

Government Lohia College, Churu

GREEN AUDITING

Introduction

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 institute which will lead for sustainable development. A clean and healthy environment aids effective learning and provides a conducive learning environment. Educational institutions now a day are becoming more sensitive to environmental factors and more concepts are being introduced to make them eco-friendly. To preserve the environment within the campus, various viewpoints are applied by the several educational institutes to solve their environmental problems such as promotion of the energy savings, recycle of waste, water harvesting etc.

Being a premier institution of higher studies, the college has initiated 'The Green Campus' programs through NSS & NCC students that actively promote the environment protection and sustainability.

Green auditing is a process whereby an organization's environmental performance is tested against its environmental policies and objectives. Green audit is defined as an official examination of the effects a college has on the environment. Green audit can be a useful tool for a college to determine how and where they are using the most energy or water or resources; the college can then consider how to implement changes and make savings. It is the systematic examination of the interactions between any operation and its surroundings. This includes all emissions to air; land and water; legal constraints; the effects on the neighbouring community; landscape and ecology; the public's perception of the institute in the local area.

It can also be used to determine the type and volume of waste, which can be used for a recycling project or to improve waste minimization plan. As a part of such practices related to meet environmental requirements, internal environmental audit (Green Audit) is conducted to evaluate the actual scenario at the campus.

Objectives of this green audit

- Verifying compliance: Verifying compliance with standards or best available techniques.
- Identifying problems: Detecting any leakage, spills or other such problems with the operations and processes.
- Formulating environmental policy: Formulating the organization's environmental policy if there is no existing policy.
- Measuring environmental impact: Measuring the environmental impact of each and every process and operation on the air, water, soil, worker health and safety and society at large

Measuring performance: Measuring the environmental performance of an organization against best practices.

- Confirming environmental management system effectiveness: Giving an indication of the effectiveness of the system and suggestions for improvement.
- Providing a database: Providing a database for corrective action and future plans.
- Developing the organization's environmental strategy: Enabling management to develop its environmental strategy for moving towards a greener corporate and performance culture.
- Communication: Communicating its environmental performance to its stakeholders through reporting will enhance the image of the company.

General steps

- data collection
- Documentation with physical evidences
- Independent periodic evaluation with regulatory requirements and appropriate standards
- Systematic and comprehensive improvement and management of existing system

Benefits of the Green Auditing

- To enable waste management through reduction of waste generation, solid- waste and water recycling
- To create plastic free campus and evolve health consciousness among the students and staff.
- Recognize the cost saving methods through waste minimizing and managing
- Empower the organizations to frame a better environmental performance
- Enhance the alertness for environmental guidelines and duties
- Impart environmental education through systematic environmental management approach and Improving environmental standards
- Financial savings through a reduction in resource use
- Development of personal and social responsibility for the College and its environment
- Enhancement of college profile
- Green auditing should become a valuable tool in the management and monitoring of environmental and sustainable development programs of the college.

The audit process:

The present audit is a Pre audit to collect the details required for external auditing.

Preaudit activities

The pre audit activities include the following:

1. The sites / area that are to be audited need to be determined and selected.

2. The auditee was informed of the date of the audit enabled them to adjust and become used to the concept.
3. The audit scope was identified. The auditee was consulted when establishing the scope.
4. The audit plan was designed in such a way that it accommodated changes based on information gathered during the audit and effective use of resources.
5. Audit team and assignment of responsibility were established.
6. The chosen working papers were collected. This facilitated the auditors 'investigations' on the sites.
7. The background information on the facility including the facility' organization, layout and processes, and the relevant regulations and standards, were collected.
8. The background information on the site's historical uses, and the location of soil and groundwater contamination were collected.
9. The pre audit questionnaire was informed to auditee.

Target areas of Green Auditing

- Auditing for Water Management
- Auditing for Waste Management
- Auditing for Green Campus Management

PROCEDURE OR METHODOLOGY FOLLOWED

In order to perform green audit, the methodology included different techniques such as physical inspection of the campus, observation and review of the documentation

Data Collection

Systematic and comprehensive data collected from all over the sites / area of the campus

Data Analysis

1. Analysis of Air Quality
2. Analysis of Water quality and usage
3. Analysis of Electricity consumption and costs
4. Analysis of Waste generation and disposal
5. Reporting on Biodiversity

All the data were Compiled and based on these, a report and recommendation was formulated.

REPORT

A. Total Campus Area & College Building Spread Area

Campus area	70333.55 m ²
Built up area	46346.55m ²
Green area	2725.62m ²

I. Analysis of Air quality

Being situated in the urban area, this college is exposed to various atmospheric pollutants from vehicles as well as by other external means. Based on our calculation, the different sources of carbon dioxide emitted to our college are:

- Vehicles
- Refrigerator
- Air conditioners
- Water coolers
- Electric generator

On the days of data collection, there were 13 cars, 34 bikes and 27 scooters in our campus, which in turn proves us that these vehicles may contribute to high carbon dioxide emission. There are 4 refrigerators, 5 air conditioners, 2 working water coolers and 2 generators in our campus. The visitors also contribute to carbon dioxide emission.

II. Analysis of Water quality and usage

Water quality analysis was conducted by standard Digital Turbidity Meter

Sample No	Location where sample collected	TDS (ppm)	Water quality
1	RO water for Teachers Staff room	187	Outstanding (Potable)
2	RO water for students	230	Outstanding (Potable)
3	Tap Water	2150	Average (Non Potable)
4	Tube-Well water	1200	Good (Non Potable)

The college campus possesses many water outlets. The audit team have counted the total number of taps, rain water harvesting plants, coolers, well, and found that in total, there are 139 taps, 5 water coolers, water storage tank worth 44,000 liters and a tube well. Water taps in laboratories – 60 Out of these, 2 taps are leaking, a cooler in the staff room is not working. The 2 leaking taps lead to water wastage.

There are 5 RO system in the college. Among these 1 is of with capacity of 500 liter/ hour water and 1 with 50 l/h. Remaining three are with capacity of 10 liter/h. All these RO system wastes huge quantity of water during filtration.

Mainly water uses in the campus are in Garden, Lab Cleaning, Drinking, Toilets, Bathroom, Hostel etc. No water treatment system in the college. Main Reasons for water wastage is leakages from taps, over uses of water and overflow of water from motors.

III. Analysis of Waste generation and disposal

Wastes cannot be avoided in any environment. Wastes can be classified as Biodegradable and Non- biodegradable wastes. Biodegradable wastes include food wastes; which can be easily decomposed by the bacteria in soil. But non-biodegradable wastes are those which cannot be

degraded by any organism and remain as such for many years. Much amount of waste is generated from the college campus.

- LIBRARY - The most generated waste is paper waste.
- STORE- Not much waste is generated. But the paper waste and plastic covers are stored in dustbin.
- OFFICE- Paper waste generated.
- GARDEN-Plastic and paper waste is comparatively less.
- HALL -The wastes are collected after each programme and are stored in dustbin.
- BATHROOM-The wastes are collected in safety tank.
- CLASSROOMS-Paper Wastes are collected in the waste basket.
- 5 LABORATORY-
 - ✓ The broken glass wastes, chemical effluents are from chemistry lab
 - ✓ Electric wires, fuse and IC chips are from physics lab
 - ✓ Dissection waste from zoology lab
 - ✓ Plant parts & stained water and broken glassware from botany lab
 - ✓ Paper waste from the geography lab
 are the main waste. The outdated or non-working instruments are disposed by auction.
- COLLEGE PREMISES-Plastic waste generated is usually less. But paper waste is generated in a larger amount.

Location	Number of waste bins
College garden	4
Ground floor-front side	4
Ground floor- back side	3
First floor- front gallery	4
First floor –side & back gallery	6

IV. Analysis of Biodiversity of the campus

Biodiversity encompasses all biological entities. To conserve biodiversity, our first need is to learn about the existing diversity of the college campus. Unless we know whom to conserve we will not be able to plan proper conservation initiatives. Also, it is important to have an understanding of the bio-diversity of an area so that the local people can be aware of the richness of bio-diversity of the place they are living in and their responsibility to maintain that richness.

The college situated in low rainfall area so the biological diversity is not so good as compared to green area zone. However, some native species of flora and fauna are existing in the campus. In college garden some ornamental plants are introduced for beautification and to enrich biodiversity.

In total, based on our data collected (through rainy & winter season), there are **89 plants** species in the college campus. In this, 10 plants species are trees, 15 are plants of average length and 45 are small plants. There are **43 plants species** in the college Botanical garden. So, 89 plants species in college contribute to the oxygen supply that we utilize and act as producer in food chain.

Regarding fauna total **66 species** reported among these 25 species of invertebrates, 8 species of reptiles, 26 species of birds, 2 species of amphibians and 5 species of mammals are reported in college campus as a part of food chain of ecosystem. (*Plant and animals species were identified with the help of a team from the Department of Botany & Zoology of this college.*)

List of plant species observed at Campus of Lohia College, Churu during different seasons of the year.

S. No.	Name of the species	Habit
1	<i>Andropogon pumilus</i> Roxb. Poaceae	Annual grass
2	<i>Aristida adscensionis</i> Linn. Poaceae	Annual grass
3	<i>Brachiaria ramosa</i> (Linn.) Stapf. Poaceae	Annual grass
4	<i>Digitaria ciliaris</i> (Retz.) Koeler. Poaceae	Annual grass
5	<i>Eragrostis ciliaris</i> (Linn.) R.Br. Poaceae	Annual grass
6	<i>Tetrapogon tenellus</i> (Roxb.) Chiov. Poaceae	Annual grass
7	<i>Tragus biflorus</i> (Roxb.) Schult. Poaceae	Annual grass
8	<i>Peristrophe bicalyculata</i> (Forsk.) Burm.f. Acanthaceae	Annual herb
9	<i>Trianthema portulacastrum</i> Linn. Aizoaceae	Annual herb
10	<i>Zaleya redimita</i> (Melville) Bhandari Aizoaceae	Annual herb
11	<i>Achyranthes aspera</i> Linn. Amaranthaceae	Annual herb
12	<i>Amaranthus blitum</i> Linn. Amaranthaceae	Annual herb
13	<i>Digeria alternifolia</i> (Linn.) Mart. Amaranthaceae	Annual herb
14	<i>Ageratum conyzoides</i> Linn. Asteraceae	Annual herb
15	<i>Pulicaria crispa</i> (Cass.) Benth. & Hook. f. Asteraceae	Annual herb
16	<i>Verbesina encelioides</i> (Cav.) Benth. Asteraceae	Annual herb
17	<i>Xanthium strumarium</i> Linn. Asteraceae	Annual herb
18	<i>Heliotropium marifolium</i> Koen. ex Retz. Boraginaceae	Annual herb
19	<i>Farsetia hamiltonii</i> Royle Brassicaceae	Annual herb
20	<i>Cleome viscosa</i> Linn. Capparaceae	Annual herb
21	<i>Chenopodium album</i> Linn. Chenopodiaceae	Annual herb
22	<i>Euphorbia granulata</i> Forsk. Euphorbiaceae	Annual herb
23	<i>E.hirta</i> Linn. Euphorbiaceae	Annual herb
24	<i>Cyamopsis tetragonoloba</i> (Linn.) Taub. Fabaceae	Annual herb
25	<i>Indigofera cordifolia</i> Heyne ex DC. Fabaceae	Annual herb
26	<i>Vigna mungo</i> Linn. Fabaceae	Annual herb
27	<i>Gisekia pharnacioides</i> Linn. Molluginaceae	Annual herb
28	<i>Mollugo cerviana</i> (Linn.) Ser. Molluginaceae	Annual herb
29	<i>M. nudicaulis</i> Lamk. Molluginaceae	Annual herb
30	<i>Pedaliium murex</i> Linn. Pedaliaceae	Annual herb
31	<i>Polygala erioptera</i> DC. Polygalaceae	Annual herb
32	<i>Anagallis arvensis</i> Linn. Primulaceae	Annual herb
33	<i>Borreria articularis</i> (Linn.f.) Willd. Rubiaceae	Annual herb
34	<i>Anticharis linearis</i> Benth. Scrophulariaceae	Annual herb
35	<i>Momordica dioica</i> Roxb. Ex Willd. Convolvulaceae	Perennial climber
36	<i>Asparagus racemosus</i> Willd. Liliaceae	Perennial climber
37	<i>Cenchrus biflorus</i> Roxb. Poaceae	Perennial grass

38	<i>C. ciliaris</i> Linn. Poaceae	Perennial grass
39	<i>C. setigerus</i> Vahl. Poaceae	Perennial grass
40	<i>Cynodon dactylon</i> (Linn.) Pers. Poaceae	Perennial grass
41	<i>Dactyloctenium aegyptium</i> (Linn.) P. Beauv. Poaceae	Perennial grass
42	<i>D. indicum</i> Boiss. Poaceae	Perennial grass
43	<i>Eleusine compressa</i> (Fork.) Aschers. Poaceae	Perennial grass
44	<i>Panicum antidotale</i> Retz. Poaceae	Perennial grass
45	<i>P. turgidum</i> Forsk. Poaceae	Perennial grass
46	<i>Erianthus munja</i> Linn. Poaceae	Perennial grass
47	<i>Dicoma tomentosa</i> Cass. Asteraceae	Perennial herb
48	<i>H. subulatum</i> Hochst. ex DC. Boraginaceae	Perennial herb
49	<i>Convolvulus microphyllus</i> Choisy.	Perennial herb
50	<i>Citrullus colocynthis</i> (Linn.) Schard. Convolvulaceae	Perennial herb
51	<i>C. lanatus</i> (Thumb.) Matsumara & Nakai Convolvulaceae	Perennial herb
52	<i>Ctenolepis cerasiformis</i> (Stocks) Naud. Convolvulaceae	Perennial herb
53	<i>Cucumis callosus</i> (Rottl.) Cogn. Convolvulaceae	Perennial herb
54	<i>Cyperus arenarius</i> Retz. Cyperaceae	Perennial herb
55	<i>C. rotundus</i> Linn. Cyperaceae	Perennial herb
56	<i>Phyllanthus amarus</i> Schum. & Thonn. Euphorbiaceae	Perennial herb
57	<i>Tephrosia purpurea</i> (Linn.) Pers. Fabaceae	Perennial herb
58	<i>Ocimum sanctum</i> Linn. Lamiaceae	Perennial herb
59	<i>Boerhavia diffusa</i> Linn. Nyctaginaceae	Perennial herb
60	<i>Argemone mexicana</i> Linn. Papaveraceae	Perennial herb
61	<i>Solanum nigrum</i> Linn. Solanaceae	Perennial herb
62	<i>Corchorus depressus</i> (Linn.) Christ. Tiliaceae	Perennial herb
63	<i>C. tridens</i> Linn. Tiliaceae	Perennial herb
64	<i>Tribulus terrestris</i> Linn. Zygophyllaceae	Perennial herb
65	<i>Aerva persica</i> (Burm. f.) Merrill Amaranthaceae	Perennial undershrub
66	<i>A. pseudotomentosa</i> Blatt. & Halb. Amaranthaceae	Perennial undershrub
67	<i>Sonchus asper</i> Fig. Asteraceae	Perennial undershrub
68	<i>Crotalaria burhia</i> Buck. Ham. Fabaceae	Perennial undershrub
69	<i>Abutilon indicum</i> (Linn.) Sweet Malvaceae	Perennial undershrub
70	<i>Withania somnifera</i> (Linn.) Dunal Solanaceae	Perennial undershrub
71	<i>Barleria cristata</i> Linn. Acanthaceae	Perennial Undershrub
72	<i>Adhatoda zeylanica</i> Medic. Acanthaceae	Perennial shrub
73	<i>Leptadenia pyrotechnica</i> (Forsk.) Decne. Asclepiadaceae	Perennial shrub
74	<i>Calligonum polygonoides</i> Linn. Polygonaceae	Perennial shrub
75	<i>Datura inoxia</i> Mill. Solanaceae	Perennial shrub
76	<i>Calotropis procera</i> (Ait.) R. Br. Asclepiadaceae	Perennial shrub /small tree
77	<i>Parkinsonia aculeata</i> Linn. Caesalpiniaceae	Small tree
78	<i>Ziziphus mauritiana</i> Lamk. Rhamnaceae	Small tree
79	<i>Z. nummularia</i> (Burm.f.) Wt. Rhamnaceae	Small tree
80	<i>Tecomella undulata</i> (Sm.) Seem. Bignoniaceae	Tree
81	<i>Azadirachta indica</i> A.Juss. Meliaceae	Tree
82	<i>Albizia lebbek</i> (Linn.) Benth. Mimosaceae	Tree

83	<i>Prosopis cineraria</i> (Linn.) Benth. & Hook.f	Mimosaceae.	Tree
84	<i>P.juliflora</i> (Swartz) DC.	Mimosaceae	Tree
85	<i>Ficus bengalensis</i> Linn.	Moraceae	Tree
86	<i>F. religiosa</i> Linn.	Moraceae	Tree
87	<i>Salvadora oleoides</i> Decne.	Salvadoraceae	Tree
88	<i>S. persica</i> Linn.	Salvadoraceae	Tree
89	<i>Tamarix aphylla</i> (Linn.) Karst.	Tamaricaceae	Tree

Total	= 89
Climbers	= 2 or 2.24%
Grasses	= 17 or 19.10%
Herbs	= 45 or 50.56%
Under shrubs	= 7 or 7.86%
Shrubs	= 5 or 5.61%
Small trees	= 3 or 3.37 %
Trees	= 10 or 11.23%

List of fauna observed at Campus of Lohia College, Churu during different seasons of the year

S N	Common name	Zoological name	Family
INVERTEBRATE			
1	Earthworm	Pheretima	
2	centipede	Scolopendra	
3	scorpion	Palamnaeus	
4	spider	Arenia	
5	wasp	Vespula	
6	cockroach	Periplaneta americana	
7	Honey bee	Apis indica	Apidae
8	Ant	Lasius	Formicidae
9	Termite		
10	Dragon fly		
11	Carpenter bees	Xylocopa	Xylocopidae
12	Butterfly	Papilio	Danidae
13	Moth		Spongidae
14	Grasshopper	Poekilocerus pictus	Acritidae
15	Locust	Locusta migratoria	Acritidae
16	Praying mantis		Mantidae
17	Dung beetal		
18	Ground beetal		
19	House fly	Musca domestica	
20	Stink bug	Halyomorpha	Pentatomidae
21	Mosquito	Anopheles	Culicidae
22	Mosquito	Aedes aegypti	Culicidae
23	Blue bottle fly	Calliphora	Calliphoridae
24	Silver fish	Lepisma	Lepismatidae
25	Teej velvet beetle	Trombidium	Trombidioidea
VERTEBRATES			
AMPHIBIANS			
26	Frog	Rana tigerina	

27	Frog	Bufo melanostictus	
REPTILES			
28	Wall lizard	Lacertid	Hemidactyllidae
29	Monitor lizard	Varanus versicolor	Varanidae
30	Maubiya		
31	Russell's viper	Viepra ruselli	
32	Rat snake		
33	Golden snake		
34	Chalemeon		
35	Uromastix		
BIRDS			
36	House sparrow	Passer domesticus	Passeridae
37	Parrot	Psittacula krameri	
38	Crow	Corvus splendens	corvidae
39	Kingfisher	Halcyon smyrensis	
40	Owl	Tyto alba	
41	Pigeon	Columba livia	
42	Kite	Milvus migrans	
43	Peacock	Pavo cristatus	
44	Koel	Eudenemys scolopacia	
45	Bee eater	Merops orientalis	
46	Sun bird	Nectariana asiatica	
47	Tree pie		
48	Green pigeon		
49	Bulbul		
50	Maina	Sturnus contra	
51	Dove	Streptopelia decaocto	
52	Drango		
53	Indian roller		
54	Wood packer		
55	Barbet	Megalaima rubricapilla	
56	Black ibis	Pseudibis papillosa	
57	Egyptian Vulture	Neophron percnopterus	
58	Baaz		
59	Brown rockchat	Circomela fusca	
60	House swift	Appus affinus	
61	Sand martin		
MAMMALS			
62	Indian flying fox(Bat)	pteropus	Pteropodidae
63	Dog	Canis	canidae
64	Cat	Felis	Felidae
65	Indian palm Squirrel	Funambulus	Sciuridae
66	Rat	Rattus rattus	Muridae

Total = 66
 Invertebrates = 25 or 37.8 %
 Vertebrates = 41 or 62.2 %

SUGGESTIONS AND RECOMMENDATIONS

- More plants need to be planted. More of shade trees to be planted inside the college campus.
- The use of plastic products should be banned in the College campus.
- Wastes should not be burned that leads to pollution. Instead they could be given to organizations which use it in other works like road construction, etc., on a monthly basis.
- Taps needed to be repaired. The water coolers which are not working need to be repaired immediately.
- Separate baskets should be there for biodegradable and non-biodegradable wastes.
- Vermicompost facility may be practiced more, for this vermicomposting plant should be actively working.
- Agencies like Nagar Parishad or individuals should be available to transport wastes from the college premises.
- The College campus is poor in biodiversity, so more plantations especially medicinal plantations are required in the campus. Plantation of fruit plants will attract more birds hence enrich the food chain of the ecosystem. In this context, there is urgent need to form a *Green Monitoring Team* which consist of members from teaching & nonteaching staffs, students and other interested people. The priority of this body is to maintain the greenery of the College campus.
- Sustainable use of resource maintained throughout the year.

CONCLUSION

We, the member of pre audit team, believe that we have successfully completed the analysis of various environmental components. We hope that the suggestions put forward by us would be considered by the college and implemented as soon as possible.

Post audit activities (to be conducted)

Post audit activities begin with the preparation of a draft report. The draft report should be reviewed by the facility personnel directly involved in the audit. The final report should be derived from it and it should then be distributed to all interested parties within the organization. It is important for college administration to follow-up the report and develop an action plan to implement those audit findings.

Acknowledgement

- We would like to sincerely thank all the departments, students, teaching and non-teaching staff of the college for their cooperation during the survey.

Date-

In charge

Green Audit Team

Biological diversity of the campus





