MTES

Estd: 1990

MUKTAINAGAR TALUKA EDUCATION SOCIETY'S

SHRIMATI GODAVARIBAI GANPATRAO KHADSE COLLEGE, MUKTAINAGAR

TAL-MUKTAINAGAR, DIST- JALGAON
MAHARASHTRA

ENVIRONMENT AUDIT
(2022-23)

Prepared by
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Acknowledgement

We at Nutan Urja Solutions, Pune wish to express our sincere gratitude to the management of Muktainagar Taluka Education Society's Smt. Godawaribai Ganpatrao Khadse College, Muktainagar for assigning the work of Environmental Audit of college campus.

We appreciate the co-operation and support extended to our team members during the entire tenure of field study.

We are also thankful to various Head of Departments & other Staff members for helping us during the field measurements.

We are also thankful to all other staff members who helped us during the measurements at the field and for giving us the necessary inputs to carry out this vital exercise.

Executive Summary

After the Field measurements & analysis, we present herewith important observations made and various measures to reduce the dependency on Natural resources & reduce the pollution.

Muktainagar Taluka Education Society's Smt. Godawaribai Ganpatrao Khadse College, Muktainagar consumes various resources for day-to-day operations, namely: Air, Water, Electrical Energy & LPG.

1. Various Pollution due to College Activities:

- Air pollution: Mainly CO_2 on account of Electricity & LPG Consumption
- Solid Waste: Bio degradable Waste, Garden Waste
- Liquid Waste: Human liquid waste, lab wastes

2. Present Level of CO_2 Emissions:

Sr no	Parameter	Energy consumed, (Units)	CO2 Emission (MT)
1	Maximum	7,317	5.85
2	Minimum	1,141	0.91
3	Average	2,974	2.38
4	Total	35,693	28.55

3. The various projects already implemented for Environmental Conservation:

- Usage of Energy Efficient BEE STAR Rated ACs
- Usage of Natural Day light in corridors
- Implementation of Bio Composting pit for disposal of Bio degradable waste
- Implementation of Rain Water Harvesting
- Installation of Solar Thermal Hot Water System.
- Usage of 2 nos. of solar PV street lights

4. Recommendations:

1. Installation of Bio Gas Generator Plant instead of Bio composting Plant.
2. Installation of Sewage treatment Plant to make campus a Zero Discharge campus

5. Notes & Assumptions:

1. **1 kWh** of Electrical Energy releases **0.8 Kg of CO_2** into atmosphere
2. 1 kWp Solar PV plant generates 5 kWh/day Electrical Energy for 300 days in an year.

Abbreviations

AC	:	Air conditioner
PES	:	Progressive Education Society
CFL	:	Compact Fluorescent Lamp
FTL	:	Fluorescent Tube Light
LED	:	Light Emitting Diode
kWh	:	kilo-Watt Hour
Qty	:	Quantity
W	:	Watt
kW	:	Kilo Watt
PF	:	Power Factor
M D	:	Maximum Demand
PC	:	Personal Computer
MSEDCL	:	Maharashtra State Electricity Distribution Company Ltd

1. Introduction

1.1 Important Definitions:

1.1.1 Environment: Definition as per environment Protection Act: 1986

Environment includes water, air and land and the inter-relationship which exists among and between Water, Air, Land and Human beings, other living creatures, plants microorganism and property

1.1.2. Environmental Audit: Definition:

An audit which aims at verification and validation to ensure that various environmental laws are compiled with and adequate care has been taken towards environmental protection and conservation.

According to UNEP, 1990, "Environmental audit can be defined as a management tool comprising systematic, documented and periodic evaluation of how well environmental organization management and equipment are performing with an aim of helping to regularize the environment

1.1.3. Environmental Pollutant: means any solid, liquid and gaseous substance present in the concentration as may be, or tend to be, injurious to Environment.

1.1.4. Relevant Environmental Laws in India: Table No-1:

1927	The Indian Forest Act
1972	The Wildlife Protection Act
1974	The Water (Prevention and Control of Pollution) Act
1977	The Water (Prevention & Control of Pollution) Cess Act
1980	The Forest (Conservation) Act
1981	The Air (Prevention and Control of Pollution) Act
1986	The Environment Protection Act
1991	The Public Liability Insurance Act
2002	The Biological Diversity Act
2010	The National Green Tribunal Act

1.1.5. Some Important Environmental Rules in India: Table No-2:

1989	Hazardous Waste (Management and Handling) Rules
1989	Manufacture, Storage and Import of Hazardous Chemical Rules
2000	Municipal Solid Waste (Management and Handling) Rules
1998	The Biomedical Waste (Management and Handling) Rules
1999	The Environment (Siting for Industrial Projects) Rules
2000	Noise Pollution (Regulation and Control) Rules
2000	Ozone Depleting Substances (Regulation and Control) Rules
2011	E-waste (Management and Handling) Rules

2011	National Green Tribunal (Practices and Procedure) Rules
2011	Plastic Waste (Management and Handling) Rules

1.1.6 National Environmental Plans & Policy Documents: Table No-3:

1.	National Forest Policy, 1988
2.	National Water Policy, 2002
3.	National Environment Policy or NEP (2006)
4.	National Conservation Strategy and Policy Statement on Environment and Development, 1992
5.	Policy Statement for Abatement of Pollution (1992)
6.	National Action Plan on Climate Change
7.	Vision Statement on Environment and Human Health
8.	Technology Vision 2030 (The Energy Research Institute)
9.	Addressing Energy Security and Climate Change (MoEF and Bureau of Energy Efficiency
10	The Road to Copenhagen; India's Position on Climate Change Issues (MoEF)

1.2 Objectives

1. To study present usage of Natural resources the College is consuming
2. To Study the present pollution sources
3. To study various measures to make the campus Self sustainable in respect of Natural resources
4. To suggest the various measures to reduce the pollution: Air, Water, Noise

1.3 Audit Methodology:

1. Study of College as System
2. Study of Electrical Energy Consumption
3. Study of CO_2 emissions
4. Suggestions on usage of Renewable Energy

1.4 General Details of College

No	Head	Particulars
1	Name of Institution	Muktainagar Taluka Education Society's Smt. Godawaribai Ganpatrao Khadse College, Muktainagar.
2	Address	Muktainagar Taluka Education Societys Smt Godavaribai Ganpatrao Khadse College, Near Gajanan Maharaj Temple, Bhusawal Road, Muktainagar, Dist. Jalgaon – 425 306.
3	Affiliation	Kavayitri Bahinabai Chaudhari North Maharashtra University, Jalgaon.

2. Study of Consumption of Various Resources

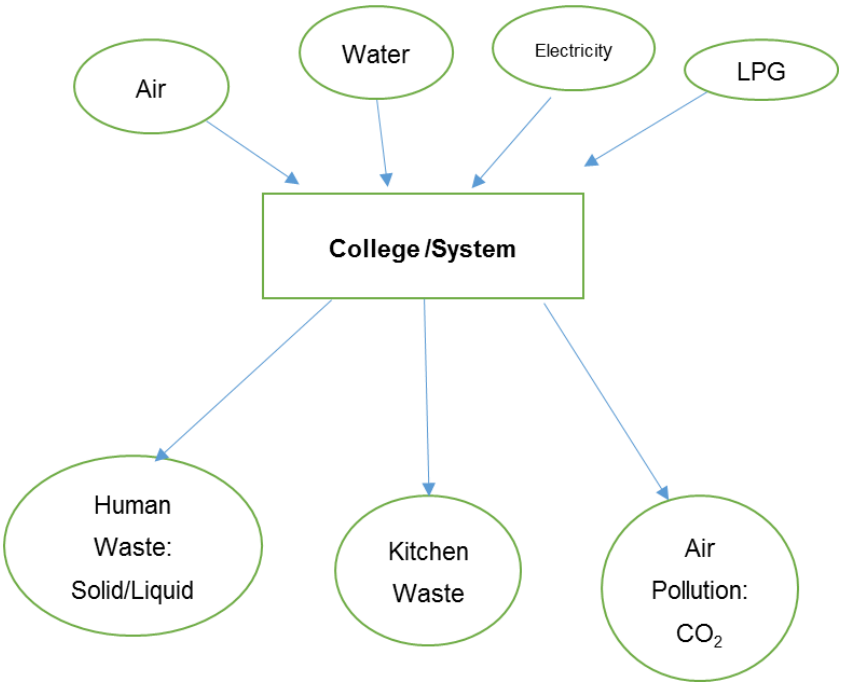
The Institute consumes following basic/derived Resources:

1. Air
2. Water
3. Electrical Energy
4. Liquefied Petroleum Gas

Also, college emits following pollutants to environment

1. Human Waste: Solid/ Liquid
2. Air pollution

We try to draw a schematic diagram for the College System & Environment as under.



Now we compute the Generation of CO_2 on account of consumption of Electrical Energy & LPG as under.

The calculation of electrical energy consumption by college can be given as,

Table 2.1: Electrical Energy Consumption

No	Month	Energy (kWh)
1	May-23	3129
2	Apr-23	5,116
3	Mar-23	4,532
4	Feb-23	2,941
5	Jan-23	2,439
6	Dec-22	7,317
7	Nov-22	1,845
8	Oct-22	1,845
9	Sep-22	1,942
10	Aug-22	1,993
11	Jul-22	1,453
12	Jun-22	1,141
	Total	**35,693**
	Maximum	7,317
	Minimum	1,141
	Average	2,974

2.1 Variation of Monthly Electrical Energy Consumption

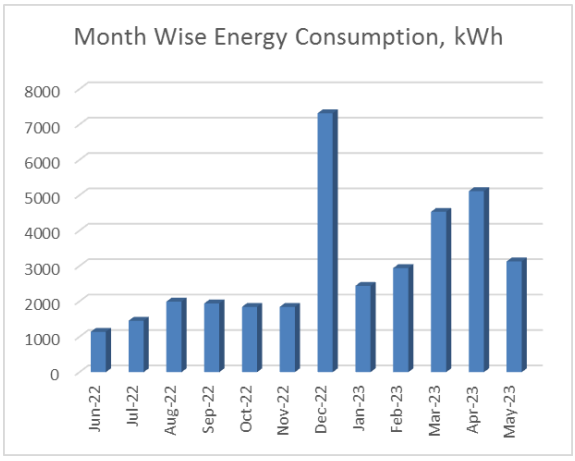


Figure 2.1 : Monthly Electrical Energy Consumption

2.2 Key Inference drawn

From the above analysis, we present following important parameters:

Table 2.2: Variation in Important Parameters

No	Parameter/ Value	Energy Consumed, kWh
1	**Total**	35,693
2	**Maximum**	7,317
3	**Minimum**	1,141
4	**Average**	2,974

3. Study of Environmental Pollution

In this Chapter, we present the various types of Pollution as under:

3.1 Air Pollution

The College is using two forms of Energies, namely: Thermal in the form of LPG and Electrical Energy used for day-to-day operations of the College. The major pollutant on account of above Energy forms is the Carbon Di Oxide.

- 1 unit (kWh) of Electrical Energy emits 0.8 Kg of CO_2 in the atmosphere
- 1 Kg of LPG emits 3 Kg of CO_2 in the atmosphere

In the following Table, we present the CO_2 emissions.

Table 3.1: Month wise Consumption of Electrical Energy & CO_2 Emissions:

No	Month	Energy Consumed, kWh	CO2 Emissions, MT
1	May-23	3,129	2.50
2	Apr-23	5,116	4.09
3	Mar-23	4,532	3.63
4	Feb-23	2,941	2.35
5	Jan-23	2,439	1.95
6	Dec-22	7,317	5.85
7	Nov-22	1,845	1.48
8	Oct-22	1,845	1.48
9	Sep-22	1,942	1.55
10	Aug-22	1,993	1.59
11	Jul-22	1,453	1.16
12	Jun-22	1,141	0.91
	Total	**35,693**	**28.55**
	Maximum	7,317	5.85
	Minimum	1,141	0.91
	Average	2,974	2.38

In the following Chart we present the CO_2 emissions due to usage of Electrical Energy.

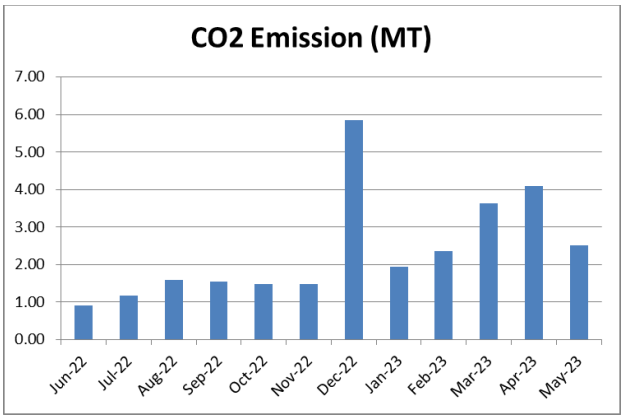


Figure 2.1: CO_2 emission due to usage of electrical energy.

3.2 Study of Solid Waste Generation

The College has already installed a Bio composting Plant, wherein, the bio-degradable waste is composted & is used as fertilizer for the garden.

3.3 Study of Liquid Waste Generation

At present the Liquid Waste generated due to day-to-day operations is drained off to the municipal Corporation through a pipe.

3.4 Study of e-Waste Management:

The internal communication is through emails and hence there is hardly any generation of e-Waste in the premises.

4. Study of Rain Water Harvesting

The College has already installed Rain Water Harvesting project, wherein the rain water falling on the terrace is collected and recharge in the ground.

Photograph of Rain Water Harvesting pipe

5. Recommendations

In order to reduce the dependency on Natural resources and also in order to reduce the various pollutions arising due to the day-to-day operations of the College we herewith recommend following recommendations.

- Installation of Bio Gas Generator Plant instead of Bio composting Plant.
- Installation of Sewage treatment Plant to make campus a Zero Discharge campus

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GREEN AUDIT

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We at Nutan Urja Solutions, Pune, express our sincere gratitude to the management of Muktainagar Taluka Education Society's Smt. Godawaribai Ganpatrao Khadse College, Muktainagar for awarding us the assignment of Green Audit of their college premises.

We are also thankful to various Head of Departments & other Staff members for helping us during the field measurements.

We hope that the recommendations stated in this report will be useful and worthy of discussions to take things forward to help implementation of energy conservation measures and green practices. While we have made every attempt to adhere to high quality standards, in both data collection and analysis through the report, we would welcome your suggestions so as to improve upon this report further.

Executive Summary

Green Audit of Muktainagar Taluka Education Society's Smt. Godawaribai Ganpatrao Khadse College, Muktainagar is conducted by Nutan Urja Solutions, Pune. Based On the audit field study, following important points can be presented.

1. Present Energy Consumption

Muktainagar Taluka Education Society's Smt. Godawaribai Ganpatrao Khadse College, Muktainagar uses Electrical Energy as the source of Energy for various equipment in the college campus. In the following Table, we present the details of Energy Consumption.

Table no 1: Details of energy consumption

Sr no	Parameter	Energy consumed, (Units)	CO2 Emission (MT)
1	Maximum	7,317	5.85
2	Minimum	1,141	0.91
3	Average	2,974	2.38
4	Total	35,693	28.55

2. Various Measures Adopted for Energy Conservation

1. Usage of STAR Rated ACs at new installations
2. Usage of LED lights at some indoor locations
3. Usage of LED Lights for outdoor lighting.

3. Usage of Renewable Energy

The College has installed a Roof Top Solar thermal hot water system of 1200 liters capacity. Also, college has installed 2 nos. of solar PV street lights.

4. Rain Water Harvesting

The College has installed the Rainwater harvesting project.

5. Waste Management

The College has already installed a Bio composting Plant, wherein, the bio-degradable waste is composted & is used as fertilizer for the garden.

The internal communication is through emails and there is hardly any generation of e-Waste in the premises.

6. Notes and Assumptions

1. Daily working hours-10 Nos
2. Annual working Days-250 Nos
3. Average Rate of Electrical Energy : **Rs 11/- per kWh**

Abbreviations

CFL	:	Compact Fluorescent Lamp
FTL	:	Fluorescent Tube Light
LED	:	Light Emitting Diode
V	:	Voltage
I	:	Current
kW	:	Kilo- Watt
kWh	:	kilo-Watt Hour
kVA	:	Active Power

1. Introduction

The college Smt. G. G. Khadse Science and Arts College Muktainagar is run by The Muktainagar Taluka Education Society Muktainagar, is located at a natural and peaceful surroundings on a hill, on Bhusawal road, near Gajanan Maharaj Temple. The college is permanently affiliated to the North Maharashtra University Jalgaon.

Though the college is situated in rural area, its progress and development is no less than the other of progress. An attempt is always made to retain standard and attain new horizons. In this attempt the management, the principal, the teaching and non-teaching staff of the collage work together hard for the overall development of the rural students. The college has availed advanced academics, sports and other facilities to the student for their social, physical, spiritual, intellectual and spiritual development. The glorious results of the students in the University exams, the medals and prizes in sports, the state and university level awards of N.S.S. .etc are an outcome of these efforts.

1.1 Objectives

1. To study present level of Energy Consumption
2. To Study the present CO_2 emissions
3. To assess the various equipment/facilities from Energy efficiency aspect
4. To measure various Electrical parameters
5. To study Scope for usage of Renewable Energy
6. To study various measures to reduce the Energy Consumption

1.2 Audit methodology

1. Study of connected load
2. Study of various Electrical parameters
3. To prepare the Report with various Encon measures with payback analysis

2. Study of Electrical Energy Consumption

In this chapter, electricity bills are studied for the analysis of electrical energy consumption.

Table no 2.1: Summary of electricity bills

No	Month	Energy (kWh)	Bill Amount (Rs)
1	May-23	3129	46709
2	Apr-23	5,116	71,969
3	Mar-23	4,532	39,368
4	Feb-23	2,941	26,600
5	Jan-23	2,439	20,980
6	Dec-22	7,317	31,020
7	Nov-22	1,845	15,990
8	Oct-22	1,845	15,990
9	Sep-22	1,942	16,860
10	Aug-22	1,993	114,010
11	Jul-22	1,453	96,580
12	Jun-22	1,141	9,050
	Total	**35,693**	**505,126**

Variation in energy consumption is as follows,

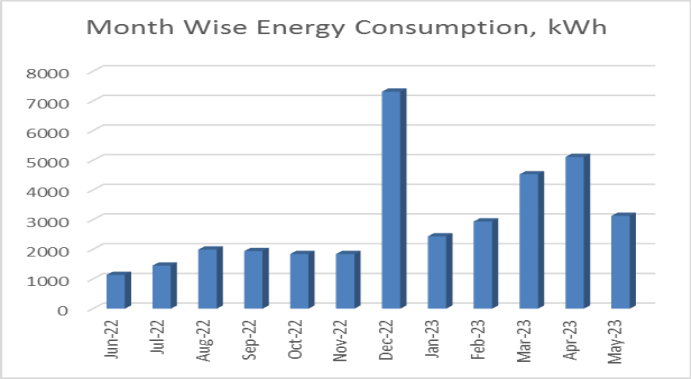

Figure 2.1: Month wise energy consumption

Monthly variation in electricity bill is as follows,

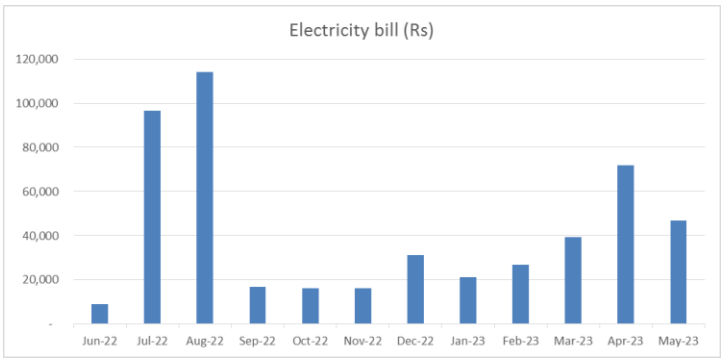

Figure 2.2: Month wise electricity bill

Key observations of electricity bill are as follows,

Table no 2.2: Key observations

Sr no	Parameter	Energy consumed, (Units)	CO2 Emission (MT)
1	Maximum	7,317	5.85
2	Minimum	1,141	0.91
3	Average	2,974	2.38
4	Total	35,693	28.55

3. Carbon Foot printing

1. A Carbon Foot print is defined as the Total Greenhouse Gas emissions (CO_2 emissions), emitted due to various activities. In this we compute the emissions of Carbon-Di-Oxide, by usage of the various form of Electrical Energy used by the College for performing its day to day activities

2. Basis for computation of CO_2 Emissions:

The basis of Calculation for CO_2 emissions due to Electrical Energy is as under

- 1 Unit (kWh) of Electrical Energy releases **0.8 Kg of CO_2** into atmosphere.

Based on the above Data we compute the CO_2 emissions which are being released in to the atmosphere by the College due to its Day to Day operations

We herewith furnish the details of various forms of Energy consumption as under

Table 3.1: Month wise Consumption of Electrical Energy & CO_2 Emissions

No	Month	Energy Consumed, kWh	CO2 Emissions, MT
1	May-23	3,129	2.50
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10	Aug-22	1,993	1.59
11	Jul-22	1,453	1.16
12	Jun-22	1,141	0.91
	Total	**35,693**	**28.55**

In the following Chart we present the CO2 emissions due to usage of Electrical Energy.

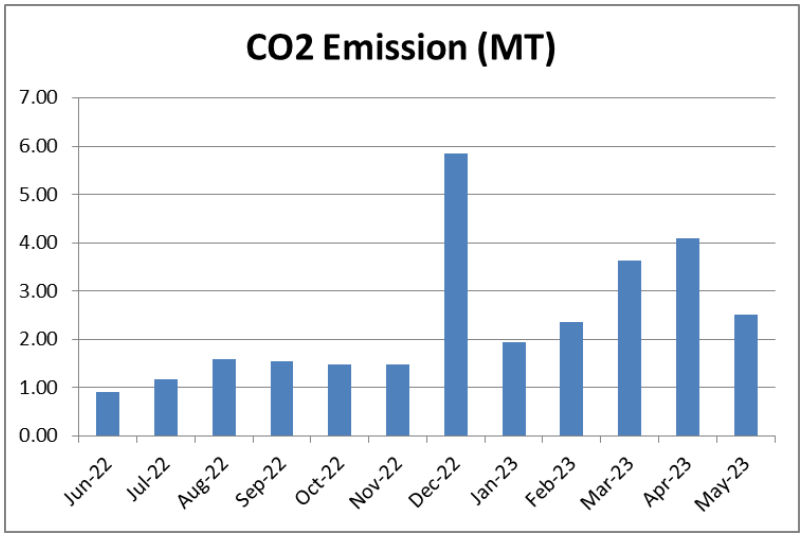

Figure 3.1: Month wise CO2 Emission

4. Study of Usage of Alternate Energy

The College has installed a Solar thermal hot water system of 1200 liters capacity on hostel terrace. Also, college has installed 2 nos. of solar PV street lights.

Photograph of Solar Thermal Water Heaters

5. Study of Rain Water Harvesting

The College has already installed Rain Water Harvesting project, wherein the rain water falling on the terrace is collected and recharge in the ground.

Photograph of Rain Water Harvesting pipe

6. Study of Waste Management

6.1 Solid Waste Management

The College has already installed a Bio composting Plant, wherein, the bio-degradable waste is composted & is used as fertilizer for the garden.

6.2 e-Waste Management

The internal communication is through emails and there is hardly any generation of e-Waste in the premises.

7. Study of Green Practices

7.1 No of students who don't use own Vehicle for coming to Institute

Out of total students coming to Institute, about 20% students use own Automobile and 60 % of the students commute by public transport.

7.2 Usage of Public Transport

During the Students transport study, it was revealed that the 60 % of the students who are residing near areas make use of Public Transport like local buses, local sharing type auto rickshaws. Some students use bicycles. Institute encourages students to not to use automobiles.

7.3 Pedestrian Friendly Roads

The Institute has well defined pedestrian foot paths as to facilitate the easy movement of the students within the campus.

Photograph of Road within campus

7.4 Plastic Free Campus

The Institute is an active participant in the Government of India's most prestigious project of SWATCHH BHART ABHIYAN. The Institute has displayed boards in the Campus, to make the campus plastic free. Various measures adopted for this purpose are as follows

- Installation of Separate waste bins for Dry waste & wet waste
- Usage of paper tea cups in the Institute canteen
- Display of boards in the campus for Plastic Free campus

7.5 Paperless Office

The internal communication of the Institute is through the Internet. There are hardly any day to day operations, where printing is required.

7.6 Green Landscaping with Trees and Plants

The Institute has beautiful maintained Garden.

Figure 7.1: Beautiful maintained Garden of college