

Green Audit Report (2014-2019)



**Lyallpur Khalsa College
Jalandhar**

Green Audit Report

(2014-19)

Lyallpur Khalsa College, Jalandhar



Green Audit is an important feature of any organization having physical aspects. Considering the importance of environment conservation, it has become almost mandatory for organizations and institutions to conduct green audit. Keeping in line with this, Lyallpur Khalsa College has also undergone green audit. It is based on following factors:

1. Distribution of Biodiversity
2. Air quality
3. Water quality

4. Energy Consumption
5. Waste management and disposal

1. Distribution of Biodiversity: In total, there are many lawns in college campus including Boys hostel lawn, MRS block lawn, Comp. Sci. Block lawn, Science block lawn, New PG Block Lawn, Old PG Block lawn, Commerce Block lawn etc., having so many plant, flowering species, herbs and shrubs. There are two playgrounds which are fully covered with green belt. Green belt is also established outside the campus under Landscaping Project. There are Acacia, Asoka, Neem, Areca, Gulmohr, Peepal, Mango etc. in above mentioned lawns and playgrounds as well as in college Botanical Garden. There are many flowering plant varieties like Marigold, Hibiscus, Rose, Petunia, Pansy flowers, Bougainvillea etc. exist in our College campus. Above mentioned flora add to major biodiversity of Punjab.

Lyallpur Khalsa College has sprawling campus spread over area of 28 acres.

The total covered area is 31,631 sq. mtrs, including Maharaja Ranjit Singh block (6905 sq. mtrs), Administrative block (922 sq. mtrs), Computer Science and IT block (3003 sq. mtrs), Physiotherapy block (1294 sq. mtrs), Science block (4590 sq. mtrs), Commerce block (1564 sq. mtrs), Library (1654 sq. mtrs), Old PG block (762 sq. mtrs), New PG block (1676 sq. mtrs), Gurdwara Sahib (1536 sq. mtrs), Hostel mess (486 sq. mtrs), Hostel block I (1879 sq. mtrs), Hostel block II (900 sq. mtrs), Juice bar (8 sq. mtrs), Power house (51 sq. mtrs), Post office (31 sq. mtrs), Security room (16 sq. mtrs), Sports utility (1310 sq. mtrs), Canteen (704 sq. mtrs), Gym (352 sq. mtrs), New auditorium (1988 sq. mtrs.)

The total open area is 34,145 sq. mtrs, including Grounds (26,600 sq. mtrs), Road and footpath (960 sq. mtrs), Park and lawns (2175 sq. mtrs), Walking track (2250 sq. mtrs), Car/scooter parking (2160 sq. mtrs).

The total green area is 28,775 sq. mtrs, including Grounds (26,600 sq. mtrs) and Park & lawns (2175 sq. mtrs). Green cover is further enriched by extensive plantation of avenue trees along roads, walking track, playgrounds and within lawns.



Green-belt of avenue trees along pathways.



Artificial nests are installed in campus to conserve bird population.



Bottle-palms adorning the administrative block.

LYALLPUR KHALSA COLLEGE JALANDHAR



Campus map of LKC showing green area and plantation belts.

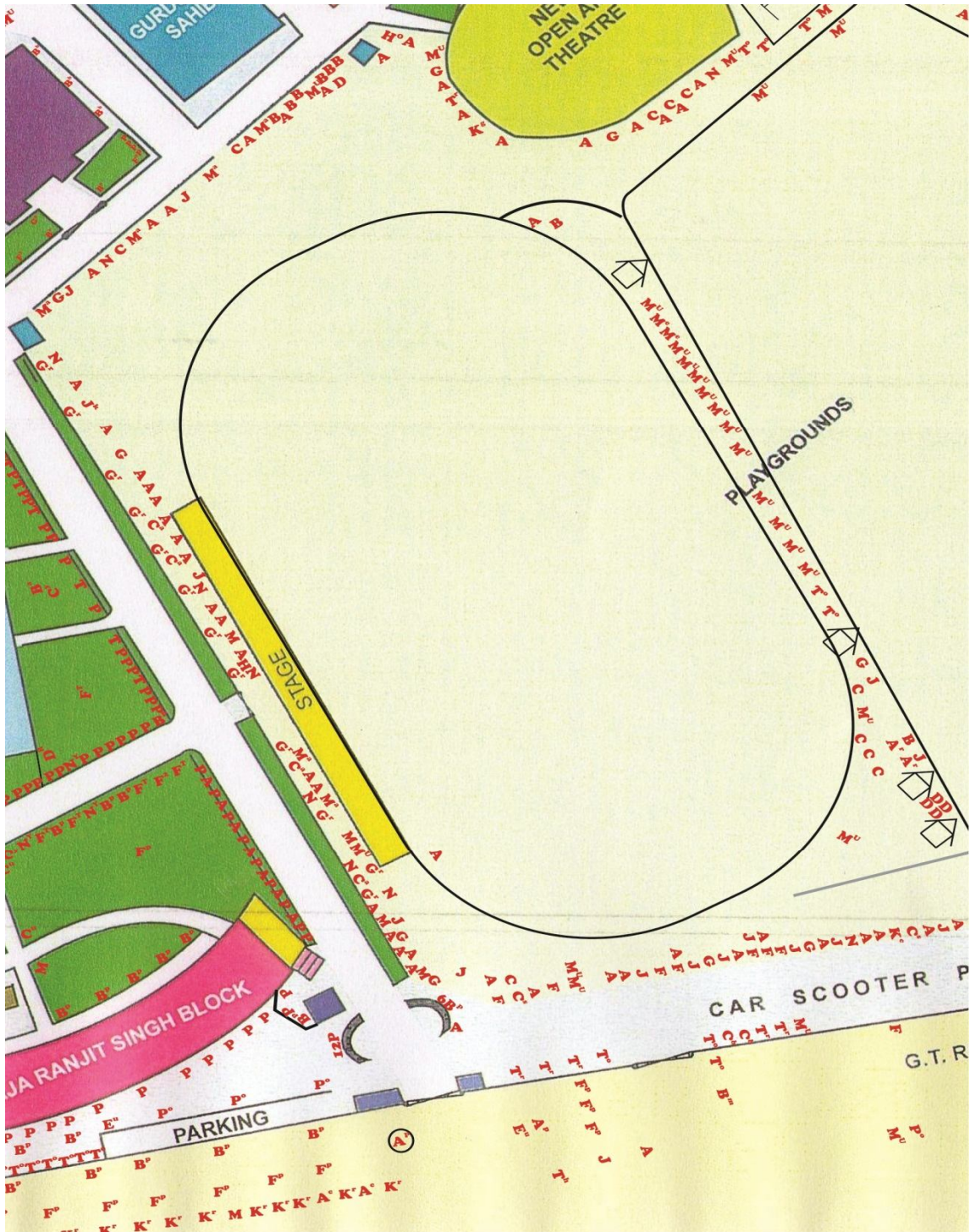
Abbreviations of the planted tree species as shown in map

A = Alstonia	G ^b = Golden bottle brush
A ^c = Acacia	G ^r = Grevillea
A ^l = Arjuna	H ^o = Holoptelea
A ^m = Amla	J = Jamun
A ^p = Areca palm	J ^k = Jackfruit
A ^r = Araucaria	K ^c = Kanak champa
B = Bauhinia	K ^g = Kigelia
B ^a = Bael	K ^r = Karaka
B ^b = Bottle brush	L = Lagerstomia
B ^m = Bombax	M = Mango
B ^p = Bottle palm	M ^a = Mahua
B ^u = Butea	M ^c = Melia
C = Cassia	M ^u = Mulberry
C ^a = Calliandra	N = Neem
C ^b = Ceiba	N ^y = Nyctanthus
C ^s = Casuarina	P = Polyalthia
C ^u = Cuppressus	P ^m = Plumeria
C ^y = Cycas	P ⁿ = Pinus
D = Dalbergia	P ^o = Pongamia
D ^r = Delonix	P ^u = Putranjiva
E = Euphorbia	T = Thuja
E ^u = Eucalyptus	T ^h = Thevetia
F = Ficus	T ^m = Tabernaemontana
F ² = Ficus virens	T ^o = Toona
F ^p = Fan palm	T ^r = Trichilia
F ^t = Fishtail palm	Z ^y = Zizyphus
G = Guava	

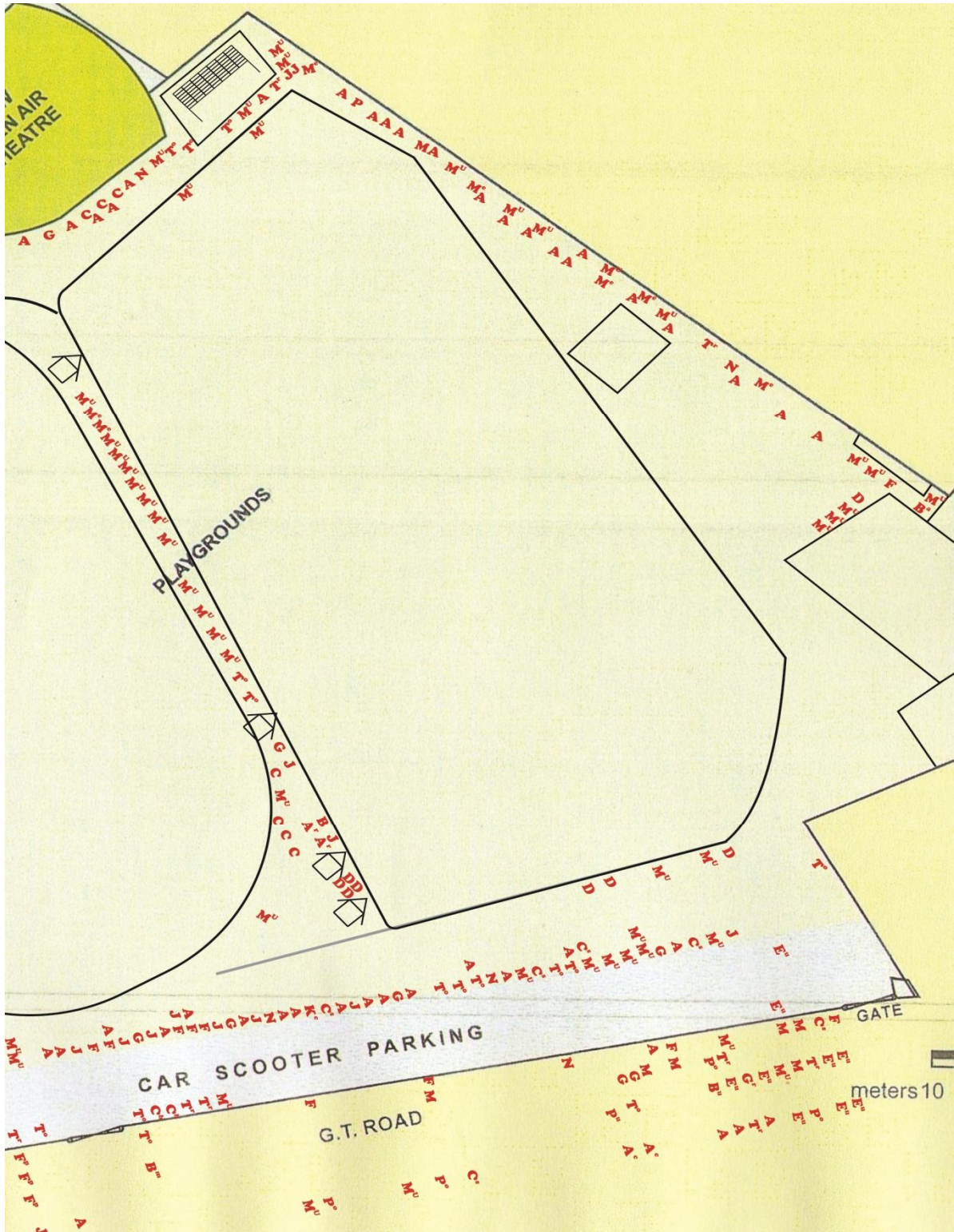
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Details of the tree species planted in college campus



Section 1: Main entrance road and Ground 1 plantation



Section 2: Ground 2 plantation



Section 3: Administrative block, Science block and MRS block plantation.



Section 4: Library, Commerce block, Old PG, New PG blocks, Gurdwara Sahib and Hostels
Plantation.

Avenue trees

S.No.	Common name	Scientific name
1.	Satpatia	<i>Alstonia scholaris</i>
2.	Bottle palm	<i>Hyophorbe lagenicaulis</i>
3.	Guava	<i>Psidium guajava</i>
4.	Amla	<i>Phyllanthus emblica</i>
5.	Mango	<i>Mangifera indica</i>
6.	Jamun	<i>Syzygium cumini</i>
7.	Neem	<i>Azadirachta indica</i>
8.	Drek	<i>Melia azederach</i>
9.	Silver oak	<i>Grevillea robusta</i>
10.	Mulberry	<i>Morus alba</i>
11.	Jackfruit	<i>Artocarpus heterophyllus</i>
12.	Amaltas	<i>Cassia fistula</i>
13.	Kachnar/ Orchid tree	<i>Bauhinia variegata</i>
14.	Tahli/ Shisham/ Indian rosewood	<i>Dalbergia sisoo</i>
15.	Forest mahogany	<i>Trichilia dregeana</i>
16.	Toon/ Indian mahogany	<i>Toona ciliata</i>
17.	Kapok/ White silk cotton	<i>Ceiba pentendra</i>
18.	Peepul	<i>Ficus religiosa</i>
19.	Banyan	<i>Ficus bengalensis</i>
20.	Silk cotton	<i>Bombax ceiba</i>
21.	Beach oak	<i>Casuarina equisetifolia</i>
22.	Peelikaner	<i>Thevetia peruviana</i>
23.	Indian beech	<i>Pongamia pinnata</i>
24.	False ashoka	<i>Polyalthia longifolia</i>
25.	Safeda/ Neelgiri	<i>Eucalyptus globulus</i>
26.	Bottle brush	<i>Callistemon citrinus</i>
27.	White cedar	<i>Thuja occidentalis</i>
28.	Cypress	<i>Cuppressus sempervirens</i>

29.	Bael	<i>Aegle marmelos</i>
30.	Red Jasmine	<i>Plumeria rubra</i>
31.	Fishtail palm	<i>Caryota urens</i>
32.	Fan palm	<i>Livistona chinensis</i>
33.	Areca palm	<i>Dypsis lutescens</i>
34.	Harshrigar	<i>Nyctanthus arbor-tristis.</i>
35.	Sago palm	<i>Cycas revoluta</i>
36.	Karaka	<i>Corynocarpus laevigatus</i>
37.	Gulmohur	<i>Delonix regia</i>
38.	Cheer	<i>Pinus roxburghii</i>
39.	Powder puff	<i>Calliandra haematocephala</i>
40.	Candelabra tree	<i>Euphorbia ingens</i>
41.	Putranjiva	<i>Putranjiva rouxburghii</i>
42.	Kanak champa	<i>Pterospermum acerifolium</i>
43.	Ber	<i>Zizyphus jujuba.</i>
44.	Christmas tree	<i>Araucaria araucana</i>
45.	Balam kheera	<i>Kigelia africana</i>
46.	Arjuna	<i>Terminalia arjuna</i>
47.	Jarul/ Crape myrtle	<i>Lagerstomia speciosa</i>
48.	Scarlet bush	<i>Hamelia patens</i>
49.	Golden bottle brush	<i>Mebaleuca citrinus</i>
50.	Mahua	<i>Maduca longifolia</i>
51.	Black wattle	<i>Acacia mearnsii</i>
52.	Palash	<i>Butea monosperma</i>

Ornamental shrubs and herbs

	Common name	Scientific name
53.	Crape jasmine	<i>Tabernaemontana divaricata</i>
54.	China rose	<i>Hibiscus rosa-sinensis</i>
55.	Marigold	<i>Tagetes erecta</i>

56.	Sweet william/ Pink	<i>Dianthus caryophyllus</i>
57.	Rose	<i>Rosa indica</i>
58.	Shatamull/ Shatawar	<i>Asparagus officinalis</i>
59.	Dahlia	<i>Dahlia pinnata</i>
60.	Kaner	<i>Nerium oleander</i>
61.	Ferns	<i>Petris vittata</i>
62.	Hedge bower	<i>Clerodendrum inerme</i>
63.	Candy-tuft	<i>Iberis amara</i>
64.	Petunia	<i>Petunia hybrida</i>
65.	Crown of thorns	<i>Euphorbia milii</i>
66.	Nasturtium	<i>Nasturtium officinale</i>
67.	Guldauji	<i>Chysanthemum indicum</i>
68.	Bangkok rose	<i>Mussaenda philippica</i>
69.	Madagascar dragon tree	<i>Dracaena marginata</i>
70.	Pansy	<i>Viola tricolor</i>
71.	Sunflower	<i>Helianthus annus</i>
72.	Zinnia	<i>Zinnia elegans</i>
73.	Dog flower	<i>Antirrhinum majus</i>
74.	Dopaharkhiri	<i>Portulaca grandiflora</i>
75.	Sadasuhagan	<i>Vinca rosea</i>
76.	Passion flower	<i>Passiflora spp.</i>
77.	Bougainvillea	<i>Boungainvillea spectabilis</i>
78.	Bush clockvine	<i>Thunbergia erecta</i>
79.	Lantana	<i>Lantana indica</i>
80.	Rat ki Rani	<i>Cestrum nocturnum</i>
81.	Spotted dumbcane	<i>Dieffenbachia maculata</i>
82.	Copper plant	<i>Acalypha wilkesiana</i>
83.	Coleus	<i>Coleus blumei</i>
84.	Phlox	<i>Phlox drummondii</i>
85.	Madhukamini	<i>Murraya paniculata</i>

86.	Duranta/ Golden dewberry	<i>Duranta repens</i>
87.	Carnation	<i>Dianthus caryophyllus</i>
88.	Crinum lily	<i>Crinum asiaticum</i>
89.	Weeping fig	<i>Ficus benjamina</i>
90.	Hollyhock	<i>Alcea rosea</i>
91.	Golden ball cactus	<i>Echinocactus grusonii</i>
92.	Blue dude	<i>Echeveria sp.</i>
93.	Zebra haworthia	<i>Haworthiopsis attenuata</i>
94.	Mother-in-law's tongue	<i>Sansevieria trifasciata</i>
95.	White thread of cascade	<i>Agave × leopoldii</i>
96.	Prickly pear	<i>Opuntia ficus-indica</i>
97.	American aloe	<i>Agave Americana var. variegata</i>
98.	Cooper's haworthia	<i>Haworthia cooperi</i>
99.	String of pearls	<i>Senecio rowleyanus</i>
100.	Broadleaf lady palm	<i>Raphis exelsa</i>
101.	Kapuka	<i>Griselinia littoralis</i>
102.	Money plant	<i>Epipremnum aureum</i>
103.	Jasmine	<i>Jasminum officinale</i>
104.	Smoketree spurge	<i>Euphorbia cotinifolia</i>
105.	Cock's comb	<i>Celosia argentea</i>
106.	Ice flower	<i>Mesembryanthemum crystallinum</i>
107.	Lackspur	<i>Delphinium spp.</i>

Medicinal herbs and shrubs

S.No.	Common name	Scientific name
108.	Kari patta	<i>Murraya koenigii</i>
109.	Chinese chaste tree	<i>Vitex nigundo</i>
110.	Vasa/ Adusa	<i>Adathoda vasica</i>
111.	Anantmool	<i>Hemidesmus indicus</i>
112.	Babchi	<i>Psoralea corylifolia</i>

113.	Gudmar	<i>Gymnema sylvestris</i>
114.	Sarpgandha	<i>Rauwolfia serpentina</i>
115.	Niazbo	<i>Ocimum basilicum</i>
116.	Akarkara	<i>Spilanthes acmella</i>
117.	Long pepper	<i>Piper longum</i>
118.	Kawar	<i>Aloe vera</i>
119.	Brahmi	<i>Centella asiatica</i>
120.	Lemon	<i>Citrus limon</i>
121.	Kalmegh	<i>Andrographis paniculata</i>
122.	Sweetleaf	<i>Stevia rebaudiana</i>
123.	Patharchatt	<i>Bryophyllum pinnatum</i>
124.	Tulsi	<i>Ocimum sanctum</i>
125.	Patchouli	<i>Pogostemon cablin</i>
126.	Bach	<i>Acorus calamus</i>
127.	Pudina	<i>Mentha arvensis</i>
128.	Touch-me-not	<i>Mimosa pudica</i>
129.	Lemon grass	<i>Cymbopogon citratus</i>
130.	Citronella grass	<i>Cymbopogon nardus</i>
131.	Ajwain	<i>Trachyspermum ammi</i>
132.	Haldi	<i>Curcuma longa</i>
133.	Brahmi	<i>Bacopa monnieri</i>
134.	Hadjod	<i>Cissus quadrangularis</i>

Nursery for ornamental plants

As a new initiative, a nursery of ornamental plants is being established besides Science block, primarily to fulfill needs of the college and with future vision of service to the civil-society.



Newly established nursery of ornamentals plants besides Science block.

Total expenditure on green initiatives:

Average percentage expenditure on green initiatives and waste management, excluding salary component during last 5 years (2014-19)

Year	Budget allocated for green initiatives	Expenditure on green initiatives and waste management excluding salary component
2014-15	70,000/-	68,648/-
2015-16	24,00,000/-	23,40,233/-
2016-17	6,00,000/-	5,72,215/-
2017-18	16,00,000/-	15,48,170/-
2018-19	2,00,000/-	1,59,399/-
Total expenditure	48,70,000/-	46,88,665/-

2. **Air quality:** Being situated in the urban area, our 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:

- Refrigerator
- Vehicles
- Air conditioners
- Water coolers
- Other Activities

So above mentioned flora including plants, herbs and shrubs in our college contribute to the oxygen supply that we utilize and also consume carbon dioxide produced.



Green area outside the campus



Presence of green-area maintains fresh atmosphere inside the campus. Air quality inside campus is much better than outside.



Air sprinklers established in our campus are used for efficient irrigation and to deal with Suspended particulate matter (SPM).

3. Water quality:

Water supply for irrigation, drinking and laboratory purposes is maintained by supply from municipal corporation and six submersible bore wells installed in the campus area. Municipal water supply charges amounts to Rs 17,875/month.

Rain water harvesting in Campus:

- Normally rain water is harvested through gardens as college has huge lawns and open area for collection of rain water.
- Roof-top rain water is directed to green areas for artificial recharging of underground water table.
- Rain water collected in the play grounds is infiltrated down into underground water table.



- College has installed 3 large and 7 small rain water harvesting units to collect the rain water from the roof-top of various buildings.
- Besides, an open channel directs the roof top water of MRS block into an open area for underground percolation.

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Campus map of LKC showing rain water harvesting system in college.

- 1) In front of New PG block: A pit of $4 \times 4 \times 8$ ft. dimensions, filled with sand (2 ft.), gravel (2ft.) for harvest of roof top water from new auditorium..



- 2) At back side of old PG block: A pit of $7 \times 5 \times 8$ ft. dimensions, filled with sand (2 ft.), gravel (2ft.) for harvest of roof top water from Old PG block.



- 3) At back side of Commerce block: A pit of $5 \times 5 \times 10$ ft. dimensions, filled with sand (2 ft.), gravel (2ft.) for harvest of roof top water from Commerce block and Old PG block.



- 4) At back and front of library: 4 small rain water harvesting pits of $2 \times 2 \times 4$ ft. dimensions, filled with sand (1 ft.), gravel (1ft.) at back side of library and 3 small rain water harvesting pits of $2 \times 2 \times 4$ ft. dimensions, filled with sand (1 ft.), gravel (1ft.) in front of library.



- 4) At back side of MRS block: Roof top rain water from 6 discharge pipes of MRS block has been directed into an open lawn area for underground percolation.



4. Energy Consumption and cost: The College is well equipped with electricity supply. Each department possesses computers, printers, fans, plug points, tube lights, LED's, AC's, Refrigerators, etc. In addition to these equipment, our college also have:

- Pathological microscopes
- Distillation units
- Photoelectric colorimeter
- Autoclaves
- Exhaust fans
- Laminar air flow
- Hot plate
- Incubator
- Table fans
- Hot air oven
- Centrifuge
- Filters
- Telephones
- Induction
- Mike
- Bell

Major energy supply is received from Punjab State Power Corporation Limited. The monthly power consumption of college is around 20,257 KWH and supply charges is Rs 2,18,280/- (approx).

In addition, college is also focusing on eco-friendly power sources by installation of roof-top solar panels. The current power out-put from solar panels is 600 Watts.



Renewable energy resources are also in use to supply energy.

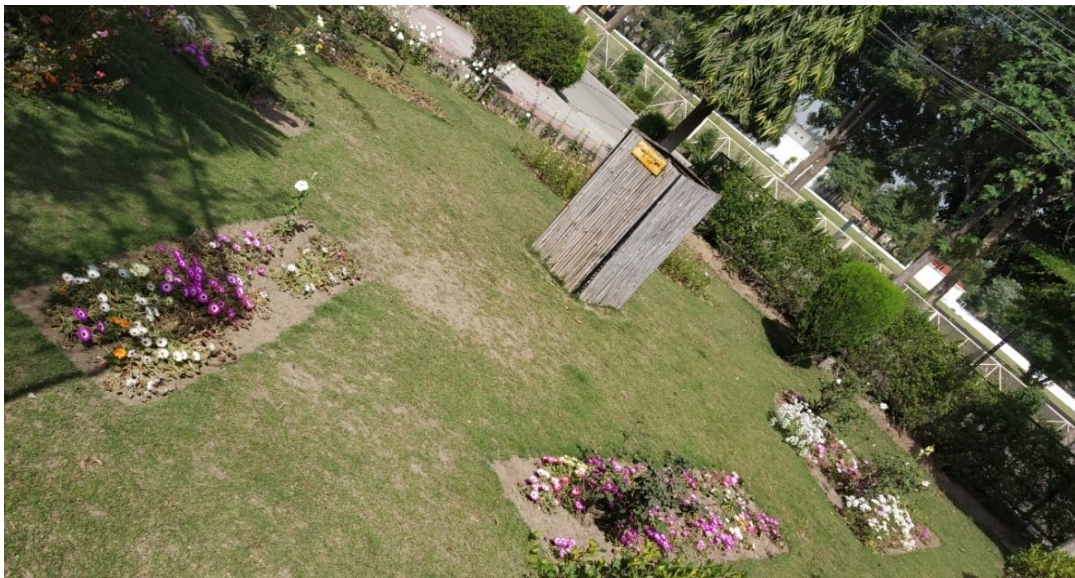
5. Waste management and disposal:

Solid waste

- The College generally has green waste in the form of lawns and leaves, fruit and vegetable waste (peels etc) from hostel mess and college canteen which is thrown in separate pits and used for **vermicomposting**.
- Solid waste is segregated as **biodegradable** and **non-biodegradable** as shown in figure given below.
- Non-biodegradable waste in form of plasticis sent for **recycling** through junk dealer.
- The college has solid waste disposal bins in each block which is collected by concerned employees daily for its disposal.
- Use of pesticides and harmful chemical fertilizers is replaced by **organic manure** produced by green waste.
- Polythene bags usage is discouraged.



Segregation of waste at collection source



Eco-friendly organic waste collection bins

Liquid waste management

- Organic liquid waste generated from canteens, hostel mess etc. is discharged into sewage system.
- Chemical (inorganic) liquid waste treatment is in the initial stages of implementation. It is planned to collect liquid waste in pits near laboratories, to be subjected to phyto-remediation by growing hydrophytes suitable for the purpose,

such as *Eichhornia*. These plants absorb and accumulate toxic chemicals from water, making it less toxic, before discharge.

PHYTOREMEDIATION UNIT

The liquid waste generated in the institution falls in different categories and need to be disposed and treated in different ways depending upon the components of the waste. The liquid waste generated from the science labs, mostly from the chemistry department has quite high levels of heavy metals in it. This heavy metal rich waste water should be avoided to be directly disposed in the sewage water as heavy metals like mercury, lead and cadmium are highly toxic. Moreover the harmful consequences of the heavy metal contaminated water gets aggravated owing to their property of biomagnification. The recent advances in science and technology have revealed phytoremediation to be the most cost effective green technology for the reclamation of the waste waters contaminated with heavy metals.

A demo phytoremediation unit has been set in the college premises at the backside of the Science block (4ft x 4 ft x 2 ft). Water hyacinth is the major metal hyperaccumulator, used for reclamation of the polluted aquatic habitats. The water hyacinth plants are provided the organic matter for their survival in the form of soil sediments at the base of the unit and timely replenishment through vermiwash of the adjoining vermicomposting unit. The wastewater containing heavy metals generated in the chemistry lab is checked for its heavy metal content prior to pouring in the unit and then the water of the unit is checked for the heavy metal content at an interval of 7 days. When the level of heavy metals in the water gets reduced upto a level within the permissible limits, the water is periodically discharged in the pit adjacent to the unit from where it seeps down to the ground water.



PHYTOREMEDIATION UNIT

Green Practices:

1. More emphasis on e communication to reduce paper use: each department and each faculty member has an official email id to receive and send official information. This reduces paper use.
2. Computerization of College working: The institutional working is largely computerized which has led to paperless work culture.
3. Pedestrian friendly Roads: entry of vehicles is restricted to parking area only. Only select vehicles are allowed inside the college campus
4. Plastic Free Zones: Following areas of the campus have been demarcated as plastic free zones to minimize plastic and polythene use:
 - New PG Block
 - Old PG Block
 - Commerce Block
 - Computer Block
 - Gurudwara Sahib Area
 - All lawns