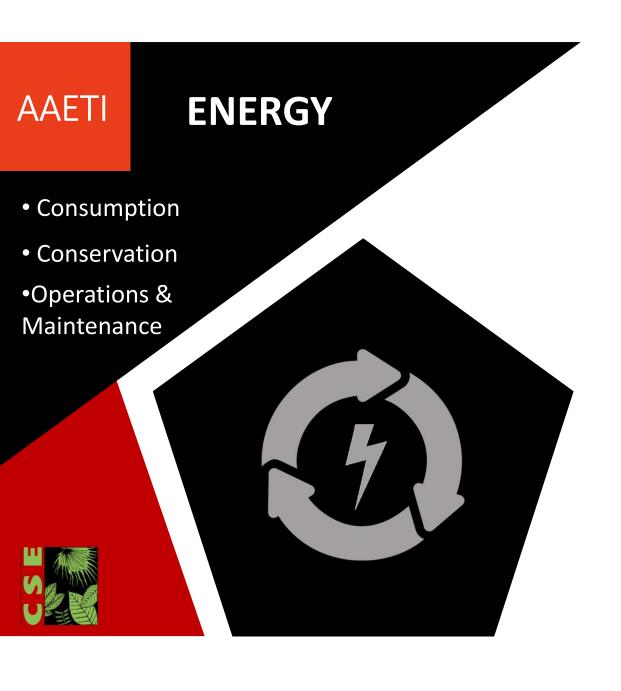


Status of Institutions in NE Region









Annual lighting power requirement:

Start with making an inventory of the fixtures and their wattages in different spaces.



Number of fixtures	- LED -	X	Watts	X	Estimated annual usage in hours	=	Energy consumption in WHr
		X	Watts	X	Estimated annual usage in hours	=	Energy consumption in WHr
	**	X	Watts	X	Estimated annual usage in hours	=	Energy consumption in WHr

Annual Energy consumption from lighting

Annual Energy consumption from LEDs

Annual Energy consumption from lighting

X 100 :

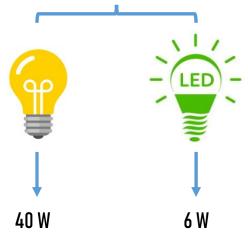
Percentage of annual energy requirement met by LED bulbs



BRIGHTNESS BULB	450 lumens	800 lumens	1100 lumens	1600 lumens	2600 lumens	5800 lumens
LED	6W	9-10W	13W	16-18W	24W special high	45W voltage lamps
CFL CFL	8-9W	13-14W	18-19W	23W	40W	85W
Regular	40W	60W	75W	100W	150W	300W
Halogen	29W	43W	53W	72W	150W	300W

The output one gets

450 Lumens, same output



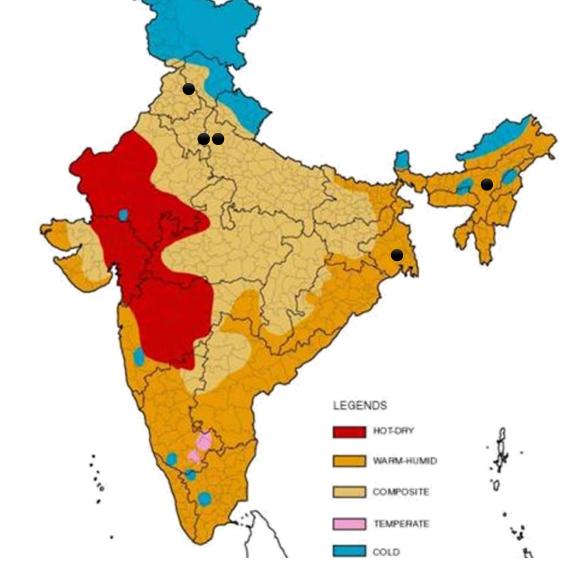
The wattage consumed to achieve the same amount of output







Selected campuses for complete case studies





Selected campuses for complete case studies



National CPWD Academy



Ramakrishna Mission Vivekananda Centenary College













Ramakrishna Mission Vivekananda Centenary College, West Bengal



Population 812



Green Team

Green Campus Monitoring Committee



Area

60 Acres



Climatic Zone

Warm and Humid





LAND



ENERGY



WATER



WASTE



Plantation



Trees such as Jackfruit, Mango, Ramfal etc.

Energy Efficiency



LED lighting fixtures



BEE 5-star rated

fan units

Energy Generation



72 KW Solar PV

Caters to 33% demand



Savings 4,36,452 in 2018.



Rain Water Harvesting



RWH System capacity -19114 kiloliters









Usage

Organic Waste Handling



Mechanical Compost Machine





On site vermicomposting





Guru Nanak Dev University, **Amritsar**



Population

12,200



Green Team

Go Green Club



Area 500 Acres



Climatic Zone

Composite





LAND



ENERGY



WATER



WASTE



AIR

Plantation



20000 trees, shrubs and Climbers



Botanical garden spread over an area of 25 acres

Green Gardening

Practices

Mulching is used as a

gardening practice

Land Permeability

Permeable Walkways

have been provided

Design Interventions

N-S Oriented Building Blocks

Cavity Wall construction.



Shading Elements

Courtyard Planning



Energy Generation



Solar PV plant of 1480 KW



Waste Water Treatment



WTP has a capacity to treat 2.5MLD waste water



Rain Water Harvesting

Flow of rain water is Channelizing towards the lawn/open areas.



Waste Segregation



Color Coded Bins are used for segregation at source of generation



Policy

No Vehicle Policy

NMT/Shared Mobility



E-rickshaws



Campus Cycle System



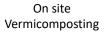
Green Infrastructure Provisions

Shaded Walkways Shaded Cycle tracks.





Organic Waste













Green Team Eco Club



Area 9.19 Acres



Climatic Zone
Composite



LAND



ENERGY



WATER



WASTE



AIR

Plantation Drives



Sapling Plantations and distribution



Energy Efficiency



40 solar based lighting fixtures



Bio-Gas produced partially mitigates external fuel requirement and manages organic waste from canteen



Rain Water Harvesting



RWH capacity (606 kilolitres)



Organic Waste Treatment

On site composting



Awareness Programmes



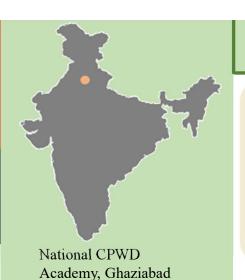
Campaigns and Workshops
BYOM





'Mera Mug' Campaign to ban single use of Plastics







Population



Green Team Green Committee



Area 36 Acres



Climatic Zone Composite





LAND



ENERGY



WATER



WASTE



AIR

Recreational areas and open spaces





Permeable

walkways

Design Interventions Shading Elements

Courtyard Planning



Waste Water Treatment

WTP has a capacity to treat 2.5MLD waste water



Organic Waste Handling



Mechanical Compost Machine



On site Vermicomposting **Shared Mobility**

Pick up and Drop service for students and staff members



Energy Efficiency



LED lighting fixtures



rated fan units



BEE 5-star

Harvesting



Rain Water



Energy Generation



Solar Street Lighting System and Solar Heaters







