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"Green Audit and Eco Safety" Environmental Parameters: An Overview

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Abstract: ***The quality of environment of a site, greatly affects those that are intimately associated with it. The parameters used to determine any site in terms of how eco friendliness is, depending on the pattern of energy use, greenhouse gases, water usage, wastewater, Emissions, waste management, aspects pollution prevention/hazardous and active hazardous substances, contaminated land/soil and groundwater, land use patterns and amount of biodiversity. In the recent years it is mandatory for the industries and private organizations to use the Green Audit system to find out their suitability of a site or to advise what is to be done in making a site suitable for use. Our College campus is located little bit away from the urban area, however in the very near future it will be in the heart of the city and activities on our campus affect the surrounding localities. So, we undertook the survey of the campus of our college on some of the parameters, like solid waste management, soil quality, water quality, air quality and noise quality on the site using standard procedures. We also calculated the green ratio of our campus and the results are presented in the paper.***

Keywords: Eco safety, Green audit, Environmental Management System, Wastewater Pollution

1. Introduction

Green audit undertakes the studies in areas of environmental issues related to public health, pollution, energy efficiency and social and policy research in relevant areas. It aims at monitoring the performance of different industries and organizations whose activities have potential to put the ecosafety and health of Citizens at risk. It also aims to provide information to all the stakeholders. Through green audit or environmental audit, the conditions of a site are evaluated to see if they are suitable for use or what is to be done in order to make it suitable. The parameters such as human activities, waste management, noise, soil, air and water pollution risks of the site are tested and corrective measures to be implemented are suggested. Establishment of green cover through tree plantation and use of nonconventional energy resources are included in the survey of a site for determining its environmental safety.

Ours is an Educational Organization where our activities as well as the air, soil, water and noise level qualities, waste management, green coverage and energy consumption of our campus are going to affect not only our staff and students but also the people living close to our premises. The National Assessment and Accreditation Council (NAAC) take a serious note of these aspects while grading the educational institutes.

We are going to face the peer team visit of NAAC for the third cycle accreditation of our institute and as a part of the preparation for the same, we decided to check the quality of our campus in terms of soil, water, outdoor air, noise levels, green cover and energy consumption. After due consideration to the results obtained of this testing, we have formulated a strategic plan to make our campus Eco friendly and safe. In this paper, we present our findings for the site survey towards green audit.

2. Material and Methods

2.1 Air Sample Testing

An air quality of our College campus is tested with the kind assistance of Joint Director of Pollution Control Board, Chikodi, using an instrument APM 460 NL of Environtech based on technology from NEERI, Nagpur, India. SPM, PM and gaseous pollutants are detected and measured for air monitoring by exhaust testing method. SO2 is measured by improved West and Geake method. NO2 is measured by modified Jacob & Hochheiser method. SPM is measured by gravimetric technique. The results are compared with the prescribed maximum permissible level for each air pollutant for specific areas by Central Pollution Control Board (CPCB), Delhi.

2.2 Water Sample Testing

With the help of Government Public Health Laboratory and our Chemistry lab experts, the bore-well water and drinking water samples are periodically analyzed for the detection of possible hazardous chemical and microbial contents. Chemical analysis results were interpreted on the basis of BIS specifications. For detecting the presence of water contaminating bacteria standard MPN technique was used.

2.3 Soil Sample Testing

About 150 soil samples from Herbal garden area and internal roadside area were analyzed for their physico-chemical properties. With the help of Volumetric analysis, Flame photometry and fractional distillation methods, parameters like salinity, alkalinity, nitrogen, potassium and phosphorous contents were measured. pH values were determined by using buffer deviation curve method by using normal ph meter in our laboratory

2.4 Noise Quality Testing

Since our institution is located in the heart of the city and is very close to newly developing residential area called Buddha Nagar the activities related to educational institute might be causing disturbance to the residents living nearby. To observe the noise levels for their pollution potential, we tested the noise levels at 3 different times of the day at 3 different locations using dB meter.

3. Results and Discussion

The results for air sample testing **(Table 1)** revealed that annual average values of SO2 and NO2 are under permissible limits but that of PM and SPM in ambient air in Basavaprabhu Kore College surroundings is high. This can be attributed to the urbanization, vehicular movement, the background and roadside dust, biomass or solid waste burning on open land in our area. These factors have contributed to the higher values of RSPM and SPM. One more important reason is the number of students and staff members using petrol driven vehicles has remarkably increased since last few years as compared to the times when staff and students used to reach the premises either walking or at the most by bicycles. **(Table 2)**.

That air pollution is a risk factor for many of health conditions including respiratory infections heart disease, stroke and lung cancer is a fact supported by WHO estimates released at Geneva on 25th March 2014 (7 million premature deaths annually linked to air pollution). The health effects caused by air pollution may include difficulty in breathing, wheezing, coughing, asthma and respiratory and cardiac conditions. Individual reactions to air pollutants depend on the type of pollutant a person is exposed to, the degree of exposure, and the individual's health status and genetics. Air pollution has also been correlated with impaired lung function and total respiratory failure. The most common sources of air pollution include particulates, ozone, nitrogen dioxide, and sulfur dioxide. **Table 3** and **Table 4** show the results of water sample analysis. We have well on the campus that takes care of the everyday need of maintenance of green coverage of our institute. For drinking purpose, we use water supplied by Municipal Corporation. This tap water is double filtered and provided to staff and students. However, ours is a drought prone arid region with uncertain and scanty rainfall. Since the well has adequate water to meet with the drinking water demands too in the event of drought, we decided to check the water quality of tap water as well as well water on our campus. The physico-chemical analysis indicates that the values for pH, turbidity, alkalinity, hardness, TDS, iron content, nitrites and fluorides are well within the permissible limits. Water quality is greatly affected by direct or indirect discharge of wastes into or near the water body leading to water pollution. The bacteriological analysis of the both water samples however is a matter of worry. The presence of Coliforms and thermo tolerant Coliform bacteria indicate that it is clearly unsuitable for drinking. Groundwater pollution is the first and foremost effect by which the residing people are shown to have been affected severely. Drinking water ideally should not have any Coliforms and thermo tolerant Coliforms /100 ml. The reason for high number of bacterial counts might be due to inadequate maintenance of water reservoirs. **(16)** Even though, the presence of Coliform bacteria is not a threat in itself, it is an indicator of the presence of other potentially harmful bacteria. **Table 5** shows the results of soil sample analysis of our campus. Though the soils nutritionally are not very satisfactory, they are not likely to pose any threat to the persons on the campus since there is no chance of entry of the undesirable chemicals or pathogens. As far as the garden soil sample is concerned, quality needs to be improved for better growth of the tree plants and ornamentals **(Table 6)**.The noise level analysis on and near the campus reveals **(Table 7)** that no values are crossing the permissible limit. Our Institute is located in the heart of the city and is surrounded on two sides by the residential areas and on the other side there is Belagavi-Bijapur road having very heavy traffic throughout the day. If the values obtained for noise levels by us are compared with those standard permissible values prescribed by Environmental protection Law (2002 amendment), they do not cross the limits for residential zone as well as the silent zone of educational Institute. According to WHO estimates road traffic is one of the major sources of noise pollution. Health effects of noise include anxiety and stress reaction and in extreme cases fright **(Table 8)**. The physiological manifestations are headaches, irritability and nervousness, feelings of fatigue and decrease in work efficiency **(15)**. The increased noise levels due to the activity of staff and students like increased use of motor vehicles pose health threat to the people of residential area around the institute.

Table 1: Air sample analysis for (2013-14)

S/N	**Month**	**SO2**	**NO2**	**RSPM**	**SPM**
1	December	49.42	15.52	95.06	205.52
2	January	50.52	19.05	100	221.82
3	February	47.34	16.91	112.01	388
4	March	43.86	14.15	113.62	390.84
5	April	37.12	10.9	111.68	295
6	May	42.43	10.99	80.77	300.28
7	June	38.88	11.25	77.66	220.50
8	July	38.17	10.28	59.99	210.98
9	August	38.26	11	68.62	262.26
10	September	38.55	11.12	73.74	198.20
11	October	44.24	14.92	88.64	215.27
12	November	39.83	11.35	98.66	292.15
	Annual average	**42.385**	**13.12**	**90. 045**	**266.735**

Note: (Values in µg/m3)

Table 2: National Ambient Air Quality Standards (CPCB)

Pollutant	Average/day	Concentration in µg/m3		
		Industrial	Residential/ Other areas	Sensitive
SPM	24 hrs	500	200	100
	Annual average	360	140	70
RSPM	24 hrs	150	100	75
	Annual average	120	60	50
SO2	24 hrs	120	80	30
	Annual average	80	60	15
NOx	24 hrs	120	80	30
	Annual average	80	60	15

Table 3: Physico-Chemical Analysis

S/N	Test parameter	Sample A	Sample B	BIS specification 10500:2012 normal values	
		Bore well	Tap water	Desirable limits	Permissible limits
1	Physical appearance	Clear	Clear	-----	-----
2	Odor	Odorless	Odorless	Agreeable	Agreeable
3	Turbidity (as N.T.U.)	0.50%	0.98%	1	5
4	pH value	7.48	7.61	6.5-8.5	No relaxation
5	Chlorides (as Cl)	121	125	250	1000
6	Nitrates (as NO2)	53.07	53.42	45	No relaxation
7	Total hardness(as CaCO2)	352	392	200	600
8	Alkalinity (asCaCO2)	208	212	200	600
9	Total dissolved solids	644	670	500	2000
10	Iron (as Fe	0.03	0.03	) 0.03	No relaxation
11	Fluorides (as F)	0.57	1	1	1.5
12	Other tests (if any)	-----	-----	-----	-----

Table 4: Bacteriological analysis of water samples

Sl. No.	Sample description	Results MPN of bacteria/100ml of Sample			Remarks
		Coliforms	Thermo tolerant Coliforms	*E. coli*	
1	Sample A - Bore well	More than 16	9	-----	Unsuitable for drinking
2	Sample B- Tap water	More than 16	3	-----	Unsuitable for drinking

Table 5: Soil sample analysis: Sample-1 (Road side)

Sl. No.	*Property*	*Observation*	*Explanation*
1	pH	8.11	Medium alkaline
2	Salinity	0.48	Normal
3	Organic carbon (%)	0.408	Low
4	Available Nitrogen (Kg/ha)	112.9	Very low
5	Available Phosphorus (Kg/ha)	10.575	Very low
6	Available Potassium (Kg/ha) e	544.32	Adequate

Table 6: Soil sample analysis: Sample-2 (Garden soil)

S/N	*Property*	*Observation*	*Explanation*
1	1 pH	8	Medium alkaline
2	Salinity	0.37	Normal
3	Organic carbon (%)	0.268	Low
4	Available nitrogen (Kg/ha)	80.72	Very low
5	Available phosphorus (Kg/ha)	8.672	Low

Table 7: Noise Level Analysis

	Time					
	10.00am		**12.00pm**		**3.30pm**	
Place	Min.(dB)	Max.(dB)	Min.(dB)	Max.(dB)	Min.(dB)	Max.(dB)
Main gate	40.1	52.2	55.6	63.7	53.5	65.8
Play ground	40.9	47.3	45.6	66.4	71.5	80.2
School ground	55.4	66.6	54.4	64.3	73.2	83.7

Table 8: Ambient Noise Standards

S/N	*Category of area/zone*	*Limits in dB*	
		Day time	*Night time*
1	Industrial area	75	70
2	Commercial area	65	55
3	Residential area	55	45
4	Silence zone	50	40

(Source**:** Environment Protection Act, 2002 amendment)

Looking at the results obtained, need of raising awareness about environmental issues is acutely felt. While reviewing the literature on environmental auditing in educational institutes, a case study provided us with a very important point of view regarding curriculum based action plan (**3**). It surveyed school children and teachers through questionnaire and concluded that environmental education at primary, secondary and tertiary levels has an important role to play in the development of students who are capable of understanding and who are motivated to respond to the issues which give rise to an environmental crisis. In another case study conducted at Mangalore University, a SWOT analysis of the university campus has been shown to help in developing a model for Environmental Management Systems in all the Universities through establishment of a sustainability cell (**6, 11-14**). Based on this literature study, we reviewed the status of environmental management at our B. K. College campus. **(1, 9&10)**

Ecosafety measures observed

For the improvement of the Ecosafety of our campus following things are being done.

Waste management of the campus

All the biodegradable organic waste of our campus is converted into vermicompost and it is used for manuring our green coverage. The institute has a plan of a fully functional rain water harvesting system. These steps help in achieving reuse of solid wastes and water.

Green coverage

Out of total 23.80 acres of our campus area, 80,836 Sq. Ft. area has been brought under lawn coverage. Establishment of Botanical Garden, plantation of green trees and ornamental plants to enhance the campus beauty. Every year on August 1st we celebrate Plantation day. We have 485 plants including trees out which 15 tree species are fruit yielding.

Minimizing electricity usage

Use of LED lights on the campus and solar water heaters in the hostels help us to save electricity. Other ecosafety measures observed on our campus: Observing zero fuel consumption day, Strict prohibition of the use of tobacco products on campus, maintaining no horn zone to minimize noise pollution, use of fume hoods in the chemistry laboratories to release hazardous gases safely, avoiding wastage of water by continuous repairs of water leakage and of electricity by minimizing its use and also to switch off lights and fans when leaving the rooms, being a part of an educational institute, we can play a vital role in increasing awareness regarding environmental protection, conservation and challenges among all the students .We are actively doing this by the way of running a compulsory course on Environmental studies for degree students at second semester

4. Conclusion

From the above results and discussion, we believe that following strategic plan will help to improve the present status of our campus and make it more eco friendly. For minimizing the hazardous effects of particulate and respirable suspended particulate matters from the ambient outdoor air, more area can be brought under tree plantations. Reduction in pollution level can be achieved by the development of green belt around Campus. More frequent checking of all the vehicles and emphasizing the need of maintenance of vehicles should be done. Water purification of well and tanks that store drinking water. This will ensure the safe drinking water for all members using the campus. Use of vermicomposting manure will help to improve soil quality of the garden. This is best way of recycling the solid organic waste. Solar power system on the terrace of hostels are taking care of the energy requirements of the hostels and help us save the precious national electricity resources. Awareness can be raised among the staff, students and residents of nearby locality for the minimal use of vehicle horns. Shifting location of parking for the pick-up and drop off vehicles for school children can help to bring down the noise levels. Plantation of more trees in additional available area suggested.

References

[1] Aher S. B. et al., Study on design, development and energy utilization efficiency of smoke reduced hot water store, *J. Environ. Res. Develop*., **9**(1), 94-101, **(2014).**

[2] Antony R. M. and Renuga F. B., Microbiological analysis of drinking water quality of Ananthanar channel of Kanyakumari district, Tamil Nadu, India. *Ambi-Agua, Taubaté,* **7**(2), 42-48, **(2012).**

[3] Ashish Dhamaniya, Presentation of air pollution data using GIS : A case study, *J. Environ. Res. Develop.,* **5**(2), 350-358, **(2010).**

[4] Daniel A. Valiero, Elsevier Academic Press, *Fundamentals of Air Pollution,***5th Edn**., 255, **(2014).**3 *Drinking Water Specification* **(2nd Rev)**, BIS IS 10500, **(2012).**

[5] Dwivedi P., Dwivedi H. S. and Malik B., Study of physicochemical parameters and micro flora of River Khan, Ujjain, India. *J. Environ. Res. Develop.,* **9**(2), 382-388,**(2014).**

[6] Goyal P., Mishra Dhirendra and Anikender Kumar., Emissions of criteria pollutants from vehicular traffic in Delhi, India, *J .Environ. Res. Develop*., **7**(4A), 1693-1702,**(2013).**

[7] K. Parameswari and K. Karunakaran, Ground water issues and community awareness in Perungudi Dumpsite, Chennai, India, *J. Environ. Res. Develop*.,**5** (2), 404-412, **(2010).**

[8] Li H., Chen R., Meng X., Zhao Z., CaiJ., Wang C., Yang C. and Kan H., Short term exposure to ambient air pollution and coronary heart disease mortality in 8 Chinese cities, *Int. J. Cardiol.*, **197**(1),265-270, **(2015).**

[9] Miyajan S. Juned and Desai Hemangi, Assessment of ambient air quality index of Surat city during early morning hours, *J. Environ. Res. Develop*., **8**(3), 384-394, **(2014).**

[10] Naik Anjali and Daspute Asmita *J. Environ. Res. Develop* Journal of Environmental Research And Development Vol.10 No. 01, July-September 2015

[11] Norelyza H. and Rashid M., Performance of MR-de-Duster on particulate emission control for a different area of axial entry, *J. Environ. Res. Develop.*, **7** (4), 1392-1398,**(2013).**

[12] Patel G. D., Dhaduk B. K. and Kapadiya D., Landscape gardening : A tool for environmental moderation, *J. Environ. Res. Develop*., **8**(3A), 689-695, **(2014).**

[13] Shrivastava R. K., Saxena Neeta and Gautam Geeta, Air pollution due to road transportation in India : A review on assessment and reduction strategies, *J. Environ. Res. Develop*., **8**(1), 69-77, **(2013).**

[14] Srinivas J., Lokesh Kumar P. and Purushotham A.V., Evaluation of ambient air quality index status in industrial areas of Visakha-Patnam, Andhra Pradesh, India, *J. Environ. Res. Develop*., **7**(4A), 1501-1517, **(2013).**

[15] Suresh Jain and Pallavi Pant, Environmental Management Systems for Educational Institutions: A case study of TERI University, New Delhi., *Int. J. Sustain. Hig. Educ.*,**11** (1), 236-249, **(2010).**

[16] Unnikrishnan Seema, Singh Anju, Sawant B. and Naik N., Environmental Education and practices in Schools. *J. Environ. Res. Develop*., **9**(1), 271-283, **(2014).**