GREEN AUDIT REPORT

Graphic Era Deemed to be University

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Dehradun, Uttarakhand, India

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(Academic Year: 2019-20)

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Report by: **Dr. Pawan Tyagi**

CONTEXT

The National Assessment and Accreditation Council, New Delhi (NAAC) has made it mandatory from the academic year 2019–20 onwards that all Higher Educational Institutions should submit an annual Green Audit Report. Moreover, it is part of Corporate Social Responsibility of the Higher Educational Institutions to ensure that they contribute towards the reduction of global warming through Carbon Footprint reduction measures.

In view of the NAAC circular regarding Green Auditing, the College Management decided to conduct an external Green Evaluation by a competent Green Auditor along with a Green Audit Assessment Team headed by **Prof. (Dr.) Pradeep Kumar Sharma, Environmental Science Division, Graphic Era (Deemed to be University), Dehardun.**

Green Audit or Environment Audit focuses on the Green Campus, Waste Management, Water Management, Air Pollution, Energy Management & Carbon Footprint etc. being implemented by the College Management.

The concept, structure, objectives, methodology, tools of analysis, objectives of the audit are mentioned below.

CONCEPT

The term **'Green audit'** means differently to different people. Terms like 'assessment', 'survey' and 'review' are also used to describe similar activities. Furthermore, some organizations believe that an 'Green Audit' addresses only environmental matters, whereas others use the term to mean an audit of health, safety and environment-related matters. Although there is no universal definition of Green Audit, many leading companies/institutions follow the basic philosophy and approach summarized by the broad definition adopted by the International Chambers of Commerce (ICC) in its publication of Environmental Auditing (1989).

The ICC defines Environmental Auditing as:

"A management tool comprising a systematic, documented, periodic and objective evaluation of how well environmental organization, management and equipment are performing with the aim of safeguarding the environment and natural resources in its operations/projects."

The European Commission, in its proposed regulation on environmental auditing, has also adopted the ICC definition of Environmental Audit. However, the outcome of Green Audit should be established with concrete evidence that the measures undertaken and facilities in the institution under green auditing.

GREEN AUDIT PARTICIPANTS

Table 1: List of audit participants from institute

Name	Position/Department
Dr. R.C. Joshi	**Chancellor**
Dr. Rakesh Sharma	**Vice-chancellor**
Mr. M.P. Singh	**Registrar**
Dr. H. N. Nagaraja	**Pro Vice-chancellor**
Prof (Dr) Bhaskar Pant	**Dean Research**
Prof (Dr) Dipali Bansal	**Dean, Engineering**
Prof (Dr.) D.R. Gangodkar	**Dean, International Affairs**
Prof (Dr) Manish Bisht	**Dean, Student Welfare**
Prof (Dr) A.S. Shukla	**Proctor**
Prof (Dr) Pradeep Kumar Sharma	**Professor, (Environmental Science)**

Audit was conducted on behalf of **ECON Laboratory & Consultancy**:

Table 2: List of external auditors

Name	Position	Qualification
Dr. Pawan Tyagi	Auditor	M.Sc., Ph. D. (Environment Science), PGDISM
Dr. Mahadev Semwal	Auditor	M.Sc., Ph. D. (Environment Science)
Ms. Kiran Kumari	Deputy Technical Manager	M.Sc., (Organic Chemistry)

Index

INTRODUCTION

Green Audit was initiated with the beginning of 1970s with the motive of inspecting the work conducted within the organizations whose exercises can cause risk to the health of inhabitants and the environment. It exposes the authenticity of the proclamation made by multinational companies, armies and national governments with the concern of health issues as the consequences of environmental pollution. It is the duty of the organizations to carry out the Green Audit of their ongoing processes for various reasons such as; to make sure whether they are performing in accordance with relevant rules & regulations, to improve the procedures and ability of materials, to analyse the potential duties and to determine a which can lower the cost and add to the revenue. Though Green Audit, one gets directions as how to improve the conditions of environment and there are various factors that have determined the growth of carrying out Green Audit. Some of the incidents like Bhopal Gas Tragedy (Bhopal: 1984), Chernobyl catastrophe (Ukraine; 1986), Exxon-Valdex Oil Spill (Alaska; 1989), have cautioned the industries that setting corporate strategies for environmental security elements have no meaning until they are implemented.

The term green means eco-friendly or damaging the environment. This can acronymically be called as: Global Readiness in Ensuring Ecological Neutrality" (GREEN). Green Audit can be defined as systematic Identification, qualification, recording, reporting and analyses of components of environmental diversity. Green accounting can be defined as systematic identification quantification, recording, reporting & analysis of components of ecological diversity & expressing the same in financial or social terms. "Green Auditing" an umbrella term, Known by another name "Environmental Auditing". The 'Green Audit' aims to analyze environmental practices within and outside the college campus, which will have an impact on the eco- friendly ambiance. It was initiated with the motive of inspecting the work conducted within the organization whose exercises can cause risk to the health of inhabitants and the environment. Through Green Audit, one gets a direction as how to improve the condition of environment and there are various factors that have determined the growth of carrying out Green Audit. The green audit is a tool that organizations use to identify their environmental impacts and assess their compliance with applicable laws and regulations, as well as with the expectations of their various stakeholders. . It also serves as a means to identify opportunities to save money, enhance work quality, improves employee health, safety and morale, reduce liabilities and achieve other form of business values. This concept has got its origin in recent past and suddenly got acceleration due to growth in population, needs has increased causing the increase in GAP between demand and supply.

Educational institutions have broad impacts on the world around them, both negative and positive. The activities pursued by campus can create a variety of adverse environmental impacts. But they are also in a unique position as educational institutions to be leaders in pursuing environmentally sustainable solutions. As environmental sustainability is becoming an increasingly important issue for the nation, the role of higher educational institutions in relation to environmental sustainability is more prevalent. The rapid urbanization and economic development at local, regional and global level has led to several environmental and ecological crises. On this background it becomes essential to adopt the system of the Green Campus for the institutes which will lead for sustainable development and at the same time reduce a sizable amount of atmospheric carbon-di-oxide from the environment. The National Assessment and Accreditation Council, New Delhi (NAAC) has made it mandatory that all Higher Educational Institutions should submit an annual Green Audit Report. Moreover, it is part of Corporate Social Responsibility of the Higher Educational Institutions to ensure that they contribute towards the reduction of global warming through Carbon Footprint reduction measure. A clean and healthy environment aids effective

learning and provides a conducive learning environment. There are various efforts around the world to address environmental education issues. **Environmental Management Systems** (EMS) is very popular in the industrial sector, but the general belief is that EMS is something pertaining to industries only. Other parts of the world have started adopting compatible environmental management systems either voluntarily or for promoting standards by external certification. International environmental standards do not suit the existing Indian educational system. Hence, **Graphic Era University** has developed a compatible system by developing locally-applicable techniques.

A very simple indigenized system has been devised to monitor the environmental performance of educational institutions. It comes with a series of questions to be answered on a regular basis. Environmental conditions may be monitored from angles that are relevant to Indian requirements, without stress on legal issues or compliance. This innovative scheme is user- friendly and totally voluntary. The environmental monitoring system helps the institution to set environmental examples for the community and to educate young learners. It can be adapted to urban and / or rural situations.

OVERVIEW OF INSTITUTE

Graphic Era Deemed to be University is an institute of higher education in Clement Town, Dehradun, Uttarakhand, India. The university was founded as 'Graphic Era Institute of Technology' in 1993. In 2008 it was accorded the status of Deemed to be University. In 1993 a young man with just twenty nine thousand and loads of determination embarked on a mission to transform the higher education landscape of the Doon Valley. Graphic Era Deemed to be University is the culmination of the vision of its founder, **Prof (Dr) Kamal Ghanshala,** who had the dream to change the destiny of thousands of youth, through quality and holistic education and his vision took a concrete shape in the form of Graphic Era Institute in 1996.In 2008, the Institute was accorded the status of Deemed University under Section 3 of the UGC Act, 1956 vide Notification F.9-48/2007-U.3 (A) dated August 14, 2008 and approved by Ministry of Human Resource Development, Government of India. In 2015 Graphic Era University was accredited by NAAC with grade 'A'. University has acquired transnational dimensions through student exchange and knowledge sharing programs with many foreign universities and has been acclaimed and honored at international forums for its brilliance in upholding the highest standards of education. With recognition from prestigious institutions, Graphic Era University is setting new benchmarks in education. It has taken big initiative in engineering programs by getting into Partnerships with Tata Technologies and IBM to create next age Engineering Professionals through Industry Collaborations.

Graphic Era hosts Technology Business Incubator that provides support for technology-based entrepreneurship. At present, Graphic Era has innumerable students on its rolls, pursuing education in different disciplines, ranging from engineering, science, business, management, commerce, hospitality to humanities and social sciences. The alumni of Graphic Era can be encountered worldwide in marquee brands like Apple, Google, Microsoft, HSBC, to name a few and in the service of the nation in all wings of the Armed forces. The University is situated at 566/6 Bell Road, Society Area, Clement Town, Dehradun; it is less Approx 2 kilometers from ISBT Dehradun and has an easy and convenient access from Dehradun, Airport. Graphic Era (Deemed to be University) imparts education from *Graduate to Ph.D. levels.*

Phases of Green Audit

Phase- I: Pre – Audit

- Plan the audit
- Selection of audit team (External experts and members for Current Audit)
- Collect the Background Information
- Start assessing the certain environmental factors required for prior to On-Site.

Phase – II: On – Site

- Site Understand the significance of Green Audit
- Conduct the Audit and collect the information in prescribed format
- Make an inventory for all the observations during the audit Phase

Phase – III: Post – Audit

- Prepare the Draft report on the information collected during audit
- Generate a Final Report
- Submit the Report to higher authorities of Institution with action plans to overcome the flaws
- Share all the current status and recommendations with all the Heads and Deans of Institution
- Time to time check the action plan

For the current Green Audit, the focused was made on following indicators, covering an extremely wide range of environmental impacts:

1. **Air Quality Monitoring**
    a) Air Quality Indices.
    b) Air Quality Management.
    c) DG Stack Emission Monitoring.
2. **Water Quality Monitoring**
    a) Water Quality Indices
    b) Water Footprint
3. **Green Cover Assessment**
4. **Human Activities**
5. **Environmental Management Practices**
    a) Energy Management
    b) Water Resources and Management
    c) Waste Management
    d) Landscape Environment
    e) Green Agenda in Syllabus
    f) Transportation
    g) Noise management
    h) Lux illumination monitoring
6. **Environmental Awareness Activities.**
7. **Recommendations**
8. **Conclusion**

OBJECTIVES

Green Audit is assigned to the Criteria of NAAC, National Assessment and Accreditation council which is a self-governing organization of India that declares the institutions as Grade A. B or C according to the scores assigned are the time of accreditation. The intention of organizing Green Audit is to upgrade the environment condition in and around the institutes, colleges, companies and other organizations, It is carried out with the aid of performing tasks like waste management, energy saving and others to turn into a better environmental friendly institute. To conduct the Green Audit, Green Audit Cell, ECON laboratory and consultancy has made a self-inquiry on various parameters of the campus with the following objective:

- To establish a baseline of existing environmental conditions with focus on natural and physical environment.
- Securing the environment and cut down the threats prised to human health. To make sure that rules and regulations in terms of environmental laws are taken care of.
- To understand the current practices of sustainability with regard to the use of water and energy, generation of wastes, purchase of goods, transportations, etc.
- To avoid the interruptions in environment that are more difficult to handle and their correction requires high cost
- To suggest the best protocols for adding to sustainable development
- To promote environmental awareness through participatory auditing process
- To create a report that documents baseline of good practices and provide future strategies and action plans towards improving environmental quality for future.

SIGNIFICANCE OF GREEN AUDIT

Significance of Green Audit One of the major threats arising from urbanization and increase in population on earth is over- development and unmanaged utilization of resources. To monitor this there are a number of environmental management techniques that can be used to minimize the effects of development one of the techniques associated with environmental management programmers is that Green Audit or Environmental Auditing. The purpose of this management tool is to measure the actual and potential environmental impacts in the ecosystems.

In the present time, the pollution is significantly increasing day-by-day due to the industries and factories. It is causing serious health problems to the human being and also polluting the environment. It can also make an adverse effect on the mental, social, and economic ability of the person. It becomes imperative to save the people from dangerous chemicals and waste of the industries because people have to live in the green environment to lead a healthy life. It is important for the government to regulate rules and regulations for the industries to make the environment neat and clean. For this purpose, there is a strict need to employ environmental inspectors who can perform Green audits to prevent the pollution.

Man has the fundamental right to freedom, equality and adequate conditions of life, in an environment of a quality that permits a life of dignity and well-being and he bears a solemn responsibility to protect and improve the environment for present and future generation." Most countries today face environmental threats due to the increase in pollution of the atmosphere, water and land, Wildlife habitats continue to le threatened: Water contamination and air pollution

are critical problems facing most countries. Environment related problems are linked closely to the rapid growth of population, as well as to technological advancements.

Green auditing or environmental audit is a process of extracting information about a company that provides a realistic assessment of how the company affects the environment and also a set of environmental objectives and targets to reduce the effects. Eco-auditing is a systematic multidisciplinary method used periodically to assess the environmental performance of a project. Eco-auditing evolved as a management tool in the USA in 1980s. It has been promoted in Europe by the International Chamber of Commerce and by some multinational corporations as a means of getting effective environmental management. But, in developing countries, the eco-auditing concept is still a theoretical concept; However, India has modified its Companies Act to include a requirement for eco-audits. This it is very important for each organization to conduct it environmental audits or green audit to ensure that we are working in the direction of sustainable development.

Green audits are necessary to evaluate the impact of industries and their manufacturing on the natural resources. The environmental auditing is an important process to make sure continuous development in the environmental management. The environmental auditor appropriately monitors.

The system for safe disposal of waste in the industries to ensure the safety of the natural resource, It also lessens the interference of the government directly since the environmental auditor examine the required standards and present the report to the government.

A good environmental auditing system needs a constant effort to monitor and analyse the industrial working system to create the analysis on pollution being generated. The major objective so performing green audit is controlling the pollution. It also helps in improving the production safety and to making sure the prevention and reduction of the chemical waste. It also provides performance reviews of institutional working facilities and its possible impact on the surroundings.

The environmental auditor has to detect the existing environmental compliance problems and make recommendations to the manufacturers for reducing the pollution to save the environment.

While enforcing the Green Audit effectively,

- Will help to maintain the environment and its resources in institution
- Highlight the problems from energy loss to water loss.
- Minimize the waste and use the resources efficiently.
- Give the better approach to environmental conditions and its improvisation
- Helps in awareness activities for students.
- Can participate in national programmes like SWACHH BHARAT MISSION, NAMAGI GANGE, WATER CONSERVATION, SWASTH BHARAT etc.

Part I: Air Quality

Air quality is influenced by a variety of factors and is a complex issue. The term air quality refers to the degree to which the air in a particular place is free from pollutants. Air pollutants are substances present in the atmosphere at concentrations above their normal background levels which can have a measurable effect on humans, animals and vegetation.

Good outdoor air quality is fundamental to our well-being. On average, a person inhales about 14.000 liters of air every day, and the presence of contaminants in this air can adversely affect people's health. People with pre-existing respiratory and heart conditions, diabetes, the young and older people are particularly vulnerable. Overseas studies have shown poor air quality can also adversely affect the natural environment. Ecological damage may occur when air pollutants come into direct contact with vegetation or when animals inhale them. Pollutants can also settle out of the air onto land and water bodies. From the soil, they can wash into waterways, or be taken up by plants and animals. Poor air quality can also affect our climate: some pollutants have a warming effect while others contribute to cooling (European Environment Agency, 2013). Environment can, in turn, have negative economic impacts. We incur major costs, for example, for hospitalisation and medical treatment, premature deaths, and lost work days. Damage to soils vegetation, and waterways may reduce the productivity of our agriculture and forestry industries, In urban areas, air pollution can be costly when, for example, transport is disrupted (due to large-scale events like volcanic eruptions), or corroded buildings need to be repaired. The sources of some of these pollutants also have positive effects. For example, having a warm home (from burning wood or coal, or other heating sources) has health benefits, while transport provides people with mobility and the distribution of goods and services.

Indian cities are reeling under multiple problems, including environmental issues that they must contend with. Most pressing of them all is the issue of air pollution. The poor air quality that citizens are forced to breathe- especially in the heavily polluted cities- has a detrimental impact on their health and well-being. In 2016, a World Health Organisation (WHO) study found that fourteen of the twenty world's most polluted cities belonged to India. Kanpur, in Uttar Pradesh, emerged as the city with the highest $PM_{2.5}$ level, standing at 173 (17 times higher than the limit set for safety). It is estimated that in 2016, over 9 lakh deaths were caused due to air pollution in India. Some other cities with high PM 2,5 levels include Faridabad. Varanasi, Gaya, Patna, Delhi, Lucknow and Agra. Delhi, as the capital of the country, too gained notorious reputation as a result of its severely poor air quality. In the past, there have been multiple instances where the presence of heavy smog in the national capital has led to the declaration of public health emergencies, flight cancellations, school closures and inevitable political acrimony.

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The sources of air pollution are multiple. Vehicular emissions, crop burning, generation of dust- particularly from construction sites, depleting arcs covers and poor waste management – all contribute towards the declining air testily. one of the problems with tackling air pollution solely at the city level is that severaciors which contribute towards increasing pollution levels have their origins in the bordering sub-urban areas. In Delhi, for instance, one of the major factors responsible for its declining air quality is paddy straw burning in its neighbouring

states.Vehicular emissions, crop burning, generation of dust- particularly from construction sites, depleting tree covers and poor waste management – all contribute towards the declining air quality.

Air pollution does not recognize geographical boundaries. Just as polluted air from rural areas travels into cities, cities too contribute towards rural pollution. Thus, it is critical for anti-pollution efforts to be coordinated across different levels. Urban-rural and inter-state Responses are integral to crafting successful solutions. Fortunately, the Government of India (GOI) has responded to the air pollution epidemic with a nation-wide programme. This is likely to have very positive impact on the health of all citizens, especially city dwellers. The Air Quality Life Index indicates that if national standards with regard to air quality are met, life expectancy would go up by two years. It is critical for anti-pollution efforts to be coordinated across different levels. Urban- rural and inter-state responses are integral to crafting successful solutions.

This is clearly what the National Clean Air Mission (CAM-INDIA) aims to achieve. It is a cross-sectoral initiative for air pollution mitigation launched by GOI involving Ministries of Transport, Power, Construction, Agriculture, Rural Development, Environment and the states. Along with a five-year action plan to curb air pollution, the Mission hopes to build a pan-India air quality monitoring network and heighten citizen awareness. Air quality can be significantly improved by cutting the use of solid fuel in households; using sustainable fuels can reduce air pollution levels by almost 40 percent. According to the 2011 Census, 16.6 crore households out of a total of 24.7 crore continued to rely on solid fuels (firewood, crop residue, dung and coal) for cooking. Hopefully, GOI's Ujjwala scheme, which provides cooking gas to millions of poor households, will substantially reduce solid fuel usage. Additionally, reducing emissions from thermal power plants, instituting strong emission standards for industries and introducing stronger vehicular emission standards also need to be effectively implemented. In this regard, state pollution control boards (PCBS) are adopting the Star Rating Programme. The programme rates industries on their fine particulate pollution emissions and enables the monitoring of industries' pollution levels. Furthermore, in partnership with Gol, states are promoting an electric vehicle policy. Use of electrically powered buses, cars and two-wheelers are bound to have a positive qualitative effect on air quality in cities.

The National Clean Air Mission is a cross-sectoral initiative for air pollution mitigation launched by GOI involving Ministries of Transport, Power, Construction, Agriculture, Rural Development, Environment and the states.

Certain policies and programmes focus specifically on cities- The National Clean Air Programme targets 102 polluted Indian cities and aims to reduce their PM2.5 levels by about one-third over the next five years. Steps are also being taken for up gradation to BS VI fuel from BS IV which is expected to reduce air pollution. Initial results are encouraging. The Environment Ministry reported a fall in the national annual average concentration of PM 2.5 from 134 micrograms per cubic metre in 2016 to 125 in 2017. For PM 10, the national annual average fell from 289 micrograms per cubic metre in 2017 to 268 in 2016. An action plan has also been readied for 94 cities which suffer from severe air pollution.

While steps are being taken to reduce air pollution at the national and state levels, cities could improve the national performance by introducing complementary initiatives. Firstly the Clean India Campaign requires energetic implementation. Since dust and waste burning are major

sources of PM, cities must ensure wall-to-wall paving of streets, the vacuum cleaning of roads, enforce bans on open solid waste burning and attempt to effectively recover methane from landfill.

While steps are being taken to reduce air pollution at the national and state levee cities could improve the national performance by introducing complementary initiatives. Some state municipal acts make it mandatory for cities to prepare an annual environment status report. The main objective of such a report is to curate data which allows cities to take cognizance of where they stand in terms of environmental well-being, including the status of air pollution. The next step for cities should be to launch remedial steps as the annual report enables municipalities to assess the impact of their policies on a yearly basis. Sadly, while the reports have been prepared, not much action has been taken. This needs to change.

Many cities also carry out a decennial tree census' which tells them what their tree population is. Depletion of tree cover in specific areas triggers a warning mechanism advising the city to replenish tree stock via fresh plantation. Another city-centric solution that municipalities should consider implementing is the incentivisation of the maintenance of roof-top gardens as well as, potted plants in balconies and kitchen gardens through suitable amendments in development control regulations.

While the issue of air pollution has managed to capture public imagination, the problem of growing question of growing population density in cities continues to be at best- an afterthought. High human density hinders the successful implementation of positive initiatives. The volume of polluting activities continues to multiply, as the space to counteract them physically shrinks. The question of decentralising urbanisation needs to be addressed in a meaningful way, for it holds the key to improving the quality of urban life.

When there are many different types of air pollutants, why do we focus on $PM_{2.5}$? Why is it particularly dangerous?

A chemically charged pollutant, PM has contributions from all the primary emissions.

- Black carbon and organic carbon, as primary emissions are part of $PM_{2.5}$
- SO_2: undergoes chemical reactions to form sulphate aerosols, which is part of $PM_{2.5}$
- NO.-CO-VOC combines and reacts in many ways to chemically transform to form nitrate and secondary organic aerosols, which are part of $PM_{2.5.}$
- NO-CO-VOC also combine and react in many ways to form and consume ozone (depending on the mixture of the gases), which also contributes to health impacts and also participates in the formation of nitrates and secondary organic aerosols, which are part of $PM_{2.5}$.

So, if we target $PM_{2.5,}$ the one pollutant we are mainly concerned about in India, we are invariably targeting all the other pollutants as well. Therefore, any control mechanism aimed to reducing direct $PM_{2.5}$ emissions also reduces other pollutants (since sources to all these pollutants are common), except for re suspended dust.

The particle size, less than 2.5 micro-meters, is small enough to enter our lungs and blood stream, and stay there for a long time. There are more studies linking $PM_{2.5}$ to various health risks than any of the other pollutants.

Meteorology over the Indo-Gangetic plains is complicated and it plays a strong role in the observed seasonal cycle of air pollution in the cities in this region – with the winter time highs (due to high inversion) and the summer time lows (due to rains).

While meteorology plays its part, there is also an increase in the total emissions during the winter months, which further exaggerates the problem. These additional emissions are primarily from the burning of wood, coal, and waste for space heating as the temperatures drop. While the need for space heating is there for most part of the winter season, there are also episodic spikes from bursting of crackers during Diwali, which lasts for 2-3 days as well as crop residue burning, which lasts for 2-3 weeks. Do we have adequate information on air pollution in India? What do we need to improve the quality of this information?

The quality of air in India is bad and is becoming a serious public health issue with huge repercussions to our quality of life and economy. We know this through anecdotal evidence and through the little data on monitoring that trickles down to the public. This limited information is not enough – to formulate policy, to understand seasonal and diurnal variations, to tease out patterns or to calibrate forecasting models. It is the right of any citizen to have access to information on the quality of air she is breathing – monitoring data that is real-time, reliable and accessible to any citizen.

While the results of the GBD study do fill in this lacuna of information, it is not a substitute for real-time information. These results are obtained through a modelling exercise that combines satellite feeds, emission inventories and historical monitoring data to then estimate ground-based concentrations. Note that satellites neither measure one location nor take ground measurements at all times (orbital satellites create a snapshot of the entire planet every one or two days). These snapshots are interpreted using the global chemical transport models to better represent the vertical mix of these measurements (known as aerosol optical depth). Like any modelling exercise, this data also comes with uncertainty. While this process is very useful in establishing annual trends, these systems are not a substitute for daily on-ground monitoring.

What we need are ground measurements using reference methods approved by the environment ministry. This ensures that the monitoring information is reliable and conforms to the government's standards. Low-cost sensors do provide some information but because many of them are not recognised by the government or are not calibrated accurately, the data they generate cannot be used for policymaking.

In India, we estimate that we require around 4,000 continuous monitoring stations to spatially and temporally represent the air pollution problem 2,800 in the urban areas and 1,200 in the rural areas. Currently, data when available comes from around 600+ manual stations and less than 100 continuous monitoring stations.

Among all the cities and states, most number of continuous monitoring stations are present in Delhi, which means there is more information coming from Delhi, there are more studies by national and international institutions on Delhi, and there is more media and public focus on the issue of Delhi. It is very important to understand that air pollution is a regional Problem. We need to focus on regions in the country, where people are exposed to unsafe levels of pollution, and there are no monitors to determine how much that is.

As Delhi's air quality worsens every day, a similar situation has been observed in one of India's most visited destination – Haridwar. Pollution in Haridwar has been in news for about a few years now. As the tourist population of Uttarakhand is rising, naturally the pollution level is increasing.

The constant rise in industrial emission, stubble burning, and forest fire has resulted in air pollution in Haridwar. Weather reports suggest that Haridwar weather is getting hotter during summers due to unusual weather pattern.

The locals say that the city is facing major water and air pollution issue. Local government authorities have done no more than little to control the issue. Similar to major city people, Haridwar and Rishikesh are also choking on hazardous air quality. The increase in $PM_{2.5}$ in the city's air quality is the real reason for major respiratory issues among the people. PCRI (Pollution Control Research Institute) recently reported that the presence of $PM_{2.5}$ – one of the deadliest air components, causes chronic health issues.

Fine particulate matter can pose a great health risk and can have both long-short-term effects. Breathing $PM_{2.5}$ can be dangerous and it can minimize the human heart and lung functionality. Tourist destination such as Dehradun, Nainital, Haridwar and Rishikesh witnesses over thousands of visitors everyday travelling via Government transport services or by own mode of the vehicle. The increase in the number of vehicles emits harmful substances that pose a serious threat to not only the tourists but also the locals residing in the city.

Dehradun is about 300 km away from the national capital of India, New Delhi. Currently, the capital sees a daily average of AQI as 466 which is hazardous air quality, while Dehradun is 160, which is unhealthy air quality.

"There are few recommendations like phasing out vehicles that have completed 15 years cycle, restricting public transport with only four-stroke engines, modification of engines and others," said SP Subuddhi, member secretary of the Uttarakhand Environment Protection and Pollution Control Board (UEPPCB).

New Delhi particularly has become an epicenter for the country's pollution crisis, since harmful air substance has covered the city's air. At the same time, neighbouring cities have also started to declare public health emergency which has now become a debatable topic.

AIR QUALITY MANAGEMENT

Air quality management refers to all the activities a regulatory authority undertakes to help protect human health and the environment from the harmful effects of air pollution. The source of air pollution can be from vehicles, emissions from DG set etc.

The ambient air quality of two locations was monitored i.e., near gate No. 1 and near gate No. 2 of the campus with the help of RDS and $PM_{2.5}$ attachment. Moreover, the work zone air monitoring i.e., Environmental Science Laboratory was also done with the help of Handy sampler with all accessories.

AMBIENT AIR QUALITY MONITORING NEAR GATE NO.1:

S. No.	Parameters	Test Methods	Test Results	Units	NAAQS#
1.	Particulate Matter (PM_{10}	IS : 5182 (P-23), 2006	72.10	µg/m³	100
2.	Particulate Matter ($PM_{2..5}$)	$PM_{2.5}$ as per SOP ECON/PM2.5/01-2015 Manual Volume I/Gravimetric Method	40.70	µg/m³	60
3.	Sulphur Dioxide (SO_2)	IS : 5182 (P-2), 2001	8.40	µg/m³	80
4.	Nitrogen Dioxide (NO_2)	IS : 5182 (P-6), 2006	20.17	µg/m³	80
5.	Ammonia (NH_3)	IS : 11255 (P-6), 1999	4.90	µg/m³	400
6.	Carbon Monoxide (CO)	IS: 5182 (P-10), 1999	0.61	mg/m³	4
7.	Benzene (C_6H_6)	IS : 5182(P-11), 2006	ND**	µg/m³	5
8.	Benzo(a)pyrene,	IS : 5182(P-11), 2006	ND	ng/m³	1
9.	Lead (Pb)	IS: 5182 (P-22),2004	ND	µg/m³	1
10.	Arsenic (As)	IS: 5182(P-22), 2004	ND	ng/m³	6
11.	Nickel(Ni)	IS: 5182(P-22), 2004	ND	ng/m³	20
12.	Ozone (O_3)	IS: 5182 (P-9), 1974	10.90	µg/m³	180

NAAQS-National Ambient Air Quality Standard: Schedule-VII, [Rule 3 (3B)], [Part-II-Sec.-3(i) 16

**Not Detected

AMBIENT AIR QUALITY MONITORING NEAR GATE NO.2:

S. No.	Parameters	Test Methods	Test Results	Units	NAAQS#
1.	Particulate Matter (PM_{10}	IS : 5182 (P-23), 2006	68.60	µg/m³	100
2.	Particulate Matter ($PM_{2.5}$)	$PM_{2.5}$ as per SOP ECON/PM2.5/01-2015 Manual Volume I/Gravimetric Method	39.10	µg/m³	60

3.	Sulphur Dioxide (SO_2)	IS : 5182 (P-2), 2001	8.50	µg/m³	80
4.	Nitrogen Dioxide (NO_2)	IS : 5182 (P-6), 2006	20.08	µg/m³	80
5.	Ammonia (NH_3)	IS : 11255 (P-6), 1999	5.20	µg/m³	400
6.	Carbon Monoxide (CO)	IS: 5182 (P-10), 1999	0.50	mg/m³	4
7.	Benzene (C_6H_6)	IS : 5182(P-11), 2006	ND**	µg/m³	5
8.	Benzo(a)pyrene,	IS : 5182(P-11), 2006	ND	ng/m³	1
9.	Lead (Pb)	IS: 5182 (P-22),2004	ND	µg/m³	1
10.	Arsenic (As)	IS: 5182(P-22), 2004	ND	ng/m³	6
11.	Nickel(Ni)	IS: 5182(P-22), 2004	ND	ng/m³	20
12.	Ozone (O_3)	IS: 5182 (P-9), 1974	9.42	µg/m³	180

NAAQS-National Ambient Air Quality Standard: Schedule-VII, [Rule 3 (3B)], [Part-II-Sec.-3(i) 1**Not Detected

Ambient Air Quality Standards

रजिस्ट्री सं० डी० एल०-33004/99 REGD. NO. D. L.-33004/99

भारत का राजपत्र
The Gazette of India

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राष्ट्रीय परिवेशी वायु गुणवत्ता मानक
केन्द्रीय प्रदूषण नियंत्रण बोर्ड
अधिसूचना

नई दिल्ली, 18 नवम्बर, 2009

सं. बी-29016/20/90/पी.सी.आई.-I.—वायु (प्रदूषण निवारण एवं नियंत्रण) अधिनियम, 1981 (1981 का 14) की धारा 16 की उपधारा (2) (एच) द्वारा प्रदत्त शक्तियों का प्रयोग करते हुए तथा अधिसूचना संख्या का.आ. 384(ई), दिनांक 11 अप्रैल, 1994 और का.आ. 935 (ई) दिनांक 14 अक्टूबर, 1998 के अधिक्रमण में केन्द्रीय प्रदूषण नियंत्रण बोर्ड इसके द्वारा तत्काल प्रभाव से राष्ट्रीय परिवेशी वायु गुणवत्ता मानक अधिसूचित करता है, जो इस प्रकार है-

राष्ट्रीय परिवेशी वायु गुणवत्ता मानक

क्र. सं.	प्रदूषक	समय आधारित औसत	परिवेशी वायु में सान्द्रण		
			औद्योगिक, शिक्षयरी, ग्रामीण और अन्य क्षेत्र	पारिस्थितिकीय संवेदनशील क्षेत्र (केन्द्र सरकार द्वारा अधिसूचित)	प्रबोधन की पद्धति
(1)	(2)	(3)	(4)	(5)	(6)
1	सल्फर डाई आक्साइड (SO_2), $\mu g/m^3$	वार्षिक*	50	20	-उन्नत वेस्ट और गाईक
		24 घंटे**	80	80	-पराबैगनी परिदीप्ती
2	नाइट्रोजन डाई आक्साइड (NO_2), $\mu g/m^3$	वार्षिक*	40	30	-उपांतरित जैकब और हॉचाइजर (सोडियम-आर्सेनाईट)
		24 घंटे**	80	80	-रसायनिक संदीप्ति
3	विविक्त पदार्थ (10माइक्रान से कम आकार)या PM_{10}, $\mu g/m^3$	वार्षिक*	60	60	-हरात्मक विश्लेषण
		24 घंटे**	100	100	-टोयम
					-बीटा तनुकरण पद्धति

4	विविक्त पदार्थ (2.5 माइक्रान से कम आकार या $PM_{2.5}$, $\mu g/m^3$	वार्षिक* 24 घंटे**	40 60	40 60	-हरात्मक विश्लेषण -टोयम -बीटा तनुकरण पद्धति
5	ओजोन (O_3) $\mu g/m^3$	8 घंटे** 1 घंटा**	100 180	100 180	-पराबैगनी द्वीप्तिकाल -रासायनिक संदीप्ति -रासायनिक पद्धति
6	सीसा (Pb) $\mu g/m^3$	वार्षिक* 24 घंटे**	0.50 1.0	0.50 1.0	ई.पी.एम 2000 या समरूप फिल्टर पेपर का प्रयोग करके AAS/ICP पद्धति -टेफलॉन फिल्टर पेपर का प्रयोग करते हुए ED-XRF
7	कार्बन मोनोक्साइड (CO) mg/m^3	8 घंटे** 1 घंटा**	02 04	02 04	-अविपेक्षी अवरक्त (NDIR) स्पैक्ट्रम मापन
8	अमोनिया (NH_3) $\mu g/m^3$	वार्षिक* 24 घंटे**	100 400	100 400	-रासायनिक संदीप्ती -इण्डोफिनॉल ब्ल्यू पद्धति
9	बैन्जीन (C_6H_6) $\mu g/m^3$	वार्षिक*	05	05	- गैस क्रोमेटोग्राफी आधारित सतत् विश्लेषक -अधिशोषण तथा निशोषण के बाद गैस क्रोमेटोग्राफी
10	बैन्जो (ए) पाईरीन (BaP) केवल विविक्त कण, ng/m^3	वार्षिक*	01	01	-विलायक निष्कर्षण के बाद HPLC/GC द्वारा विश्लेषण
11	आर्सेनिक (As) ng/m^3	वार्षिक*	06	06	-असंवितरक अवरक्त स्पैक्ट्रामिती ई.पी.एम. 2000 या समरूप फिल्टर पेपर का प्रयोग करके ICP/AAS पद्धति
12	निकिल (Ni) ng/m^3	वार्षिक*	20	20	ई.पी.एम. 2000 या समरूप फिल्टर पेपर का प्रयोग करके ICP/AAS पद्धति

* वर्ष में एक समान अंतरालों पर सप्ताह में दो बार प्रति 24 घंटे तक किसी एक स्थान विशेष पर लिये गये न्यूनतम 104 मापों का वार्षिक अंकगणीतीय औसत ।

** वर्ष में 98 प्रतिशत समय पर 24 घंटे या 8 घंटे या 1 घंटा के मानीटर मापमान, जो लागू हो , अनुपालन कये जाएंगे । दो प्रतिशत समय पर यह मापमान अधिक हो सकता है, किन्तु क्रमिक दो मानीटर करने के दिनों पर नहीं ।

टिप्पणी:

1. जब कभी और जहां भी किसी अपने-अपने प्रवर्ग के लिये दो क्रमिक प्रबोधन दिनों पर मापित मूल्य, ऊपर विनिर्दिष्ट सीमा से अधिक हो तो इसे नियमित या निरंतर प्रबोधन तथा अतिरिक्त अन्वेषण करवाने के लिये पर्याप्त कारण समझा जायेगा ।

संत प्रसाद गौतम, अध्यक्ष

[विज्ञापन-III/4/184/09/असा.]

टिप्पणी: राष्ट्रीय परिवेशी वायु गुणवत्ता मानक संबंधी अधिसूचनाएँ, केन्द्रीय प्रदूषण नियंत्रण बोर्ड द्वारा भारत के राजपत्र आसाधरण में अधिसूचना संख्या का.आ. 384 (ई), दिनांक 11 अप्रैल, 1994 एवं का. आ. 935 (ई), दिनांक 14 अक्टूबर, 1998 द्वारा प्रकाशित की गयी थी ।

WORK ZONE AIR MONITORING OF SCIENCE LABORATORY

S. No.	Parameters	Test Results	Units	Std. Limits	Test Methods
1.	Indoor Temp	22.8	^{0}C	22.5-25.5 ^{0}C (WHO & Min. of Env., of Singapore) 22.5-25.5 ^{0}C (Japan South Korea, Hongkong)	By Thermo hygrometer
2.	Indoor Relative Humidity	65.0	-	< 70 % (WHO & Min. of Env. Singapore) 40-70 % (Japan, South Korea, Hongkong)	By Thermo hygrometer
3.	$PM_{2.5}$-Particulate Matter(<2.5 μm)	9.20	μg/m^3	15 (μg/m^3)(ASHRAE-62.1 2004, Table-B-B2)	By HAZ DUST Monitor
4.	PM_{10}-Particulate Matter(<10 μm)	15.80	μg/m^3	50 (μg/m^3) (1-Yr. Avg.) (ASHRAE-62.1 2004, Table-B-B2)	By HAZ DUST Monitor
5.	Sulphur Dioxide (SO_2)	7.30	μg/m^3	80 (μg/m^3)(ASHRAE-62.1 2004, Table-B-B2)	IS : 5182 (P-2)
6.	Nitrogen Dioxide (NO_2)	17.80	μg/m^3	Max. 100 (μg/m^3)(ASHRAE-62.1 2004 Table-B-B2)	IS : 5182 (P-6)
7.	Carbon Monoxide (CO)	0.66	mg/m^3	10 mg/m^3(ASHRAE-2001)	IS:5182 (P-10)

ASHRAE-American Society of Heating Refrigerating and Air Conditioning Engineers.

Work Zone Air standards

TABLE B-1 Comparison of Regulations and Guidelines Pertinent to Indoor Environments[a]
(The user of any value in this table should take into account the purpose for which it was adopted and the means by which it was developed.)

	Enforceable and/or Regulatory Levels				Non-Enforced Guidelines and Reference Levels		
	NAAQS/EPA (Ref. B-4)	OSHA (Ref. B-5)	MAK (Ref. B-2)	Canadian (Ref. B-8)	WHO/Europe (Ref. B-11)	NIOSH (Ref. B-13)	ACGIH (Ref. B-1)
Carbon dioxide		5,000 ppm	5,000 ppm 10,000 ppm [1 h]	3,500 ppm [L]		5,000 ppm 30,000 ppm [15 min]	5,000 ppm 30,000 ppm [15 min]
Carbon monoxide[c]	9 ppm[d] 35 ppm [1 h][d]	50 ppm	30 ppm 60 ppm [30 min]	11 ppm [8 h] 25 ppm [1 h]	90 ppm [15 min] 50 ppm [30 min] 25 ppm [1 h] 10 ppm [8 h]	35 ppm 200 ppm [C]	25 ppm
Formaldehyde[h]		0.75 ppm 2 ppm [15 min]	0.3 ppm 1 ppm[i]	0.1 ppm [L] 0.05 ppm [L][b]	0.1 mg/m^3(0.081 ppm) [30 min][p]	0.016 ppm 0.1 ppm [15 min]	0.3 ppm [C]
Lead	1.5 µg/m^3[3 months]	0.05 mg/m^3	0.1 mg/m^3 1 mg/m^3[30 min]	Minimize exposure	0.5 µg/m^3[1 yr]	0.050 mg/m^3	0.05 mg/m^3
Nitrogen dioxide	0.05 ppm [1 yr]	5 ppm [C]	5 ppm 10 ppm [5 min]	0.05 ppm 0.25 ppm [1 h]	0.1 ppm[1 h] 0.02 ppm [1 yr]	1 ppm [15 min]	3 ppm 5 ppm [15 min]
Ozone	0.12 ppm [1 h][g] 0.08 ppm	0.1 ppm	1	0.12 ppm [1 h]	0.064 ppm (120 µg/m^3) [8 h]	0.1 ppm [C]	0.05 ppm[k] 0.08 ppm[l] 0.1 ppm[m] 0.2 ppm[n]
Particles[e] <2.5 µm MMAD[f]	15 µg/m^3 [1 yr][o] ~~65~~ µg/m^3[24 h][o]	5 mg/m^3	1.5 mg/m^3 for <4 µm	0.1 mg/m^3[1 h] 0.040 mg/m^3[L]			3 mg/m^3 [C]
Particles[e] <10 µm MMAD[f]	~~50 µg/m3 [1 yr]~~[o] 150 µg/m^3[24 h][o]		4 mg/m3				10 mg/m^3 [C]
Radon				800 Bq/m^3 [1 yr]			
Sulfur dioxide	0.03 ppm [1 yr] 0.14 ppm [24 h][g]	5 ppm	0.5 ppm 1 ppm[j]	0.38 ppm [5 min] 0.019 ppm	0.048 ppm [24 h] 0.019 ppm [1 yr]	2 ppm 5 ppm [15 min]	2 ppm 5 ppm [15 min]
Total Particles[e]		15mg/m^3					

[a] Numbers in brackets [ ] refer to either a ceiling or to averaging times of less than or greater than eight hours (min = minutes; h = hours; y = year; C = ceiling, L = long-term). Where no time is specified, the averaging time is eight hours.
[b] Target level is 0.05 ppm because of its potential carcinogenic effects. Total aldehydes limited to 1 ppm. Although the epidemiological studies conducted to date provide little convincing evidence that formaldehyde is carcinogenic in human populations, because of this potential, indoor levels should be reduced as much as possible.
[c] As one example regarding the use of values in this table, readers should consider the applicability of carbon monoxide concentrations. The concentrations considered acceptable for nonindustrial, as opposed to industrial, exposure are substantially lower. These lower concentrations (in other words, the ambient air quality standards, which are required to consider populations at highest risk) are set to protect the most sensitive subpopulation, individuals with pre-existing heart conditions.
[d] MMAD = mass median aerodynamic diameter in microns (micrometers). Less than 3.0 µm is considered respirable; less than 10 µm is considered inhalable.
[e] Nuisance particles not otherwise classified (PNOC), not known to contain significant amounts of asbestos, lead, crystalline silica, known carcinogens, or other particles known to cause significant adverse health effects.
[f] See Table B-2 for the U.S. EPA guideline.
[g] Not to be exceeded more than once per year.
[h] The U.S. Department of Housing and Urban Development adopted regulations concerning formaldehyde emissions from plywood and particleboard intended to limit the airborne concentration of formaldehyde in manufactured homes to 0.4 ppm. (24 CFR Part 3280, HUD Manufactured Home Construction and Safety Standards) In addition, California Air Resources Board Regulation (93120, entitled "Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products" has specific chamber-based requirements for composite wood products sold in California.[B-42]
[i] Never to be exceeded.
[j] Carcinogen, no maximum values established.
[k] TLV® for heavy work.
[l] TLV® for moderate work.
[m] TLV® for light work.
[n] TLV® for heavy intermittent, or light workloads (less than or equal to two hours).
[o] 62FR38652 - 38760, July 16, 1997.
[p] Epidemiological studies suggest a causal relationship between exposure to formaldehyde and nasopharyngeal cancer, although the conclusion is tempered by the small numbers of observed and expected cases. There are also epidemiological observations of an association between relatively high occupational exposures to formaldehyde and sinonasal cancer.

DG STACK EMISSION MONITORING

The exhaust chimney is as per the guidelines of CPCB. The exhausts from the D.G. Sets are channelized to chimney.

The monitoring was done near the DG area and the stack was attached to DG set of 320 KVA. The stack height was 12 feet above the roof height.

DG SET EMISSION MONITORING

S. No.	Parameters	Test Methods	Results	Units	Limits
1.	Particulate Matter as (PM)	IS 11255 (P-1)1985	0.17	gm/kwh	≤0.20
2.	Oxides of Nitrogen as (NO_2)	IS 11255 (P-7)2005	1.04	gm/kwh	≤4.0
3.	Oxides of Sulphur as (SO_2)	IS 11255(P-2)1985	1.16	gm/kwh	-
4.	Carbon Monoxides as (CO)	By CO Meter	1.30	gm/kwh	≤3.5
5.	Carbon Dioxide as (CO_2)	By Orsat	10.80	%	--

The emissions from the DG set were found to under the limits mentioned in the table.

D.G Stack Monitoring Standards

Power Category	Emission Limits (g/kW-hr)			Smoke Limit (light absorption coefficient, m^{-1})
	NOx+HC	CO	PM	
Upto 19 KW	≤7.5	≤3.5	≤0.3	≤0.7
More than 19 KW upto 75 KW	≤4.7	≤3.5	≤0.3	≤0.7
More than 75 KW upto 800 KW	≤4.0	≤3.5	≤0.2	≤0.7

Note:

1. The abbreviations used in the Table shall mean as under: NO_x – Oxides of Nitrogen; HC – Hydrocarbon; CO – Carbon Monoxide; and PM – Particulate Matter.
2. Smoke shall not exceed above value throughout the operating load points of the test cycle.
3. The testing shall be done as per D2 – 5 mode cycle of ISO: 8178- Part 4.
4. The above mentioned emission limits shall be applicable for Type Approval and Conformity of Production (COP) carried out by authorised agencies.
5. Every manufacturer, importer or, assembler (hereinafter referred to as manufacturer) of the diesel engine (hereinafter referred to as 'engine') for genset application manufactured or imported into India or, diesel genset (hereinafter referred to as 'product'), assembled or imported into India shall obtain Type Approval and comply with COP of their product(s) for the emission limits which shall be valid for the next COP year or, the date of implementation of the revised norms specified above, whichever earlier.

   Explanation.- The term 'COP year' means the period from 1st April to 31st March.
6. Stack height (in metres), for genset shall be governed as per Central Pollution Control Board (CPCB) guidelines.

Part II: Water Quality

Humans have wrestled with water quality for thousands of years, as far back as the 4th and 5th centuries BC when Hippocrates, the father of modern medicine, linked impure water to disease and invented one of the earliest water filters. Today, the challenge is sizable, creating existential threats to biodiversity and multiple human communities, as well as threatening economic progress and sustainability of human lives,

Increasing the economic and human cost of toxic water-bodies: As India grows and urbanizes its water bodies are getting toxic It's estimated that around 70% of surface water in India is unfit for consumption. Every day, almost 40 million litres of wastewater enters rivers and other water bodies with only a tiny fraction adequately treated. A recent World Bank report suggests that such a release of pollution upstream lowers economic growth in downstream areas, reducing GDP growth in these regions by up to a third. To make it worse, in middle-income countries like India where water pollution is a bigger problem, the impact increases to a loss of almost half of GDP growth. Another study estimates that being downstream of polluted stretches in India is associated with a 9% reduction in agricultural revenues and a 16% drop in downstream agricultural yields. Water pollution is one of the biggest issues facing India right now. As may be evident, untreated sewage is the biggest source of such form of pollution in India. There are other sources of pollution such as runoff from the agricultural sector as well as unregulated units that belong to the small- scale industry. The situation is so serious that perhaps there is no water body in India that is not polluted to some extent or the other. In fact, it is said that almost 80% of the water bodies in India are highly polluted. This is especially applicable of ones that some form or the other of human habitation in their immediate vicinity. Ganga and Yamuna are the most polluted rivers in India.

Causes of water pollution in India: The single biggest reason for water pollution in India is urbanization at an uncontrolled rate. The rate of urbanization has only gone up at a fast pace in the last decade or so, but even then it has left an indelible mark on India's aquatic resources. This has led to several environmental issues in the long term like paucity in water supply, generation and collection of wastewater to name a few. The treatment and disposal of wastewater has also been a major issue in this regard. The areas near rivers have seen plenty of towns and cities come up and this has also contributed to the growing intensity of problems. Uncontrolled urbanization in these areas has also led to generation of sewage water. In the urban areas water is used for both industrial and domestic purposes from water bodies such as rivers, lakes, streams, wells, and ponds. Worst still, 80% of the water that we use for our domestic

Purposes are passed out in the form of wastewater. In most of the cases, this water is not treated properly and as such it leads to tremendous pollution of surface-level freshwater. This polluted water also seeps through the surface and poisons groundwater. It is estimated that cities with populations of more than one lakh people generate around 16,662 million litres or wastewater in a day. Strangely enough, 70% of the people in these cities have access to sewerage facilities. Cities and towns located on the banks of Ganga generate around 33% of wastewater generated in the country.

Following are some other important reasons of increasing levels of water pollution in India:

- Industrial waste
- Improper practices in agricultural sector
- Reduction in water quantity in rivers in plains
- Social and religious practices like dumping dead bodies in water,
- Bathing, throwing waste in water
- Oil leaks from ships
- Acid rain
- Global warming
- Eutrophication
- Inadequate industrial treatment of wastes
- Denitrification

Water pollution can have some tremendously-adverse effect on the health of any and every life form living in the vicinity of the polluted water body or using water that has been polluted to some extent. At a certain level polluted water can be detrimental to crops and reduce the fertility of soil thus harming the overall agricultural sector and the country as well. When sea water is polluted it can also impact oceanic life in a bad way. The most fundamental effect of water pollution is however on the quality of the water, consuming which can lead to several ailments. In fact, as far as India is concerned polluted water is one of the major factors behind the general low levels of health in India, especially in the rural areas. Polluted water can lead to diseases such as cholera, tuberculosis, dysentery, jaundice, diarrhoea, etc. In fact, around 80% stomach ailments in India happen because of consuming polluted water. The cost of environmental degradation in

India is estimated to be INR 3.75 trillion ($80 billion) a year. The health costs relating to water pollution are alone estimated at about INR 470-610 billion (S6.7-8.7 billion per year) - most associated with diarrheal mortality and morbidity of children under five and other population morbidities. Apart from the economic cost, lack of water, sanitation and hygiene results in the loss of 400,000 lives per year in India. Globally, 1.5 million children under five die and 200 million days of work are lost each year as a result of water-related diseases.

As per the latest estimate of Central Pollution Control Board, about 29,000 million litre/day of wastewater generated from Class-I cities and class-Il towns out of which about 45% (about 13000 MLD) is generated from 35 metro-cities alone. The collection system exists for only about 30% of the wastewater through sewer line and treatment capacity exists for about 7000 million litre/day, Thus, there is a large gap between generation, collection and treatment of wastewater, A large part of un-collected, un-treated wastewater finds its way to either nearby surface water body or accumulated in the city itself forming cesspools. In almost all urban centres cesspools exist. These cesspools are good breeding ground for mosquitoes and also source of groundwater pollution. The wastewater accumulated in these cesspools gets percolated in the ground and pollute the groundwater. Also in many cities/towns conventional septic tanks and other low cost sanitation facilities exists. Due to non-existence of proper maintenance these septic tank become major source of groundwater pollution. In many urban areas groundwater is only source of drinking. Thus, a large population is at risk of exposed to water borne diseases of infectious (bacterial, viral or animal infections). Water borne diseases are still a great concern in India. Solid waste is being dumped near the factories, and is subjected to reaction with percolating rainwater and reaches the groundwater level. The percolating water picks up a large amount of dissolve pollutants and reaches the aquifer system and contaminates the groundwater. The problem of groundwater pollution in several parts of the country has become so acute that unless urgent steps for abatement are taken, groundwater resources may be damaged. The quality of groundwater depends on a large number of individual hydrological, physical, chemical and biological factors. Generally higher proportions of dissolved constituents are found in groundwater than in surface water because of greater interaction of ground water with various materials in geologic strata. The water used for drinking purpose should be free from any toxic elements, living and non-living organism and excessive amount of minerals that may be hazardous to health. Some of the heavy metals are extremely essential to humans, for example, Cobalt, Copper, etc., but large quantities of them may cause physiological disorders. The contamination of groundwater by heavy metals has assumed great significance during recent years due to their toxicity and accumulative behaviour. These elements, contrary to most pollutants, are not biodegradable and undergo a global eco-biological cycle in which natural waters are the main pathways. The determination of the concentration levels of heavy metals in these waters, as well as the elucidation of the chemical forms in which they appear is a prime target in environmental research today. A vast majority of groundwater quality problems are caused by contamination, over-exploitation, or combination of the two. Most groundwater quality problems are difficult to detect & hard to resolve. The solutions are usually very expensive, time consuming & not always effective. An alarming picture is beginning to emerge in many parts of our country. Groundwater quality is slowly but surely declining everywhere. Groundwater pollution is intrinsically difficult to detect,

Since, problem may well be concealed below the surface and monitoring is costly, time consuming and somewhat hit-or-miss by nature. Many times the contamination is not detected until of non substances actually appear in water used, by which time the pollution has often

dispersed over large area. Essentially all activities carried out on land have the potential to contaminate groundwater, whether associated with urban, industrial or agricultural activities. Large scale concentrated sources of pollution such as industrial discharges, landfills & subsurface injection o chemicals & hazardous wastes are an obvious source of groundwater pollution. These concentrated sources can be easily detected & regulated but the more difficult problem associated with diffuse sources of pollution like leaching of agrochemicals & animal wasted subsurface discharges from latrines & septic tanks & infiltration of polluted urban run-off sewage where sewerage does not exist. Diffuse sources can affect entire aquifers, which is difficult to control & treat. The only solution to diffuse sources of pollution is to integrate land use with water management. Once pollution has entered the sub-surface environment, it may remain concealed for many years, becoming dispersed over wide areas & rendering groundwater supplies unsuitable for human uses.

Data disclosure and public policy:

Access to information has been an important part of the environmental debate since the beginning of the climate change movement. The notion that "information increases the effectiveness of participation" has been widely accepted in economics and other social science literature. While the availability of reliable data is the most important step towards efficient regulation, making the process transparent and disclosing data to the public brings many additional advantages. Such disclosure creates competition among industries on environmental performance. It can also lead to public pressure from civil society groups, as well as the general public, investors and peer industrial plants, and nudge polluters towards better behaviour.
Ground water testing results of Graphic Era Deemed to be University found under limit as per IS 10500-2012 for drinking water standards.

Table: Ground Water Testing Results of Borewell Water of Graphic Era.

S. No.	Parameters	Test –Methods	Results	Units	Limit of IS: 10500-2012	
					Desirable Limits (Max)	Permissible Limits the absence of Alternate Source (Max.)
1.	pH (at 25^0C)	IS 3025 (Part-11) 1984.	7.32	-	6.5 to 8.5	No relaxation
2.*	Color	IS 3025 (Part-4) 1983	BDL (DL-5)	Hazen	5	15
3.	Turbidity	IS 3025 (Part-10) 1984	BDL (DL-I)	NTU	1	5
4.*	Odour	IS 3025 (Part-5) 1984	Agreeable	-	Agreeable	Agreeable
5.*	Taste	IS 3025 (Part-7-8) 1984	Agreeable	-	Agreeable	Agreeable
6.	Total Hardness as $CaCO_3$	IS 3025 (Part-21) 1984	290.20	mg/l	200	600
7.	Calcium as Ca	IS 3025 (Part-40) 1991	71.20	mg/l	75	200
8.	Alkalinity as $CaCO_3$	IS 3025 (Part-23) 1996	248.50	mg/l	200	600
9.	Chloride as Cl	IS 3025 (Part-32)	23.44	mg/l	250	1000

		1998				
10.*	Cyanide as CN	IS 3025 (Part-27) 1986	BDL (DL-0.002)	mg/l	0.05	No relaxation
11.	Magnesium as Mg	IS 3025 (Part-46) 2009	28.15	mg/l	30	100
12.	Total Dissolved Solids	IS 3025 (Part-16),1984	356.10	mg/l	500	2000
13.	Sulphate as SO_4	IS 3025 (Part-24),1986	27.30	mg/l	200	400
14.	Flouride as F	IS3025(Part-60), 2008	BDL (DL-0.05)	mg/l	1.0	1.5

Specification of Water

Sl No.	Characteristic	Requirement (Acceptable Limit)	Permissible Limit in the Absence of Alternate Source	Method of Test, Ref to Part of IS 3025	Remarks
(1)	(2)	(3)	(4)	(5)	(6)
i)	Colour, Hazen units, *Max*	5	15	Part 4	Extended to 15 only, if toxic substances are not suspected in absence of alternate sources
ii)	Odour	Agreeable	Agreeable	Part 5	a) Test cold and when heated b) Test at several dilutions
iii)	*p*H value	6.5-8.5	No relaxation	Part 11	—
iv)	Taste	Agreeable	Agreeable	Parts 7 and 8	Test to be conducted only after safety has been established
v)	Turbidity, NTU, *Max*	1	5	Part 10	—
vi)	Total dissolved solids, mg/l, *Max*	500	2 000	Part 16	—

NOTE — It is recommended that the acceptable limit is to be implemented. Values in excess of those mentioned under 'acceptable' render the water not suitable, but still may be tolerated in the absence of an alternative source but up to the limits indicated under 'permissible limit in the absence of alternate source' in col 4, above which the sources will have to be rejected.

Sl No.	Characteristic	Requirement (Acceptable Limit)	Permissible Limit in the Absence of Alternate Source	Method of Test, Ref to	Remarks
(1)	(2)	(3)	(4)	(5)	(6)
i)	Aluminium (as Al), mg/l, *Max*	0.03	0.2	IS 3025 (Part 55)	—
ii)	Ammonia (as total ammonia-N), mg/l, *Max*	0.5	No relaxation	IS 3025 (Part 34)	—
iii)	Anionic detergents (as MBAS) mg/l, *Max*	0.2	1.0	Annex K of IS 13428	—
iv)	Barium (as Ba), mg/l, *Max*	0.7	No relaxation	Annex F of IS 13428* or IS 15302	—
v)	Boron (as B), mg/l, *Max*	0.5	1.0	IS 3025 (Part 57)	—
vi)	Calcium (as Ca), mg/l, *Max*	75	200	IS 3025 (Part 40)	—
vii)	Chloramines (as Cl_2), mg/l, *Max*	4.0	No relaxation	IS 3025 (Part 26)* or APHA 4500-Cl G	—
viii)	Chloride (as Cl), mg/l, *Max*	250	1 000	IS 3025 (Part 32)	—
ix)	Copper (as Cu), mg/l, *Max*	0.05	1.5	IS 3025 (Part 42)	—
x)	Fluoride (as F) mg/l, *Max*	1.0	1.5	IS 3025 (Part 60)	—
xi)	Free residual chlorine, mg/l, *Min*	0.2	1	IS 3025 (Part 26)	To be applicable only when water is chlorinated. Tested at consumer end. When protection against viral infection is required, it should be minimum 0.5 mg/l
xii)	Iron (as Fe), mg/l, *Max*	0.3	No relaxation	IS 3025 (Part 53)	Total concentration of manganese (as Mn) and iron (as Fe) shall not exceed 0.3 mg/l
xiii)	Magnesium (as Mg), mg/l, *Max*	30	100	IS 3025 (Part 46)	—
xiv)	Manganese (as Mn), mg/l, *Max*	0.1	0.3	IS 3025 (Part 59)	Total concentration of manganese (as Mn) and iron (as Fe) shall not exceed 0.3 mg/l
xv)	Mineral oil, mg/l, *Max*	0.5	No relaxation	Clause **6** of IS 3025 (Part 39) Infrared partition method	—
xvi)	Nitrate (as NO_3), mg/l, *Max*	45	No relaxation	IS 3025 (Part 34)	—
xvii)	Phenolic compounds (as C_6H_5OH), mg/l, *Max*	0.001	0.002	IS 3025 (Part 43)	—
xviii)	Selenium (as Se), mg/l, *Max*	0.01	No relaxation	IS 3025 (Part 56) or IS 15303*	—
xix)	Silver (as Ag), mg/l, *Max*	0.1	No relaxation	Annex J of IS 13428	—
xx)	Sulphate (as SO_4) mg/l, *Max*	200	400	IS 3025 (Part 24)	May be extended to 400 provided that Magnesium does not exceed 30
xxi)	Sulphide (as H_2S), mg/l, *Max*	0.05	No relaxation	IS 3025 (Part 29)	—
xxii)	Total alkalinity as calcium carbonate, mg/l, *Max*	200	600	IS 3025 (Part 23)	—
xxiii)	Total hardness (as $CaCO_3$), mg/l, *Max*	200	600	IS 3025 (Part 21)	—
xxiv)	Zinc (as Zn), mg/l, *Max*	5	15	IS 3025 (Part 49)	—

NOTES

1 In case of dispute, the method indicated by '*' shall be the referee method.

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Sl No.	Characteristic	Requirement (Acceptable Limit)	Permissible Limit in the Absence of Alternate Source	Method of Test, Ref to	Remarks
(1)	(2)	(3)	(4)	(5)	(6)
i)	Cadmium (as Cd), mg/l, *Max*	0.003	No relaxation	IS 3025 (Part 41)	—
ii)	Cyanide (as CN), mg/l, *Max*	0.05	No relaxation	IS 3025 (Part 27)	—
iii)	Lead (as Pb), mg/l, *Max*	0.01	No relaxation	IS 3025 (Part 47)	—
iv)	Mercury (as Hg), mg/l, *Max*	0.001	No relaxation	IS 3025 (Part 48)/ Mercury analyser	—
v)	Molybdenum (as Mo), mg/l, *Max*	0.07	No relaxation	IS 3025 (Part 2)	—
vi)	Nickel (as Ni), mg/l, *Max*	0.02	No relaxation	IS 3025 (Part 54)	—
vii)	Pesticides, µg/l, *Max*	See Table 5	No relaxation	See Table 5	—
viii)	Polychlorinated biphenyls, mg/l, *Max*	0.000 5	No relaxation	ASTM 5175*	— or APHA 6630
ix)	Polynuclear aromatic hydro-carbons (as PAH), mg/l, *Max*	0.000 1	No relaxation	APHA 6440	—
x)	Total arsenic (as As), mg/l, *Max*	0.01	0.05	IS 3025 (Part 37)	—
xi)	Total chromium (as Cr), mg/l, *Max*	0.05	No relaxation	IS 3025 (Part 52)	—
xii)	Trihalomethanes:				
	a) Bromoform, mg/l, *Max*	0.1	No relaxation	ASTM D 3973-85* or APHA 6232	—
	b) Dibromochloromethane, mg/l, *Max*	0.1	No relaxation	ASTM D 3973-85* or APHA 6232	—
	c) Bromodichloromethane, mg/l, *Max*	0.06	No relaxation	ASTM D 3973-85* or APHA 6232	—
	d) Chloroform, mg/l, *Max*	0.2	No relaxation	ASTM D 3973-85* or APHA 6232	—

NOTES

1 In case of dispute, the method indicated by '*' shall be the referee method.

2 It is recommended that the acceptable limit is to be implemented. Values in excess of those mentioned under 'acceptable' render the water not suitable, but still may be tolerated in the absence of an alternative source but up to the limits indicated under 'permissible limit in the absence of alternate source' in col 4, above which the sources will have to be rejected.

PART III: GREEN COVER

You've probably heard that trees produce oxygen, but have you ever wondered just how much oxygen one tree makes? The amount of oxygen produced by a tree depends on several factors including the species of tree, its age, its health, and the tree's surroundings. A tree produces a different amount of oxygen in summer compared to winter. So, there is no definitive value. Here are some typical calculations: "A mature leafy tree produces as much oxygen in a season as 10 people inhale in a year." "A single mature tree can absorb carbon dioxide at a rate of 48 pounds/year and release enough oxygen back into the atmosphere to support two human beings." "One acre of trees annually consumes the amount of carbon dioxide equivalent to that produced by driving an average car for 26,000 miles. That same acre of trees also produces enough oxygen for 18 people to breathe for a year.

Sources

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Green cover' refers to a broad range of strategies to integrate green, permeable and reflective surfaces into cities and towns, which are home to 89 per cent of our population. Surface temperatures in urban areas can be 10°C to 20°C higher than in the air temperatures because buildings, roads and other hard surfaces absorb and store heat. High temperatures, due to climate change, will further intensify the impacts of urban heat.

Unlike hard surfaces, trees and vegetation (sometimes called green infrastructure) provide shade, and cool and clean the air by evapotranspiration. Other benefits are better health and wellbeing for Types of urban green cover include bushland, private and community gardens, parks, greenways, habitat corridors, street trees, roof gardens and plant-covered walls, as well as reflective and permeable walls, pavements and other surfaces. Protecting local green spaces, designing eco- friendly buildings and creating urban networks of green space can help to minimise the impacts of urban-dwellers, more biodiversity and wildlife in urban areas, and better regulation of localised flooding. Urban heat in our cities and towns.

PART IV: Human Activities.

A community pursuing environmental sustainability does not exist in and of itself. Trade, transportation, and air borne pollutants, to name several examples, can put it directly in touch with those carrying on in less than sustainable ways. Similarly, college campuses do not exist in and of themselves. It is fairly safe to say that the typical college campus is unlikely to be able to support the livelihood of its human residents without importing some food, energy, materials, and so on, and exporting some waste + solid or otherwise. Still, the degree of the environmental impact that ensues is not cut in stone nor is it necessarily unsustainable. Like the community aspiring toward sustainability, many things on a college campus can be done that help increase the effectiveness of actions that reduce environmental impacts.

Universities play a significant role in responding to climate change by creating knowledge and integrating the handling of climate issues in educational and research programs, as well as direct and indirect operational activities. Large-scale campus like Graphic Era consisting, teaching buildings, school service buildings, roads, and other facilities of varying sizes. Comparing to other working place or entertainment venues as well nature or artificial ecological niche, in the campus, there are almost daily social activities, harboring disturbances from the exchanges of people and vehicles.

Such a semi-open community could be roughly defined as a sociological and biological community with constraint access of persons from outside with gates and hotels as the interfaces, which is strongly affected by Environmental stressors like temperature and population density. No use of Vehicles for students and faculties inside the campus. Electric vehicles used for faculties and visitor for movement inside the campus. Dustbins are using for waste disposals.

Part V: ENVIRONMENTAL PRACTICE

The term environmental practice defines the application of appropriate combination of environmental monitoring, assessing and control measures. While including it in reports it also includes the strategies or the future recommendations. The following are the sub-headings on the basis of which the current green audit of ECON laboratory and consultancy conducted:

a) Energy Management
b) Water Resources and Management
c) Waste Management

d) Landscape Environment

e) Transportation

f) Noise Management

g) Lux (Illumination) Monitoring

A. ENERGY MANAGEMENT

The increasing demand for power has led to considerable fossil fuels burning which has in turn had an adverse impact on environment. In this context, efficient use of energy and its conservation is of paramount importance. It has been estimated that nearly 25.000 MW can be saved by implementing end-use energy efficiency and demand side management measures throughout India. Efficient use of energy and its conservation assumes even greater importance in view of the fact that one unit of energy saved at the consumption level reduces the need for fresh capacity creation by 2 times to 2.5 times. Further, such saving through efficient use of energy can be achieved at less than one-fifth the cost of fresh capacity creation. Energy efficiency would, therefore, significantly supplement our efforts to meet power requirement, apart from reducing fossil fuel consumption.

The economic development of a country is often closely linked to its consumption of energy. Although India ranks sixth in the world as far as total energy consumption is concerned, it still needs much more energy to keep pace with its development objectives. India's projected economic growth rate is slated at 7.4 % during the period 1997-2012. This would necessitate commensurate growth in the requirement of commercial energy, most of which is expected to be from fossil fuels and electricity. India's proven coal reserves may last for more than 200 years, but the limited known oil and natural gas reserves may last only 18 years to 26 years, which is a cause of concern.

The continued trend of increasing share of petroleum fuels in the consumption of commercial energy is bound to lead to more dependence on imports and energy insecurity. India's energy. Intensity per unit of GDP is higher as compared to Japan, U.S.A. and Asia by 3.7 times, 1.55 times energy savings. The increasing global trade liberalisation and growing global competition have made productivity improvement, including energy cost reduction, an important benchmark e economic success, Therefore, a paradigm shift in our approach to energy policy issues is need and 1.47 times respectively. This indicates intelligent use of energy. This integrated approach would have to incorporate a judicial mix of investment in the supply side capacity, operational efficiency improvements of existing power generating stations, reduction of losses in transmission distribution, end-use efficiency and renewable technologies, The policy goals and concepts would have to be shifted from "energy conservation" to "energy efficiency", and from "energy input" to the "effectiveness of energy use" and "energy services". Creation of new power generation capacity is costly and necessitates long gestation period whereas energy efficiency activities con make available additional power at comparatively low investments within a short period of time for the past few decades, energy generation has been shifted to alternative energy sources like renewable energy forms such as solar, wind and biomass energy etc. instead of the conventional fossil fuel sources. Apart from the growth in the energy sector, there has been an equivalent increase in businesses and organisations, which has brought tremendous competition in the

market in terms of increasing environmental standards and reducing global warming, carbon foot print and greenhouse gas emissions. Energy management is a process by which a sector or an organisation can effectively manage how much energy they produce and how to control, monitor and conserve as much energy as they can while also generating enough energy to meet the demand of the customers. Apart from protection of climate and conservation of resources, another important factor when dealing with energy conservation is cost savings. The cost should he reduced in a manner such that the work processes are not affected. And thus, profit should he maximised by minimising costs.

According to a study released by the US Energy Information Administration in the year 2011, China and India were the two countries which were least affected by the worldwide recession? In the year 2008, both these nations accounted for 21% of the total world energy consumption. By 2035, both the countries will account for 31% of world energy use in the IEO2011 Reference case. This is shown in the figure 1. With these rising statistics, it is essential that we not only reduce energy consumption at private and public organisations, but also at homes, to save energy and thus, protect our environment and reduce carbon emissions as well. In 2016, India stood fourth worldwide, as the largest consumer of energy, the figure being double of that in 2000. It is also expected that nearly 315 million more Indians will move to cities in the upcoming 25 years as the economy will grow and this in turn will lead to a rise in the energy demand. With these rising statistics, it is essential that we not only reduce energy consumption at private and public organisations, but also at homes, to save energy and thus, protect our environment and reduce carbon emissions as well. In 2016, India stood fourth worldwide, as the largest consumer of energy, the figure being double of that in 2000. It is also expected that nearly 315 million more Indians will move to cities in the upcoming 25 years as the economy will grow and this in turn will lead to a rise in the energy demand. A large amount of energy and money can be saved in general by employing energy management and the savings in any organisation can follow the profile as shown.

As shown, huge amount of savings and paybacks can be achieved through energy management. It can also help companies by not only improving productivity but also the quality that they offer grouping of better quality, better products, lesser environmental damage, and lesser costs of energy using energy efficiency techniques and better materials and manufacturing processes provides bonus to the companies and in turn helps sustaining the environment. India's Energy Demand Source: IEA, World Energy Outlook 2015 Principles governing energy management are as follows.

1. Control the costs of the energy function, Since energy always provides a service, it is converted to a useful function, it is advisable to control the total cost than just the Btu of energy since the total cost is more closely related to the interests of the organisation.

2. The second principle is to control energy functions as a product cost, not as a part of manufacturing or general overhead. The energy functions should be a part of the costing system so that the specific impact of each function can be better judged.

3. The third principle is to control and meter only the main functions – which accounts for only 20% functions which make up 80 percent of the costs.

4. The last principle states that the major effort of an energy management program should be put in to installing controls and achieving results. Each step of the process should be monitored to achieve appropriate results.

When energy use is deliberately monitored, controlled, and conserved, decreases in consumption and overall costs can be realized without sacrificing facilities operations solar energy management techniques can take on many shapes and sizes. Following are facility management executives can use to increase efficiency while overcoming potential costs and enhancing efficiency of system Challenges. Actively manage real-time energy use. Use advanced metering and energy management systems (EMS) to capture real-time data ensure its accuracy and, in turn, address specific issues For example, a K-12 school installed an energy dashboard that managed the overall facility while actively engaging faculty and students. The customer could view how the systems were operating and how much they were saving based on their actions and system improvements, in instances where building owners have utility monitoring equipment but no collection of processing software, the meters or monitoring equipment become stranded assets. This is because millions of data points have to be gathered and processed manually, multiple times during the year A sophisticated metering system equipped with the proper EMS software will automatically collect, process, and format these data points in real time, if not hourly, The ability to process these useful data points into an easy to use format improves the overall system effectiveness and functionality. Actively manage energy consumption. Use collected data to build a strategy that manages costs and consumption on a daily, weekly, monthly, and annual basis, Southland Energy worked with an industrial customer to evaluate multiple peak demand reduction strategies. Load shifting and demand limiting systems were implemented to limit customer loads during peak hours and reduce costs. Limiting peak demand consumption offers additional benefits that are not always easy to idem or claim. For example, during peak hours, utilities run “peaker plants” to meet demands from I grid, however, these plants are often older and less efficient electricity generation plants, with sole purpose to run periodically to meet demand. Reducing peak demand during summer nee saves electricity costs and overall greenhouse gas emissions per kW.

Solar Power Generation in Graphic Era Campus

S. No.	Locations	Solar power in Kwp.
1.	Gaushala	24.32
2.	New HM	24.32
3.	Mechanical Department	33.60
4.	P.C. block	26.88
5.	GEU block	26.88
6.	B.Tech Block	51.20
7.	CS IT Block	50.00
	Total	**237.2**

Solar water heating system in Graphic Era Campus

S. No.	LOCATIONS	Solar water heating system LPD (Liter per day)
1.	Sardar Patel Hostel (Mess hostel)	2000
2.	Priyadarshni Hostel (NGH-II)	8000
	Total	**10000 L.P.D.**

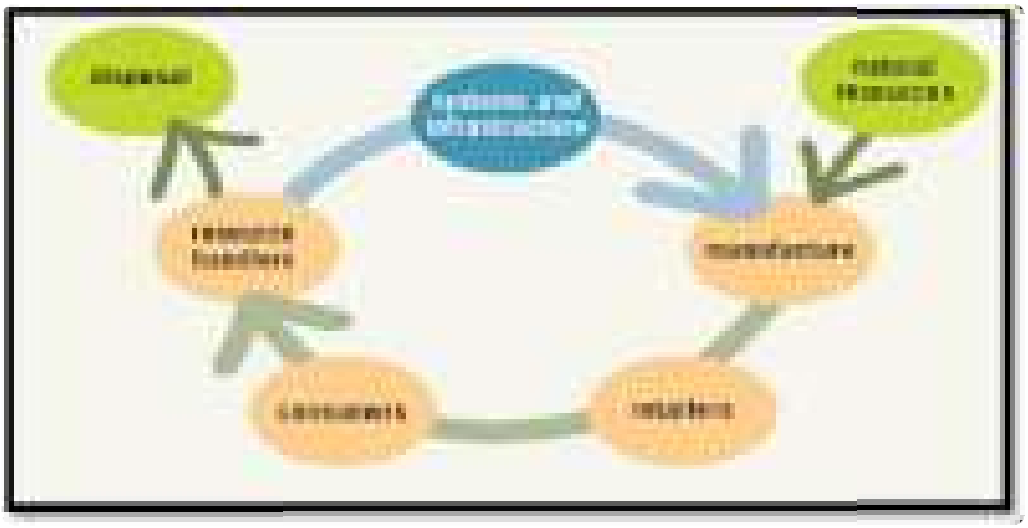
Solar Street Lights System in Graphic Era Campus

S. No.	Item	Energy Saving
1.	Solar Street Lights (40 nos.)	40*14=0.56 KW
2.	Energy saving using solar street light	2044 KWh/Anum

B. WATER RESOURCES AND MANAGEMENT

Water is must for all life on earth and the most important natural resource. We all know that about three-fourths of the earth's surface is covered with water. But about 96.5% of the global water resources come from the oceans and seas. In India, the water resources amount to an estimated 1897 square kilometer per annum. However, we all know about the shortage of Water we are facing as a country. Let us learn more about the conversation of the water resource. Water resource systems have benefited both people and their economies for many centuries. The services provided by such systems are multiple. Yet in many regions of the world they are not able to meet even basic drinking water and sanitation needs. Nor can many of these water resource systems support and maintain resilient biodiverse ecosystems. Typical causes include inappropriate, inadequate and/or degraded infrastructure, excessive withdrawals of river flows, pollution from industrial and agricultural activities, eutrophication resulting from nutrient loadings, salinization from irrigation return flows, infestations of exotic plant and animals, excessive fish harvesting, flood plain and habitat alteration from development activities, and changes in water and sediment flow regimes. The inability of water resource systems to meet the diverse needs for water often reflects failures in planning. Management, and decision-making and at levels broader than water. Planning, developing, and managing water resources to ensure adequate, inexpensive, and sustainable supplies and qualities of water for both humans and natural ecosystems can only succeed if we recognize and address the causal socioeconomic factors, such as inadequate education, corruption. Population pressures and poverty over the centuries, surface and ground waters have been a source of water supply for agricultural, municipal, and industrial consumers.

Rivers have provided hydroelectric energy and inexpensive ways of transporting bulk cargo. They have provided people water-based recreational opportunities and have been a source of water for wildlife and their habitats. They have also served as a means of transporting and transforming waste products that are discharged into them. The quantity and quality regimes of streams and rivers have been a major factor in governing the type, health, and biodiversity of riparian and aquatic ecosystems. Floodplains have provided fertile lands for agricultural crop production and relatively flat lands for the sitting of roads and railways and commercial and industrial complexes. In addition to the economic benefits that can be derived from rivers and their floodplains, the aesthetic beauty of most natural rivers has made lands adjacent to them attractive sites for residential and recreational development. Rivers and their floodplains have generated, and, if managed properly, can continue to generate, substantial cultural, economic, environmental, and social benefits for their inhabitants. Human activities undertaken to increase the benefits obtained from rivers and their floodplains may also increase the potential for costs and damages such as when the river is experiencing periods of droughts, floods, and heavy pollution. These costs and damages are physical, economic, environmental, and social. They result because of a mismatch between what humans expect or demand, and what nature offers or supplies. Human activities tend to be based on the "usual or normal" range of river flow conditions. Rare or "extreme" flow conditions outside these normal ranges will continue to occur, and possibly with increasing frequency as climate change experts suggest. River-dependent human activities that cannot adjust to these extroma flow conditions will incur losses.



How can these resources best be managed and used? How can this be accomplished in an environment of uncertain and varying supplies and uncertain and increasing demands, and consequently of increasing conflicts among individuals having different interests in their management and use? The central purpose of water resources planning, management, and analysis activities is to address, and if possible answer, these questions. These questions have scientific, technical, political (institutional), and social dimensions. Thus water resources planning processes and products are must. River basin, estuarine, and coastal zone managers-those responsible for managing the resources in those areas-are expected to manage those resources effectively and efficiently, meeting the demands or expectations of all users and reconciling divergent needs. This is no small task, especially as demands increase, as the variability of hydrologic and hydraulic processes become more pronounced, and as stakeholder expectations of system performance increase in complexity.

The focus or goal is no longer simply to maximize economic net benefits while making sure the distribution of those benefits is equitable. There are also environmental and ecological goals to consider. Rarely are management questions one- dimensional. Such as how can we provide, at acceptable costs, more high-quality water to municipalities, industry, or to irrigation areas in the basin. Now added to that question is how would those withdrawals affect the downstream hydrology water quantity and quality regimes, and in turn the riparian and aquatic ecosystems. Problems and opportunities change over time. Just as the goals of managing and using water change over time, so do the processes of planning to meet these changing goals. Planning processes evolve not only to meet new demands, expectations, and objectives, but also in response to new perceptions of how to plan and manage more effectively. Some quick Facts and Figures The total volume of water on earth's surface- 96.5 % The total volume of usable freshwater- 2.5% The volume of freshwater in ice-sheets and glaciers- 70 % Stored groundwater- 30 % Precipitation (rainfall) in India- 4 % of earth's total India's rank in the world for water availability per person (per annum)- 133 Conservation & Management of Water Resources Water everywhere, not a drop to drink.' It is a very old saying in a different reference to the situation. But, this is exactly what we fear will happen very soon, if we do not wisely use and conserve our water resources. Research shows that by 2025, India, along with many other countries will face a serious scarcity of water. Many regions in our country undergoing currently the process of water stress'. According to a research by Falken Mark, a Swedish expert on water, 'water stress' happens when the water availability falls below 1000 cubic meters per person per day. Today, most

countries placing unprecedented pressure on water resources. The global population is growing fast, and estimates show that with current practices, the world will face a 40% shortfall between forecast demand and available supply of water by 2030, Furthermore, chronic water scarecity, hydrological uncertainty, and extreme weather events (Floods and droughts) are perceived as some of the biggest threats to global prosperity and stability. Acknowledgment of the role that water scarcity drought are playing in aggravating fragility and conflict is increasing. To strengthen water security against this backdrop of increasing demand, water scarcity, growing uncertainty, greater extremes, and fragmentation challenges, clients will need to invest in institutional strengthening, information management, and (natural and man-made) infrastructure development. Institutional tools such as legal and regulatory frameworks, water pricing, and incentives are needed to better allocate, regulate, and conserve water resources. Information systems are needed for resource monitoring, decision making under uncertainty, systems analyses, and hydro-meteorological forecast and warning. Investments in innovative technologies for enhancing productivity, conserving and protecting resources, recycling storm water and seeking opportunities for enhanced water storage, including aquifer recharge and recovery. Ensuring the rapid dissemination and appropriate adaptation or application of these advances will be a key to strengthening global water security. Wastewater, and developing non-conventional water sources should be explored in addition to seeking opportunities for enhanced water storage including aquifer recharge and recovery. Ensuring the rapid dissemination and appropriate adaptation or application or application of these advances will be a key to strengthening global water security.

C. WASTE MANAGEMENT

Waste management rules in India are based on the principles of "sustainable development". "precaution" and "polluter pays". These principles mandate municipalities and commercial establishments to act in an environmentally accountable and responsible manner-restoring balance, if their actions disrupt it. The increase in waste generation as a by-product of economic development has led to various subordinate legislations for regulating the manner of disposal and dealing with generated waste are made under the umbrella law of Environment Protection Act, 1986 (EPA). Specific forms of waste are the subject matter of separate rules and require separate compliances, mostly in the nature of authorisations, maintenance of records and adequate disposal mechanisms. With rapid urbanisation, the country is facing massive waste management challenge. Over 377 million urban people live in 7,935 towns and cities and generate 62 million tonnes of municipal solid waste per annum, Only 43 million tonnes (MT) of the waste is collected, I1.9 MT is treated and 31 MT is dumped in landfill sites. Solid Waste Management (SWM) is one among the basic essential services provided by municipal authorities in the country to keep urban centres clean. However, almost all municipal authorities deposit solid waste at a dumpyard within or outside the city haphazardly. Experts believe that India is following a flawed system of waste disposal and management.

Solid-Waste Management: the collecting, treating and disposing of solid material that is discarding because it has served its purpose or is no longer useful. Improper disposal of municipal sol unsanitary conditions, and these conditions to pollution of create can turn the environment and to outbreaks of diseases that vector-borne diseases spread by rodents and insects. The tasks of solid-waste management present complex technical challenges. They have a wide variety of administrative, economic, social problems that must be managed and solved. The

key efficient waste management is to ensure proper segregation of waste at source and ensure that the waste goes through different streams for recycling and resource recovery. Then reduced final residue is then deposited scientifically in sanitary landfills. Sanitary landfills are the ultimate means of disposal for unutilised municipal solid waste from waste processing facilities and other types of inorganic waste that cannot be reused or recycled. Major limitation of this method is the costly transportation of MSW to far away landfill sites. In some urban centres, people working in the informal sector collect solid waste for each doorstep to get a collection fee and derive additional income from sale of recyclables. The informal recycling industry plays a major role in waste management. It also ensures that less waste reaches. There has been technological advancement for processing. Treatment and disposal of solid waste, Energy from-waste is a crucial element o SWM because it reduces the volume of waste from disposal also helps in converting the waste into renewable energy and organic manure, The biodegradable component of India's solid waste is currently estimated at a little over 50 percent. Bio-methanation is a solution for processing biodegradable waste which is also remains underexploited. It is believed that if we segregate biodegradable waste from the rest, it could reduce the challenges by half. E-waste components contain toxic materials and are non- biodegradable which present both occupational and environmental health threats including toxic smoke from recycling processes and leaching from e-waste in landfill into local water tables.

The concept of common waste treatment facility (ENVIS Newsletter, December 2010) is being widely promoted and accepted as it uses waste as a resource by either using it as a co-fuel or co-raw material in manufacturing processes. This has led to rise of Public Private Partnership (PPP) models in waste management which has open doors for doing business in waste management. Bio-medical waste (management and handling) rules, 1998 prescribe that there should be Common Biomedical Waste Treatment Facility (CBWTF) at every 150 kms in the country. CBWTFS have been set up and are functioning in cities and towns. However, establishment of functional CBWTF throughout the country must be ensured. Integrated common hazardous waste management facilities combine secured landfill facility, solidification/stabilisation and incineration to treat hazardous wastes generated by various industrial units. They contribute about 97.8 per cent of total landfill waste and 88 per cent of total incinerable hazardous waste generated in the country, as per an environment ministry report. To anyone tuned into Davos last month, Indian leaders presented an impressive picture of a country open for business. "If you want wealth with wellness, come to India", was the message. For those closer to the ground, however, the quality of life in India's towns and cities seems distinctly suspect. Here is one important aspect of this: India generates over 150,000 tonnes of municipal solid waste (MSW) per day, with Mumbai being the world's fifth most wasteful city. Yet, only 83% of waste is collected and less than 30% is treated. According to the World Bank, India's daily waste generation will reach 377,000 tonnes pue 2025. Blame urbanization industrialization, but the consequences of India's megacities producing tonnes of waste are tangible and troubling. A noteworthy first step from the Narendra Modi government was propelling sanitation to the top of the policy agenda under the flagship Swachh Bharat Abhiyan programme. The Clean India Dashboard tracks programme achievements, 24x7, Out of 82,607 wards, 51,734 now have 100% door-to-door waste collection, up from 33,278 in November 2015. Almost 88.4 megawatts (MW) of energy is generated from waste to energy (WTE) projects. The unique economic and social development trajectories of individual countries mandate different approaches waste management. This was considered relatively easier than public campaigns to "Reduce and Recycle". The combined efforts of CPCB (Central Pollution Control Board) and NGT (National Green Tribunal) have resulted in the

emergence of several legislatures which can effectively control the waste issues in India. A bird's eye view on India's history can tell that the nation has gained a strong hold on several fronts in the last 5 years, especially in curbing E-waste and plastics. Since the National Environment Policy Act of 1986, India has marked several milestones including the first comprehensive solid waste management rules of 2000 and revised solid waste management rules of 2016. The new rules have extended the producers' responsibility and promoted WTE (Waste-To-Energy) plants. The report titled 'What a Waste 2.0' by the World Bank explored a trajectory where waste generation will overtake population growth by 2050, but also sheds light on the ways economies are tackling the issue. The noteworthy mentions in the report highlight efforts of waste collection by partnering with informal sector in Pune and sustainable source separation of waste in Panaji. These examples exemplify the seriousness of the government regarding the issue and also accounts for the increase in public awareness. Central, State, and Local bodies are collectively trying to enforce a strict ban on non-recyclable multi-layer plastics packaging. Urban Local Bodies (ULBS) and Municipalities are also putting efforts to ensure segregation of waste sources and resource recovery. In fact, the emergence of private players in the waste management sector also symbolizes the dawn of a new era, where the informal sector will effectively turn mainstream and re-organize to create efficient and safe waste management system. From the utilitarian perspective, the inclusion of informal sector workers will not just give them a better life but will also serve as the most effective tool to mitigate the rising waste issues. Although infrastructure development and deployment of technology are going to take several more years yet the grassroots strengthening of major stakeholders including waste generator, waste collection agent and the final contractor will pave the path for a better future.

WASTE WATER MANAGEMENT

Waste water generated from university campus hostels connected through municipal sewer system. Liquid waste is managed in the campus under the supervision of Department of Biotechnology. Two wetland systems have been constructed and established at GEU dairy farms with the help of research grants received from DBT and MoEF & CC for the treatment and reuse of dairy wastewater. These projects also aim to assess reuse potential of treated water and assess the efficacy of partially treated wastewater to be used which is to be used in crop irrigation as a liquid fertilizer.

DAIRY WASTEWATER GENERATION

The dairy waste water is generated from the GEU dairy farms.

DAIRY WASTEWATER TREATMENT

VERTICAL CONSTRUCTED WETLAND SYSTEM FOR DAIRY WASTEWATER TREATMENT

INTRODUCTION

- Sub surface flow constructed wetland (SSFCW) systems consist of a basin or channel to prevent seepage and the bed contains porous media and suitable depth.
- SSFCW systems can either be based on horizontal flow (effluent moves parallel to the surface) or Vertical flow (effluent moves vertically downwards, through the planted layers).
- Treatment in these systems occurs through combined action of various physical (sedimentation, filtration), chemical (sorption, photo oxidation and volatilization) and biological (microbial activities, plant interaction and uptake) phenomena. These processes constitute the basis on which natural wetlands also remove pollutants from wastewater.

QUESTIONS ADDRESSED

- Assessment of the removal of major pollutants (nitrogen, phosphorous, organic matter) from dairy wastewater by using Vertical sub-surface flow constructed wetland (VSSF CW).
- Examine the effect of various design parameters of the CW system (recirculation rate, surface vegetation, dosing rate and filter materials).
- Assessment of the effect of seasonal variations, if any, in the treatment efficiency of Vertical flow constructed wetland system.

System Design Parameters

S. No.	Parameters	Description
1.	Design of system	Vertical (2.5 m) + Vertical (1.5 m)
2.	Hydraulic Retention Time (HRT)	24 hrs
3.	Dosing pattern	Intermittent
4.	Operation Cost (electricity)	Rs 100-200/month
5.	Depth of beds	70 cm
6.	Dosing Volume	220 litres/system/day
7.	Wastewater type	Dairy wastewater
8.	Filter materials	Sand and gravels (10 and 20 mm)
9.	Surface vegetation	Arundo donax (Giant Reed)

10.	Dosing rate	20 g BOD m^{-2}
11.	Area of each system	4 m^{-2} (2.5 m+ 1.5 m)
12.	Cost of Construction	Rs. 25,000- 30,000/system of size 4 m^{-2}

RESULTS:

All the CW systems showed good removal efficiency during the study period. There was significant decrease in the average concentration of the pollutants such as BOD, COD, NH_4-N, TN, TP and TSS. Further decrease in the concentration was recorded after recirculation of the treated effluents. The removal rates after recirculation was recorded: COD (74-97%), BOD (81-96%), TP (69-97%), TN (42-80%), NH_4-N (79-85%) and TSS (77-98%). Highest removal of TSS, TO, BOD and COD was achieved in sand filters with 75% recirculation arrangement. However, maximum removal of TN and NH_4-N was recorded in 20 mm gravel filters with 75% recirculation rate. Vertical sub-surface beds of all CW units resulted into good nitrification (2.9 to 15.0 mg/L) of wastewater and increase in DO levels (2.3-7.6 mg/L) in waste water during treatment period.

Dairy Waste Treatment Plant for treatment of Liquid Dairy Waste

DAIRY WASTEWATER CHARACTERISTICS

S. No.	Parameters	Influent Conc. (mg/L)	Effluent conc. (mg/L)	Percentage Change
1.	DO	1.4	7.2	330% increase
2.	TDS	734.0	309.0	56% decrease
3.	NO_3-N	6.50	14.85	197% increase
4.	COD	387.0	25.0	93% decrease

Sample of Dairy wastewater were collected and analysis was done for various parameters.

CONCLUSION

- All the CW units resulted in a decrease in total N, total P, TSS and BOD load from wastewater.
- 20 mm sized gravel filled CW units showed maximum removal of TN (50-65%) and NH_4-N from dairy wastewater.
- Sand filled CW units were found to be most effective in achieving maximum removal of BOD (>90%) and total P (>90%) from dairy wastewater.
- Recirculation 75% treated water into influent tank resulted in highest removal of pollution in CW units.
- The treated effluent can be further used in agriculture, irrigation and for cattle washing.

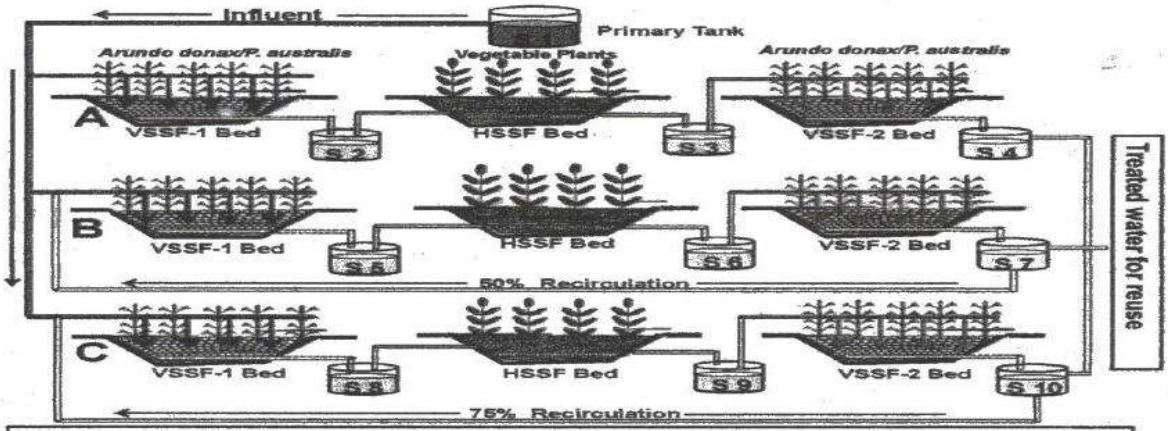


Fig. 1 Schematic layout of Hybrid subsurface flow Constructed Wetland

Parameter	Unit	Average concentration & (Purification Rate %)			
		Influent	CW A (out)	CW B (out)	CW C (out)
pH		7.5	8.0	8.1	8.0
EC	µS/cm	135.1	72.9	70.7	64.1
ORP	mV	-41.9	-73.3	-73.9	-69.0
Dissolved O_2	mg L^{-1}	3.4	7.0	7.2	7.2
Temp.	Deg. C	22.8	22.2	22.2	22.3
BOD_3	mg L^{-1}	285.6	14(95%)	13(95%)	12(96%)
COD	mg L^{-1}	567.5	43(92%)	28(95%)	44(92%)
Total N	mg L^{-1}	42.5	11(74%)	10(76%)	9.0(79%)
NH_4-N	mg L^{-1}	9.3	4.0(60%)	0.7(92%)	0.5(94%)
NO_3-N	mg L^{-1}	30.3	5.5(82%)	5.2(83%)	6.5(79%)
NO_2-N	mg L^{-1}	0.6	0.2	0.3	0.4
Total P	mg L^{-1}	30.3	5.9(81%)	6.2(80%)	6.8(77%)
TDS	mg L^{-1}	122.9	87(29%)	82(33%)	75(39%)
TSS	mg L^{-1}	321.2	30(91%)	30(91%)	30(91%)

Fig. 2 Concentration of influent and effluent and purification rates of pollutants during treatment by hybrid CW

RAINWATER HARVESTING

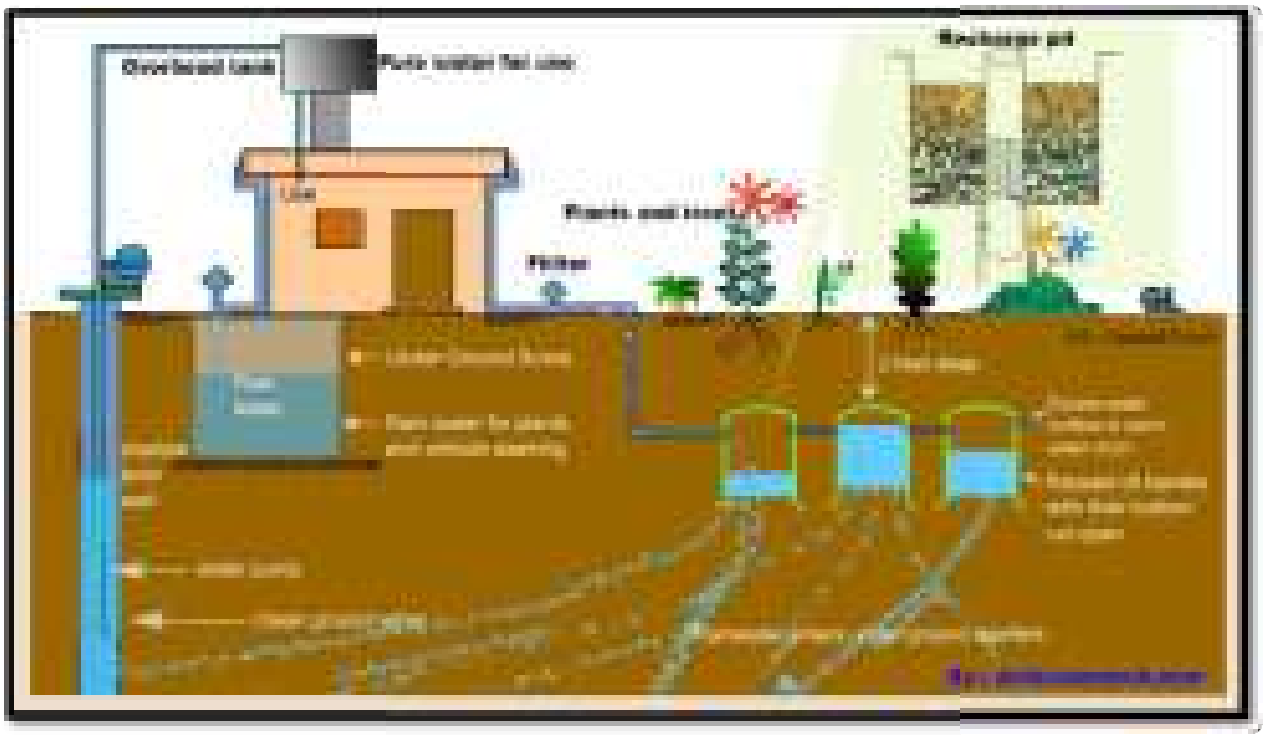
INTRODUCTION

Rainwater harvesting has been used throughout history as a water conservation measure, particularly in regions where other water resources are scare or difficult to access. In recent years, researchers and policy makers have shown renewed interest in water use strategies due to rising water demand, increased interest in conservation (both water and energy), and an increased regulatory emphasis on reducing storm water runoff volumes and associated pollutant loads. In the last decade, as interest in the practice has grown, numerous state, municipal, and regional agencies have adopted or amended codes and guidelines to encourage responsible and effective rainwater harvesting practices. In addition, researchers from universities and non-government organizations, as well as industry consultants, have published papers and articles addressing a broad range of topics related to the installation, maintenance, costs, and performance of harvest and use systems.

RAIN WATER HARVESTING

We entirely depend upon rivers, lakes and ground water. However rain is the ultimate source that feeds all these sources. Rain water harvesting means to make optimum use of rain water at the place where it falls (conserve it) and not allowing it to drain away causing floods elsewhere.

The rain water harvesting may be defined as the technique of collection and storage of rain water at surface or in subsurface aquifer before it is lost as surface run off. The augmented resources can be harvested whenever needed.



ADVANTAGES OF RAIN WATER HARVESTING

- Promotes adequacy of underground water
- Mitigates the effect of drought
- Reduces soil erosion as surface run-off is reduced
- Decreases load on storm water disposal system
- Reduces flood hazards
- Improves ground water quality/decreases salinity (by dilution)
- Prevents ingress of sea water in subsurface aquifers in coastal areas
- Improves ground water table, thus saving energy (to lift water)
- The cost of recharging subsurface aquifer is lower than surface reservoirs
- The subsurface aquifer also serves as storage and distribution system
- No land is wasted for storage purpose and no population displacement is involved
- Storing water underground is environment friendly

RAIN WATER HARVESTING PLAN

The university has already implemented the rain water harvesting system at CS/IT block and Petroleum Engineering block in the form of water collection and recharging of ground water through wells.

In addition to that, a Gabion Weir (Check Dam) has also been constructed across the drain passing through the campus. Due to this, the water during rainy season gets stored in the upstream of the weir and seeps through the bed causing thereby ground water recharge. This has augmented the water table in and around the campus. Moreover, the department of Civil Engineering has submitted a detailed plan of Rain Water Harvesting for GEU as Artificial Recharge of Groundwater salient features of which are as under:

- Construction of recharge pits
- Construction of recharge storage tanks
- Construction of gabion Weirs
- Construction of filtration chambers and sedimentation chambers.

D. LANDSCAPE ENVIRONMENT

Landscape" is a concept which includes the physical environment and people's perception and appreciation of that environment. It is not restricted to the purely visual, but may comprise and encompass the ways in which individuals and communities perceive the natural and physical resources, as through traditions, lore, and legends that express the significant and memorable elements of a landscape. The "sense of a broad expanse is common to the term "landscape". Landscape means the natural and physical attributes of land together with air and water which change over time and which is made known by people 's evolving perceptions and associations. Three broad categories of landscape attributes: Biophysical elements, patterns and processes; Sensory or perceptual qualities (such as the view of a scenic landscape or the distinctive smell and sound of the coast): and Associative meanings and values include spiritual, cultural or social associations. We may never fully understand how prehistoric people perceived their surroundings, but such knowledge is not entirely out of our reach. The main difficulty that scholars encounter stems from the division between environment and landscape. Meier argues

that environment-focussed studies are concerned with the world in relation to which humans are external observers, while landscape-orientated approaches place people at their centre. Despite the widespread use of the word landscape, most studies actually focus on the environment because they concentrate on quantifying its different aspects.

Landscape is not a single resource such as soils or vegetation. It is an integrative concept which: applied to a group of resources within a spatial area and which incorporates the human value associated with them. The extent of the spatial area may be detained by biophysical and/or perceptual/associative characteristics, but often relates to catchments' or location areas/units that share particular landscape attributes. Combining both their physical origins and the cultural overlay of human presence, often created over millennia, landscapes reflect a living synthesis of people and place that is vital to local and national identity. While assessing the landscape environment of Graphic era (Deemed to be University) it is clearly seen that it is a combination of culture heritage and scientific understanding. . The beautification and green cover of the all the campuses are found good but require maintenance and time to time up gradation. Due to major plantation in last 3-4 years, the taxonomical labelling is recommended in all the campuses of Graphic Era majorly for the exotic plants which are native of this region. Also there is an inventory is recommended to be developed to have the data for overall biodiversity of flora and fauna. For any kind of sustainable development, a landscape management plan is majorly required which should be implemented in the campus. While celebrating major environmental days by eco club and other departments it is very essential that with a landscape plan all the plantation could be done for better and sustainable outlook. Graphic Era Deemed to be University covered more than 30 % area for Plantation.

GREENING THE CAMPUS

	Is there a garden in your institute? If yes, mention size.	**Yes**	
	Do students spend time in the garden?	2-4 Hours during winters	
	Total number of Plants in Campus	Plant type	Approx. number
		Trees	2500
		Ornamental	5000
	Name of plants in your campus. (Trees, vegetables, herbs, etc.)	Mango, Litchi, Rudraksh, Chir, Sal, Bel, Lemon, Guava, Neem, Jamun, Sagon, Amla, Sadabahar, Peepal,	
	Is the university campus have any Horticulture Department	Yes	
	Number of Staff working in Horticulture Department	18	
	Number of Tree Plantation Drives organized by University per annum. (If Any)	02	

E. Transportation

Environment Link: The relationships between transport and the environment are multidimensional. Some aspects are unknown, and some new findings may lead to changes in environmental policies. Historically, transportation was associated with very few negative environmental impacts because of the modes used and the low mobility levels. A transport sector contributes a major share to environmental pollution (around 70%). A among these pollutants CO is the major pollutant coming from the transport sector, contributing 90% of total emission. Hydrocarbons are next to CO.

Graphic Era Deemed to be University is very serious about transportation and provides busses for students and less use of personnel vehicles. No permissions for student or faculties for use of vehicles inside the campus. Details of vehicles are mentioned below.

	Window Floor ratio of the Rooms	**Very Good**				
	What is the ownership of the vehicles used by your University? (Please Tick ☐ only one)		Operator-owned vehicles			
			School-owned vehicles			
		☐	A combination of campus-owned and operator-owned vehicles			
	Provide details of school-owned motorized Vehicles ?	Buses	Cars	Vans	Other	Total
	No. of vehicles	56	40	5	Nil	101
	Specify the type of fuel used by your school's vehicles:	Buses	Cars	Vans	Other	
	Diesel	Diesel, 46 no.	Diesel (20)	Diesel (5)	Nil	
	Petrol	Nil	Petrol (20)	Nil	Nil	
	CNG	Nil	Nil	Nil	Nil	
	LPG	Nil	Nil	Nil	Nil	
	Electric	nil	2	Nil	nil	
	Air Quality Monitoring Program (If Any)	Yes, Monitoring is being done by approved				

		Laboratory
	Students suffer from respiratory ailments? (If Any)	No
	Details of Genset	Yes, 4 Numbers of Kirlosker Silent DG Set The capacities of DG's are 125 KVA

F.NOISE MANAGEMENT

Noise control or **noise mitigation** is a set of strategies to reduce noise pollution or to reduce the impact of that noise, whether outdoors or indoors. The area of noise mitigation can be control of transportation noise, construction noise, occupational noise etc. The goal of noise management is to maintain low noise exposures, such that human health and well-being are protected.

AMBIENT NOISE MONITORING

The ambient noise monitoring was done near the basketball ground. Instrument used for monitoring was sound level meter. Sampling and analysis protocol were as per CPCB Guideline & **IS 9876-1981.**

AMBIENT NOISE MONITORING

S. No.	Parameters	Results	Units	Requirements (as per CPCB Guidelines) Limits in dB (A) Leq.
1.	EQUVALENT NOISE LEVEL (6.00 AM to 10.00 PM) (Day Time)	47.2	dB	50

DG NOISE MONITORING

The DG Noise monitoring was done near DG area with the help of Sound Level Meter near DG area.

Details of DG Set

DG set capacity: **1 DG set of 320 KVA**

TYPE OF FUEL USED : **Diesel**

NOISE LEVEL (D.G Room): Canopy open- 95.1 dB (A)

: Canopy Closed- 67.2 dB (A)

DG SET NOISE MONITORING

The noise level of DG set was found to be under the limits, as per the CPCB guidelines/IS: 9876-1981.

S. No.	Parameters	Protocol	Canopy Open Results dB (A)	Canopy Closed Results dB (A)	Insertion Loss
1.	L_{Max}	CPCB Guideline/IS:9876 - 1981	102.0	74.1	--
2.	L_{Min}	CPCB Guideline/IS:9876 - 1981	96.5	62.8	
3.	Leq	CPCB Guideline/IS:9876 - 1981	95.1	67.2	27.9
4.	CPCB limit in dB(A)	75.0			25.0 Minimum.

G. LUX ILLUMINATION MONITORING

Illuminance is a measure of how much luminous flux is spread over a given area. It can also be as a measure of the total "amount" of visible light present, and the illuminance as a measure of the intensity of illumination on a surface.

Good lighting plays an important role in safeguarding health at work by enabling employees to perform their work comfortably and efficiently. In simple terms, a lighting assessment is a careful examination of the lighting condition in the work environment.

Lux monitoring was done at Environment Science Laboratory with the help of Lux Meter.

LUX (ILLUMINATION) MONITORING

S. No.	Parameters	Observed Value	Std. Limits (Lux)		Protocol Used
			Minimum	Recommended	
1.	Light Level (Lux)	524	500	1000	IS:3646,(Part-1)2013

The Light Level (Lux) was found within the recommended limits.

ENVIRONMENTAL AWARENESS ACTIVITIES

World Environmental Day

RECOMMENDATIONS

- Environmental Monitoring i.e. (Ambient Air Quality monitoring, Stack Monitoring of DG sets, Water and wastewater monitoring need to be conducted by NABL Accredited Laboratory approved laboratory with frequency of six month.
- Sewage Treatment Plant (STP) should be installed for sewage treatment.
- Water Meter should be installed at institute for monitoring of water consumption per capita.
- Increase in Environmental promotional activities for spreading awareness at campus.
- Environment/Green committee formation for regulating eco-friendly initiatives at campus premises and periphery.
- Review periodically the list of trees planted in the garden, allot numbers to the trees and keep records. Assign scientific names to the trees.
- Ensure that an audit is conducted annually and action is taken on the basis of audit report, recommendation and findings.

CONCLUSIONS

Considering the fact that the Graphic Era Deemed to be University is predominantly Environment Department, there is significant environmental research both by faculty and students. The environmental awareness initiatives are substantial. The installation of solar panels, Dairy Waste Treatment System and Vermiculture are noteworthy. Besides, environmental awareness programmes initiated by the administration show the campus is going green. Few recommendations are added to curb the menace of waste management using eco-friendly and scientific techniques. This may lead to the prosperous future in context of Green Campus & thus sustainable environment and community development.

As part of green audit of campus, we carried out the environmental monitoring of campus including Ambient Air Monitoring, Work Zone Air Monitoring, Noise Monitoring, Drinking Water Testing, Illumination and Ventilation of the class room. It was observed that Illumination and Ventilation is adequate considering natural light all parameters of monitoring comes under the standards limits.

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- The Water [Prevention & Control Of Pollution] Cess Act-1977 (Amended 2003) and Rules- 1978
- The Air [Prevention & Control Of Pollution] Act – 1981 (Amended 1987) The Air (Prevention & Control of Pollution) Rules – 1982
- The Gas Cylinders Rules – 2016 (Replaces the Gas Cylinder Rules – 1981
- E-waste management rules 2016
- Electrical Act 2003 (Amended 2001) / Rules 1956 (Amended 2006)
- The Hazardous Waste (Management and Handling and Trans-boundary Movement) Rules, 2008 (Amended 2016)
- The Noise Pollution Regulation & Control rules, 2000 (Amended 2010)
- The Batteries (Management and Handling) rules, 2001 (Amended 2010)
- Relevant Indian Standard Code practices

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