BHIMAPPA
SOMAPPA
NAVI
Digitally signed by BHIMAPPA SOMAPPA NAVI
DN: c=IN, o=KARNATAKA STATE AKKAMAHADEVI WOMENS UNIVERSITY VIJAYAPURA, ou=NA, 2.5.4.20=db7789db39afe1f3d852b09ea3497499328f50a9eb82c5e3eb9b8da79cde486e, postalCode=586108, st=KARNATAKA, serialNumber=a2019af0af54b531e19e9c7b6fbd664dec1569beb802de3505e28213b85e6333, cn=BHIMAPPA SOMAPPA NAVI
Date: 2023.08.14 10:01:39 +05'30'

ಕರ್ನಾಟಕ ರಾಜ್ಯ ಅಕ್ಕಮಹಾದೇವಿ ಮಹಿಳಾ ವಿಶ್ವವಿದ್ಯಾನಿಲಯ, ವಿಜಯಪುರ

(ಹಿಂದಿನ ಹೆಸರು "ಕರ್ನಾಟಕ ರಾಜ್ಯ ಮಹಿಳಾ ವಿಶ್ವವಿದ್ಯಾನಿಲಯ, ವಿಜಯಪುರ")

Karnataka State Akkamahadevi Women's University, Vijayapura

(Formerly known as "Karnataka State Women's University, Vijayapura")

NAAC II CYCLE – SSR: Criteria 7:

7.1.6: Green Campus Initiatives

<u>Green Audit Report</u>

Report on‘Green Measures’ by

KARNATAKA STATE AKKAMAHADEVI WOMEN’S UNIVERSITY, VIJAYAPURA

Prepared by

Dr. K. Lenin Babu

Center for Resource Management Studies

#227, ‘Sri Vekaliammam Temple Road

VI Block, SIR. M.V. Layout, Ulall,

BENGALURU – 560110

E Mail:klenin2011@gmail.com

Executive Summary

National Assessment and Accreditation Council (NAAC) has been mandated and carrying out the process of quality Assessment and Accreditation (A&A) of Higher Education Institutes (HEI). For this purpose, NAAC has evolved a seven point criteria to represent the core functions and activities of a HEI, viz., 1. Curricular Aspects, 2.Teaching-Learning and Evaluation, 3.Research, Innovations and Extension, 4.Infrastructure and Learning Resources, 5.Student Support and Progression, 6.Governance, Leadership and 7.Management, Institutional Values and Best Practices. Under each Criterion, a few Key Indicators are identified and are further delineated as Metrics which actually elicit responses from the HEIs. This report is prepared Criterion 7 for the Akkamahadevi Women's University, Part 1 describes various alternate energy initiatives, Part II describes Waste Management aspects and Part III deals with Water Management at Jnanashakti Campus. Part IV provides various Green practices adopted by University.

Regarding electricity, University used to face the problem of inadequate and erratic power supply, more in summers. Typical consumption pattern of electricity in the University for various purposes is about 34778 KwH. From 2017, there was significant increase in the demand for electricity from grid. Envisaging the spike in consumption of electricity as the number of courses and students enrolled is set to increase in the years to come, University has considered the alternate energy sources. Geographical location of the University in terms of solar irradiation has offered the potential for solar energy. Accordingly, University has opted for 10.35 KV solar photovolatic rooftop plant, generating about 35 units of electricity every day. In addition, about 150 solar street lights were installed in the university campus. Further, taking advantage of native non-edible oil seed trees like Neem, University has established a Bio Fuel Training and Demonstration Centre with the support from Biofuel Board and Biodiesel Society of India with an installed capacity of 1000 li per annum. In terms of energy conservation, Univsersity has replaced about 80 per cent of conventional lighting system with LED system.

Regarding the waste management in the University, in addition to its regular teaching and research activities, **Women's Technology Park** which is one of its kind, providing a variety of skill training programmes to women especially from backward areas was established in the campus. Further, it has helped in recycling of paper from the office of Administration and Methane from kitchen waste, vermin compost unit.

Towards better water management, taking advantage of natural topography of area, several small percolation ponds were created by erecting bunds. As of now, in the campus about 15213 M^3area of percolation ponds were created. In addition, all the buildings have rainwater conservation measures in-built in their plans

Karnataka State Akkamahadevi Women's University is youngest university in the state, even then, it has became a leader in terms of planning and implementing the eco-friendly measures such as Solar PV, Solar thermal, Solar Lightening, Methane from kitchen waste, paper recycling etc. and in the process, carbon foot prints of university are minimal. Further, in the years to come, University has plans to increase the share of renewable energy to decrease the dependence on grid based electricity through increasing the roof-top PV units. Regarding fossil fuel for transportation, it is envisaged that in couple of years, the energy plantation of University will increase the supply feedstock to a level that significant portion of university vehicles can shift over to biodiesel.

Table of Contents

List of Tables

List of Figures

1. Introduction

India has one of the largest and diverse educational systems in the world. At the same time, it has also led to widespread concern on the quality and relevance of the higher education. To address these concerns, the National Policy on Education (NPE, 1986) and the Programme of Action (PoA, 1992) spelt out strategic plans for the policies, advocated the establishment of an independent National accreditation agency. Consequently, the National Assessment and Accreditation Council (NAAC) was established in 1994 as an autonomous institution of the University Grants Commission (UGC) with its head quarter in Bengaluru. The mandate of NAAC is in making quality assurance an integral part of the functioning of Higher Education Institutions (HEIs). The NAAC has been carrying out the process of quality Assessment and Accreditation (A&A) of HEIs over the past two decades. The A&A process is being revised and attempts to enhance the quality of higher education and focus is on quality culture of the institution In line with conviction that quality concerns are institutional, NAAC has placed greater importance on self-evaluation process and the subsequent preparation of the Self Study Report (SSR) to be submitted to NAAC.

NAAC has evolved a seven point criteria to represent the core functions and activities of a HEI, viz., 1. Curricular Aspects, 2.Teaching-Learning and Evaluation, 3.Research, Innovations and Extension, 4.Infrastructure and Learning Resources, 5.Student Support and Progression, 6.Governance, Leadership and 7.Management, Institutional Values and Best Practices. Under each Criterion, a few Key Indicators are identified and are further delineated as Metrics which actually elicit responses from the HEIs.

In Criterion VII: - Institutional Values and Best Practices, NAAC has laid out framework of the functional niche of HEI in changing national and global contexts an educational institution. NAAC has stressed on social responsibility of HEI to be proactive in the efforts towards development in the larger contexts and called for every institution to be responsive to at least a few pressing issues such as gender equity, environmental consciousness and sustainability, inclusiveness and professional ethics, but the way it addresses these and evolves practices will always be unique. Further, NAAC has suggested some meaningful practices pertinent to such situations that are evolved internally by the institution leading to improvements in any one aspect of its functioning – academic, administrative or organizational, - are recognized as a “best practices”. Over a period of time, due to such unique ways of functioning each institution develops distinct characteristic which becomes its recognizable attribute. NAAC has earmarked three Keypoints in Criterion VII, viz., a) Institutional Values and Social Responsibilities, b) Best Practices and c) Institutional Distinctiveness Environmental Consciousness is also given priority by NAAC in its guidelines and made the documentation of environmental management practices adopted at University as part of Self Assessment Report. In addition, NAAC has recommended a framework for the documentation purposes and this report is prepared accordingly for the Akkamahadevi Women’s University.

2. Karnataka State Akkamahadevi Women's University

Formerly known as Karnataka State Women's University, Karnataka State Akkamahadevi Women's University (KSAWU) established in 2003 in the city of Vijayapura (Formerly Bijapur), is the only Women's University in Karnataka dedicated exclusively for women's education. It is recognized under 2(f) and 12(B) of the UGC Act. It has been accredited 'B' Grade by NAAC. One hundred and thirty seven women's colleges of Karnataka, are affiliated to this University, in addition to Post Graduate Centers at Sindhanoor and Udutadi, and Extension Center at Mandya. The University offers various UG programmes leading to Bachelor's degree in Arts, Business Administration, Computer Applications, Commerce, Education, Fashion Technology, Home Science, Physical Education, Science and Social Work. It also offers 32 P G Courses, P G Diploma and Certificate Courses in the Faculties of Arts, Commerce and Management, Social Sciences, Science and Technology and Education. At its Jnanashakti Campus, the University has initiated and implemented several ecofriendly measures and this report provides a brief description of these measures. Part 1 describes various alternate energy initiatives, Part II describes Waste Management aspects and Part III deals with Water Management at Jnanashakti Campus. Part IV provides various Green practices adopted by University.

3. Energy Initiatives

AWU is located in northern Deccan Plateau plains region where agriculture is the primary economic activity. With mild winters, but harsh summers, major portion of the energy demand is for the category of lighting and heating/cooling. Coming under jurisdiction of the Hubli ESCOM, University used to face the problem of inadequate and erratic power supply during summers. Typical consumption pattern of electricity in the University for various purposes is given in Table 1 and average monthly details in Table 2. During 2015, average monthly consumption was 34778 KwH and similar consumption was registered during 2016. From 2017, there was significant increase in the average consumption of electricity from grid (Table 1).

Table 1:Energy Requirement of the University (in KwH)

Year/Month	2018-19	2017-18	2016-17	2015-16
Jan	52378	41126	39764	33609
Feb	42444	35070	33984	27686
March	48158	35032	34446	33508
April	61670	48532	44862	42044
May	60100	45156	46278	41310
June	61390	45862	37640	46938
July	52430	45118	38796	38070
August	33938	31762	19088	30928

Sept	36828	41062	25394	24660
Oct	51228	51834	30600	32878
Nov	53858	43636	32142	30934
Dec	46838	50276	37080	29836
Monthly Average	50056	42802	34817	34778

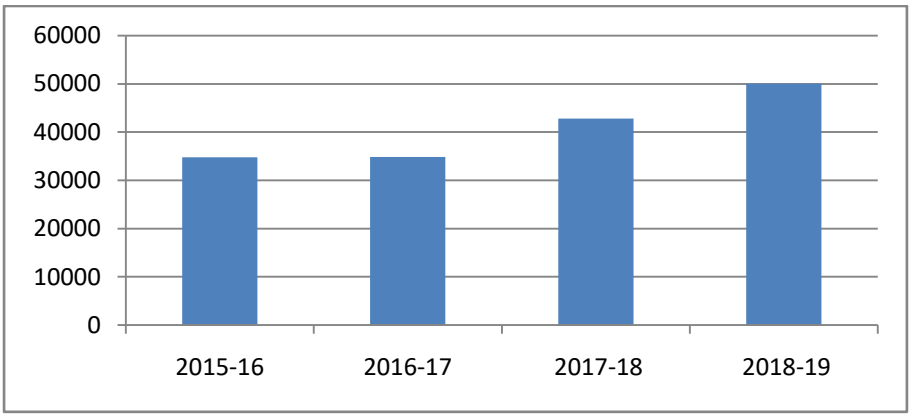

Fig 1: Average Monthly Electricity Consumption (KwH)

Table 2: Component wise Energy Consumption (KWH)

Month /Year	2015-16		2016-17		2017-18		2018-19	
	Lighting Purposes	Heating/ cooling Purposes	Lighting Purposes	Heating/ cooling Purposes	Lighting Purposes	Heating /cooling Purposes	Lighting Purposes	Heating/ cooling Purposes
Jan	25900	7700	31964	7800	33526	7600	37378	15000
Feb	22786	4900	28384	5600	28870	6200	30444	12000
March	28408	5100	29146	5300	28932	6100	36158	12000
April	34064	7980	36862	8060	40732	7800	46870	14800
May	39610	7700	38478	7800	36956	8200	45100	15000
June	39138	7800	29740	7900	38262	7600	46890	14500
July	29970	8100	30596	8200	37568	7550	37630	14800
Aug	23128	7800	11188	7900	23962	7800	19538	14400
Sept	1941	525	17694	7700	32862	8200	22328	14500
Oct	25378	7500	23000	7600	45734	8160	36328	14900
Nov	23734	7200	24942	7200	35636	8000	38898	15000
Dec	22136	7700	30080	7000	42276	8000	31938	14900

Further investigations have suggested that University could harness solar energy for three different categories, viz., electricity, lighting, generation and solar thermal energy, as detailed in following sections.

3.1 Renewable Energy Generation: Photo Voltaic Solar Plant

Both scheduled and unscheduled load shedding during summer months is common feature in and around the university area, putting students in hostels to stress as climate in summers is harsh and also due to fast approaching end semester examinations. On the other hand, University campus is located in a region of surplus solar irradiation (Table 3) with an approximate solar irradiation value of 4 kWh/m2/day. Solar Photo Voltaic (PV) technology could be ideal and University has opted for High Concentrated Photo Voltaic Solar Plant. Technical details are given in Table 4 and ever since its operation, hostels never experienced the power shortage, probably a record in the region.

Table 3: Details of Average Monthly Solar Irradiation

Variable/Month	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Insolation, kWh/m²/day	4.95	5.78	6.42	6.70	6.52	5.03	4.42	4.36	4.80	5.01	4.93	4.69
Clearness, 0 – 1	0.63	0.66	0.65	0.64	0.61	0.47	0.41	0.41	0.48	0.55	0.61	0.62
Temperature, °C	23.63	26.59	30.62	31.43	32.12	27.91	26.40	26.05	26.68	26.20	24.63	22.96
Wind speed, m/s	2.13	2.44	2.44	2.88	4.02	5.29	4.99	4.60	3.28	2.52	2.40	2.17
Precipitation, mm	3	6	8	20	38	117	158	155	203	89	21	6
Wet days, d	0.4	0.4	0.6	1.8	2.4	7.1	9.2	8.4	9.3	4.4	1.4	0.4

Source: NASA Langley Research Center Atmospheric Science Data Center;http://www.gaisma.com/en/location/gulbarga.html (accessed on 09.-7.2019)

Table 4: Details of Solar PV Unit

Total Installed Capacity	3.45 X 3Nos = 10.35 KW
Specification of Module:	High Concentrated Photo Voltaic (HCPV).
Make of Modules	Suntrix.
No of Modules in Each Units	12Nos
Module Efficiency	28-30%.
Series Parallel Combination	3Series 4Parallel
Tilt Angle of Modules	Mounted on Dual axis sun tracking system
Input Voltage to Inverter	120Volts DC.
Output Voltage of Inverter	230Volts AC.
Total Nos of Tube Lights Connected to Each Unit	25Nos (40Watts Each).
Total Nos of Fans Connected to Each Unit	25Nos (60Watts Each).
Energy Generation Details	
Generation/Day/plant (As per metering details)	10-11Units
Total generation of 3-Plants	30-33Units
Demand	42-46Units/Day

Cost of power purchase(@2017 Charges)	Rs 5.40/Unit
Energy savings	Average 30-33units/Day
Energy Savings per annum	12045Units
Cost saving per annum	Rs 65,043.00/-

Plate 1: Roof Top Solar PV Unit

3.2 Renewable Energy Generation: Solar Energy for Lighting Purposes

In addition to the power generation, University has opted for harnessing the solar energy for lighting of common areas. Accordingly, it has initiated measures to replace the conventional streetlights with that of solar street lights. Details of Solar street lights are given in Table 5 and technical specifications in Table 6.

Table 5: Harvesting Sun Light for Street Lighting

	2015-16	2016-17	2017-18	2018-19
Jan	150	150	150	150

Feb	150	150	150	150
March	150	150	150	150
April	150	150	150	150
May	150	150	150	150
June	150	150	150	150
July	150	150	150	150
August	150	150	150	150
Sept	150	150	150	150
Oct	150	150	150	150
Nov	150	150	150	150
Dec	150	150	150	150

Table 6: Details of Solar Street Lights

Solar Street Lamps	
Number of Solar Street Lights installed	150Nos
Specifications	Each solar street light
Module Efficiency	18%
Luminary	1X11Watts CFL
PV Module	74Watts
Battery Capacity	12Volts/75AH
Cost	Rs. 21,800/-
Energy Generation Details	
Total Installed capacity	74 watts X 150 Nos=11.10KW
Average Power generation	15-16Units (Assumed: 8hours)
Cost of power purchase	5.40Paise/Unit
Energy savings	Average 15-16 units/Day
Energy Savings per annum	5840Units
Cost saving per annum	Rs 31,536.00/-

3.3 Renewable Energy: Bio-diesel Production

Funding from the Government of Karnataka has enabled the University to establish Bio Fuel Training and Demonstration Centre. This center works in collaboration with Bio-Fuel Board and Bio diesel Society of India, Bangalore. Primary purpose of establishing this Center is for awareness about biodiesel and its adoption. The Center has installed capacity to crush about 10 tons of oilseeds and about 1,000 li biodiesel production. Non-edible oil seeds like Jatropa, Pongamia are purchased from different parts of district/ state from various stakeholders like individual farmers, SHGs and NGOs. Biodiesel produced Jatropa and Pongamia is used as fuel for university owned vehicles and surplus, if any, is sold to Forest Department. On the other hand, oil from Neemseeds has high demand from vineyardsand hence, the need oil is sold as neem oil only to the farmers. Byproducts like Oil Cake were sold to farmers on first come –first serve basis. To ensure the self sufficiency of feed stock for this Center, energy plantation consisting of Neem and pongamia plants is taken up in the University campus. In addition to biodiesel production, the centreis also conducts Bio Fuel Training and Demonstration activities, and training/awareness/sensitization.

Plate 2: Non Edible Oil Seeds for Biodiesel Production

Plate 3: Seed Oil Extractor

Plate 4: Esterfication Unit

Plate 5: Different Products

Plate 6: Awareness Camps

Plate7 : Biodiesel for University Vehicles

Plate 8: Awareness Programs

3.4 Energy Conservation

Incandescent bulbs produce light using electricity to heat a metal filament until it becomes "white" hot or is said to incandesce. As a result, incandescent bulbs release 90% of their energy as heat. In a CFL, an electric current flows between electrodes at each end of a tube containing gases. This reaction produces ultraviolet (UV) light and heat. The UV light is transformed into visible light when it strikes a phosphor coating on the inside of the bulb. On the other hand, Light Emitting Diode (LED) bulbs or lighting products produce light approximately 90% more efficiently than incandescent light bulbs. Their useful life is defined on 'lumen depreciation', wherein the brightness of the LED dims slowly over time. Unlike incandescent bulbs, LED "lifetime" is established on a prediction of when the light output decreases by 30 percent. LEDs are incorporated into bulbs and fixtures for general lighting applications. Small in size, LEDs provide unique design opportunities. LED lighting differs from incandescent and fluorescent in several ways. LED lighting is more efficient, versatile, and lasts longer and "directional" light sources, which means they emit light in a specific direction, unlike incandescent and CFL, which emit light and heat in all directions. That means LEDs are able to use light and energy more efficiently in a multitude of applications. A comparison between traditional incandescent, CFL and LED lighting device is given in Table 6.

Table 7: Comparison of Different Lighting Systems

Approximate cost per Unit	Traditional tube light	CFL	LED
Average warranty offered	6 months	1 year	2 years
Approximate cost per unit (in Rs)	40	100	150
Average Lifespan (in hrs)	7,000 – 15,000	6,000 – 10,000	15,000 – 25,000
Average power consumption for similar output	28 watts	15 watts	9 watts

Number of bulbs needed over 5 years for 6 hours of use per day	3	3	2
Total purchase price over 5 years (Rs)	120	300	300
Total cost of electricity for 6 hours of use per day (Rs)	1,533	821	493
Total cost over 5 years (In Rs)	1,653	1,121	793

In a University campus, significant portion of total energy is used for lightening purposes and adoption of LED provides a measures to reduce the electricity consumption and the AWU has opted for LED lighting devices and year wise progress in replacing the traditional lighting systems with LED over the years is given in Table 7. As can be seen from the table, more than 80 per cent of lighting systems are of LED type. By shifting to the LED lighting sources, University has not only reduced its electricity bill but also the actual consumption of electricity thus, contributing to sustainable development.

Table 8: Replacing Conventional Bulbs by LED lighting systems (%)

Year	2015-16	2016-17	2017-18	2018-19
Jan	58	55	69	82
Feb	61	54	65	80
March	60	50	62	84
April	56	53	66	74
May	53	51	60	81
June	51	54	71	78
July	50	56	76	82
August	52	58	73	81.5
Sept	56	53	75	83
Oct	58	59	71	80
Nov	58	61	78	77
Dec	57	58	78	81

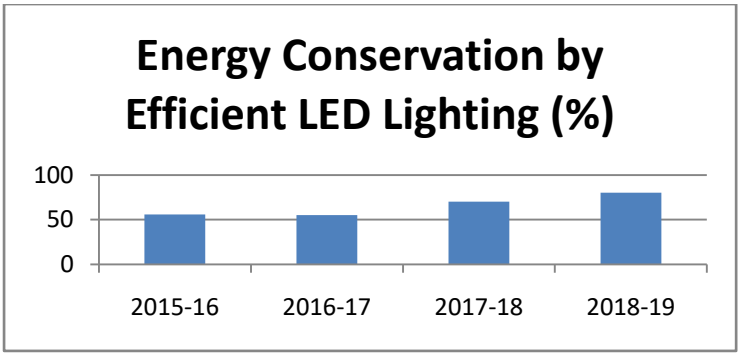

Fig 2: Energy Conservation Efficiency

4. Waste Management

Waste management is an essential part of society and environmental management, but is often mismanaged or neglected. Several measures are taken by the University to ensure proper management of waste and in the process, to the extent possible, efforts were made to provide training to the womenfolk of the surrounding villages as well. For instance waste paper recycling.In addition to its regular teaching and research activities, the University has established a **Women's Technology Park** which is one of its kind,providing a variety of skill training programmes to women especially from backward areas. The park includes the various programmes/ initiatives and natural resources management/ renewable energy is given due importance, in view of the nature of the region. On such concerns are recycling of paper from the office of Administration and Methane from kitchen waste.

4.1 Methane from Kitchen Waste: More than 60% of students stay in hostels at Jnanashakt Campus of University. There are four hostels working and more are under construction. Generation of kitchen waste generation to the tune of 30 – 40kg/day is common. This waste used to be taken away to serve as cattle feed. However, AWU thought of converting the kitchen waste for generation of methane by fermentation which can be hostels kitchen. Accordingly, anerobic reactor with a capacity of 4 cubic meters was established and all the decomposable waste generated is used as feed stock. Methane gas thus generated is used in hostel as fuel and thus helping in reduced consumption of LPG, equivalent of about 25kg/month.

4.2 Paper Recycling Unit: With twin objectives of enhancing the skill sets and also to recycle the waste paper, this unit was established. Used paper is most common waste product from the offices of University. Major portion of it is sold off to recyclers while a portion of it is collected and recycled to into products like files, greeting cards. During the process of recycling, a communication to the general community is also made so that interested persons can acquire the skill sets for recycling the paper.

4.3 Vermicompost:

University has sprawling campus of more than 100 acres and through the afforestrationprogram, most of the area was planted with native species. Litter from these trees, particularly the avenue trees, is collected for vermicomposting and the compost is used as manure in the university nursery and also for its gardens.

Part C – Water Conservation Measures

Comparatively, the University is established recently and there is significant demand for the construction of required physical infrastructure and accordingly, there are several building construction works progressing in the campus. Currently, to cater to the water requirement for the construction activities, University is drawing water VIjayapura Municipal Corporation system. However, plans are afoot to shit to underground water table for the university requirements after the completion of construction activities. Present water requirement is given in Table 9.

Table 9: Details of Water Consumption (in lakh liters)

Year	2015-16	2016-17	2017-18	2018-19
Jan	60.36	75.29	80.17	60.23
Feb	48	71.27	78.04	72.35
March	65.97	55.09	74.49	95.97
April	41.09	70.65	88.28	104.01
May	71.69	80.45	89.75	89.1
June	59.37	77.15	79.34	80.23
July	71.33	75.97	75.35	60.62
August	37.85	36.63	60.26	32.67
Sept	52.45	45.29	59.15	44.58
Oct	58.18	63.53	69.89	60.87
Nov	68.47	65.65	69.69	61.69
Dec	55.35	71.15	77.09	67.63

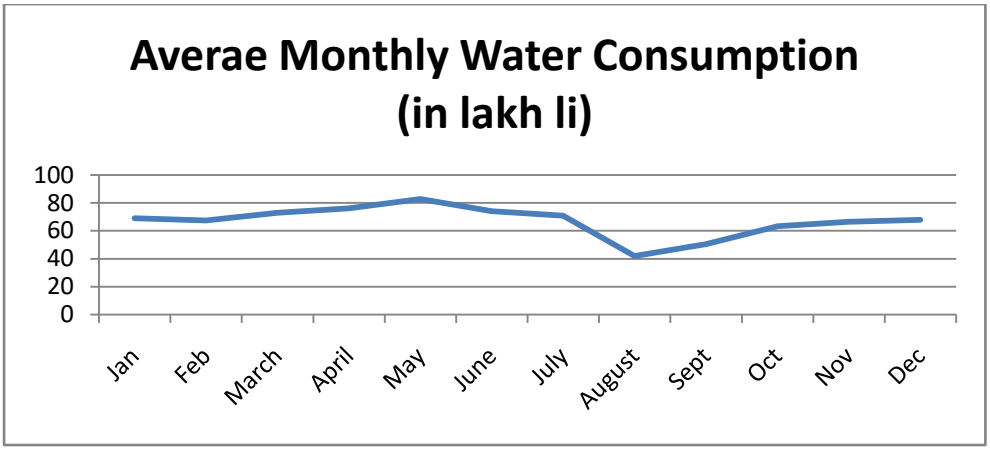

Fig 3: Water Consumption Details

5.1 Water Conservation Measures

Geology of the University campus is undulating with rocky surface that encourages faster runoff of rainwater and limited scope for groundwater table recharge. To increase the recharge of groundwater and to prevent soil erosion, suitable places were identified to build the checkdams to reduce the runoff and to conserve the top soil cover. Taking advantage of natural topography of area, several small percolation ponds were created by erecting bunds. As of now, in the campus about 15213 M^3area of percolation ponds were created. In addition, all the buildings have rainwater conservation measures in-built in their plans.

Part D - Green Initiatives

6 Aforestation

Area earmarked for the university campus initially was uneven, rocky outcrop with very little top soil cover and no vegetation with exception of seasons grasses. Over the years, vigorous efforts were made to increase the vegetation cover of the campus. Care was taken to give priority for the native species and a mix of fruit bearing trees like Singapore Cherry, Accasis species to promote fauna and also to increase organic content of soil. By building checkdams, vulnerability of top soil was reduced and percolation ponds were constructed in such a manner that the top soil is collected there and silt can be collected during dry months. Due to care and attention given to the young saplings, the survival rate recorded is more than 80 per cent.

Summary and Way Forward:

Karnataka State Akkamahadevi Women's University is youngest university in the state, even then, it has became a leader in terms of planning and implementing the ecofriendly measures such as Solar PV, Solar thermal, Solar Lightening, Methane from kitchen waste, paper recycling etc. and in the process, carbon foot prints of university are minimal. Further, in the years to come, University has plans to increase the share of renewable energy to decrease the dependence on grid based electricity through increasing the roof-top PV units. Regarding fossil fuel for transportation, it is envisaged that in couple of years, the energy plantation of University wil increase the supply feedstock to a level that significant portion of university vehicles can shift over to biodiesel.

K. Lenin Babu
(K. Lenin Babu)
Mob: 9343007438
Centre for Decentral Management Studies (CDMS)
227, KAVYA' 6th block, Sir M V. Layout,
Sri Veerabhamma Temple Road, Ullal,
Bangalore 560 056

Criterion VII–Institutional Values and Best Practices (100)

Key Indicator - 7.1 Institutional Values and Social Responsibilities (50)

Environmental Consciousness and Sustainability

Report on Green Audit-2019-20

Prepared by:

Dr. K. Lenin Babu
Fellow
Center for Resource Management Studies
#227, Sri Vekaliamma Temple Road,
6th Block, SIR M.V. Layout
Ullal, BENGALURU – 560110
E Mail: klenin2011@gmail.com/crmstudies@gmail.com
Mob: 9343007438

Feb 2021

List of Contents

Table of Contents

List of Tables

List of Boxes

List of Figures

1. Introduction:

India has one of the largest and diverse educational systems in the world. At the same time, it has also led to widespread concern on the quality and relevance of the higher education. To address these concerns, the National Policy on Education (NPE, 1986) and the Programme of Action (PoA, 1992) spelt out strategic plans for the policies, advocated the establishment of an independent National accreditation agency. Consequently, the National Assessment and Accreditation Council (NAAC) was established in 1994 as an autonomous institution of the University Grants Commission (UGC) with its head quarter in Bengaluru. The mandate of NAAC is in making quality assurance an integral part of the functioning of Higher Education Institutions (HEIs). The NAAC has been carrying out the process of quality Assessment and Accreditation (A&A) of HEIs over the past two decades. The A&A process is being revised and attempts to enhance the quality of higher education and focus is on quality culture of the institution In line with conviction that quality concerns are institutional,NAAC has placed greater importance on self-evaluation process and the subsequent preparation of the Self Study Report (SSR) to be submitted to NAAC.

NAAC has evolved a seven point criteria to represent the core functions and activities of a HEI, viz., 1. Curricular Aspects, 2.Teaching-Learning and Evaluation, 3.Research, Innovations and Extension, 4.Infrastructure and Learning Resources, 5.Student Support and Progression, 6.Governance, Leadership and 7.Management, Institutional Values and Best Practices. Under each Criterion, a few Key Indicators are identified and are further delineated as Metrics which actually elicit responses from the HEIs.

In Criterion VII: - Institutional Values and Best Practices, NAAC has laid out framework of the functional niche of HEI in changing national and global contexts an educational institution. NAAC has stressed on social responsibility of HEI to be proactive in their efforts towards development in the larger contexts and called for every institution to be responsive to at least a few pressing issues such as gender equity, environmental consciousness and sustainability, inclusiveness and professional ethics, however, the way it addresses the issues will always be unique. Further, NAAC has suggested some meaningful practices pertinent to such situations that are evolved internally by the institution leading to improvements in its functioning – academic, administrative or organizational, - be recognized as a “best practices”. Over a period of time, due

to such unique ways of functioning, each institution develops distinct characteristic which may become its recognizable attribute. NAAC has earmarked three Key Points in Criterion VII, viz., a) Institutional Values and Social Responsibilities, b) Best Practices and c) Institutional Distinctiveness. Environmental Consciousness is also given priority by NAAC in its guidelines and made the documentation of environmental management practices adopted at University as part of Self Assessment Report (SAR). NAAC has recommended a framework for the documentation purposes and this report is prepared accordingly for the Akkamahadevi Women's University, covering the issues pertaining to the environmental consciousness.

2. Karnataka State Akkamahadevi Women's University

Formerly known as Karnataka State Women's University, Akkamahadevi Women's University (AMU) established in 2003 in the city of Vijayapura (Formerly Bijapur), is the only University in Karnataka dedicated exclusively for women's education. It has been recognized under 2(f) and 12(B) of the UGC Act. It has been accredited 'B' Grade by NAAC. One hundred and thirty seven women's colleges of Karnataka, are affiliated to this University, in addition to Post Graduate Centers at Sindhanoor and Udutadi, and Extension Center at Mandya. The University offers various UG programmes leading to Bachelor's degree in Arts, Business Administration, Computer Applications, Commerce, Education, Fashion Technology, Home Science, Physical Education, Science and Social Work. It also offers 32 P G Courses, P G Diploma and Certificate Courses in the Faculties of Arts, Commerce and Management, Social Sciences, Science and Technology and Education. At its Jnanashakti Campus, the University has initiated and implemented several ecofriendly measures and this report provides a brief description of these measures. This report, structured according to the Criterion VII: - Institutional Values and Best Practices of National Assessment and Accreditation Council (NAAC) Institutional Accreditation: Manual for Self Study Report Universities, 2017.

3 Environmental Consciousness and Sustainability

3.1 Energy Concerns:

The University has implemented several measures to harness renewable energy sources such as Solar radiation, biofuels. It has installed the infrastructure like solar PV Units, Solar street lamps, biodiesel plants and methane gas plant from kitchen waste etc. The details of facilities for an alternate source of energy are given in the box 1.

Box 1: Different Sources of Renewable Energy

Sl	Energy Facility	Existing	Details of Photograph
1	Solar Energy	Yes	Plate 1
2	Biodiesel Plant	Yes	
3	Wheeling to the Grid	Yes	
4	Sensor-based energy conservation	No	
5	Use of LED bulbs/power-efficient equipment	Yes	

Options:

A.	Any 4 or all of the above	Yes

Any other relevant information

Energy Conservation: Light Emitting Diode (LED) bulbs or lighting products produce light approximately 90% more efficiently than incandescent light bulbs. LED lighting is more efficient, versatile, and lasts longer and "directional" light sources. That means LEDs are able to use light and energy more efficiently in a multitude of applications. In a University campus, a significant portion of total energy is used for lightening purposes and adoption of LED provides a measure to reduce the electricity consumption and the KSAWU has opted for LED lighting devices and year wise progress in replacing the traditional lighting systems with LED over the years is given in Table1. More than 80 per cent of lighting systems are of LED type. By shifting to the LED lighting sources, University has not only reduced its electricity bill but also the actual consumption of electricity thus, contributing to sustainable development.

Table 1: Replacing Conventional Bulbs by LED lighting systems (%)

Sl. No.	Year	2016	2017	2018	2019	2020
1	January	58	55	69	82	84
2	February	61	54	65	80	81
3	March	60	50	62	84	86
4	April	56	53	66	74	75
5	May	53	51	60	81	82
6	June	51	54	71	78	80
7	July	50	56	76	82	84
8	August	52	58	73	81.5	83

9	September	56	53	75	83	84
10	October	58	59	71	80	85
11	November	58	61	78	77	79
12	December	57	58	78	81	84

Renewable Energy Generation: Solar Energy for Lighting Purposes

In addition to the power generation, University has opted for harnessing the solar energy for the lighting of common areas. Accordingly, it has initiated measures to replace the conventional streetlights with that of solar street lights. Details of Solar street lights are given in Table 2 and Plate 2.

Table 2: Harvesting Sun Light for Street Lighting

Year	2015	2016	2017	2018	2019	2020
Jan	150	150	150	150	150	150
Feb	150	150	150	150	150	150
March	150	150	150	150	150	150
April	150	150	150	150	150	150
May	150	150	150	150	150	150
June	150	150	150	150	150	150
July	150	150	150	150	150	150
August	150	150	150	150	150	150
Sept	150	150	150	150	150	150
Oct	150	150	150	150	150	150
Nov	150	150	150	150	150	150
Dec	150	150	150	150	150	150

a) Roof Top Solar Panel

b) Solar Panel

c) Connection to Grid

d) Oil Extraction Unit

e) Biodiesel Plant

g) Vermi-compost Plant

Plate 1: Different Modes of Energy Conservation

Plate 2: Solar Powered Street Lamps

3.2: Waste Management

Describe the facilities in the Institution for the management of the following types of degradable and non-degradable waste (within 500 words)

Due to its nature of the function, University generates primarily biodegradable waste, falling into three broad categories, viz., a) paper waste generated from administration and examination sections of the university, b) organic/ food waste generated in the student hostels, and c) litter waste from the vegetation in the University campus. Other types of waste, such as biomedical waste, radioactive waste are not generated in the university. For each stream of waste, University has developed a system to recycle the waste to the extent possible and details are given below.

- **Solid Waste Management**:Significant amount of paper waste is generated from administrative and examination sections. General practice is to dispose of this material by burning it. But the University has opted for recycling and a Paper Recycling Unit(PRU) was established within the Women's Technology Part in the University Campus. It was established with dual purposes, viz., a) to recycle the paper waste that was generated within the campus and b) to train the women about the paper recycling process. The PRUhas a capacity to process about 15kg/day of used papers, note-sheets etc, and recycle the same into various products like files, greeting cards etc., The produce is sufficient to cater to the needs of University and also for its P.Gcentres located elsewhere in Mandya and Bellary districts. In the normal course of time, the unit produced about 60 files in a month (Plate 3).
- **Litter waste**:A significant quantity of leaf litter is generated in the University campus. To recycle the same and to enrich the scant soil cover in the campus, a vermi-compost unit was installed. Most of the leaf litter collected was converted into compost through this unit and is used in the university nurseries and gardens. By extensive use of vermi-compost, use of chemical fertilizers has been significantly reduced in the university campus (Plate 1g).
- **Liquid waste management**:Generation of liquid waste is primarily from the student hostels. University campus is located on a rocky area and is away from the Vijayapura City Underground Drainage Network, hence wastewater waster is let it into the ground.
- 7.1.3.4 Biomedical, Electronic and Hazardous chemicals and radioactive waste management: Not applicable /Negligible

Provide web link to

- Relevant documents like agreements/MoUs with Government and other approved agencies
    - Lenin Babu, Kamepalli., 2015. Karnataka State Women's University to be an energy-surplus campus by harnessing renewable energies. CURRENT SCIENCE, VOL. 109, NO. 4, 25 AUGUST 2015. http://www.indiaenvironmentportal.org.in/files/file/energy-surplus%20campus%20Karnataka.pdf
    - Lenin Babu, 2017. Step-upbiofuelR&D for energy security. Deccan Herald. Sept 13, 2017. https://www.deccanherald.com/content/633016/step-up-biofuel-rd-energy.html

a) Recycling Unit

c) Waste paper collected

b) Recycling Machinary

d) Different end products

Plate 3: Solid Waste Recycling

3.3 Water Conservation Measures

Water conservation facilities available in the University

Water Conservation Measures: Comparatively, the University is established recently and there are several constructionsof buildings is going on in the campus for developing required physical infrastructure. To cater the water requirement for the construction activities, University is drawing water Vijayapura Municipal Corporation system. However, plans are afoot to shift to groundwater table for the university requirements after the completion of construction activities. Present water requirement is given in Table3 and Fig 1.

Table 3: Details of Water Consumption (in lakh litres)

Year	2015	2016	2017	2018	2019	2020
Jan	60.36	75.29	80.17	60.23	75.34	79.30
Feb	48	71.27	78.04	72.35	32.086	69.9
March	65.97	55.09	74.49	95.97	57.14	101.8
April	41.09	70.65	88.28	104.01	93.80	-
May	71.69	80.45	89.75	89.1	67.00	130.50
June	59.37	77.15	79.34	80.23	66.60	64.90
July	71.33	75.97	75.35	60.62	43.10	42.70
August	37.85	36.63	60.26	32.67	44.70	26.10
Sept	52.45	45.29	59.15	44.58	65.30	27.70
Oct	58.18	63.53	69.89	60.87	51.70	32.70
Nov	68.47	65.65	69.69	61.69	42.60	22.40
Dec	55.35	71.15	77.09	67.63	29.85	56

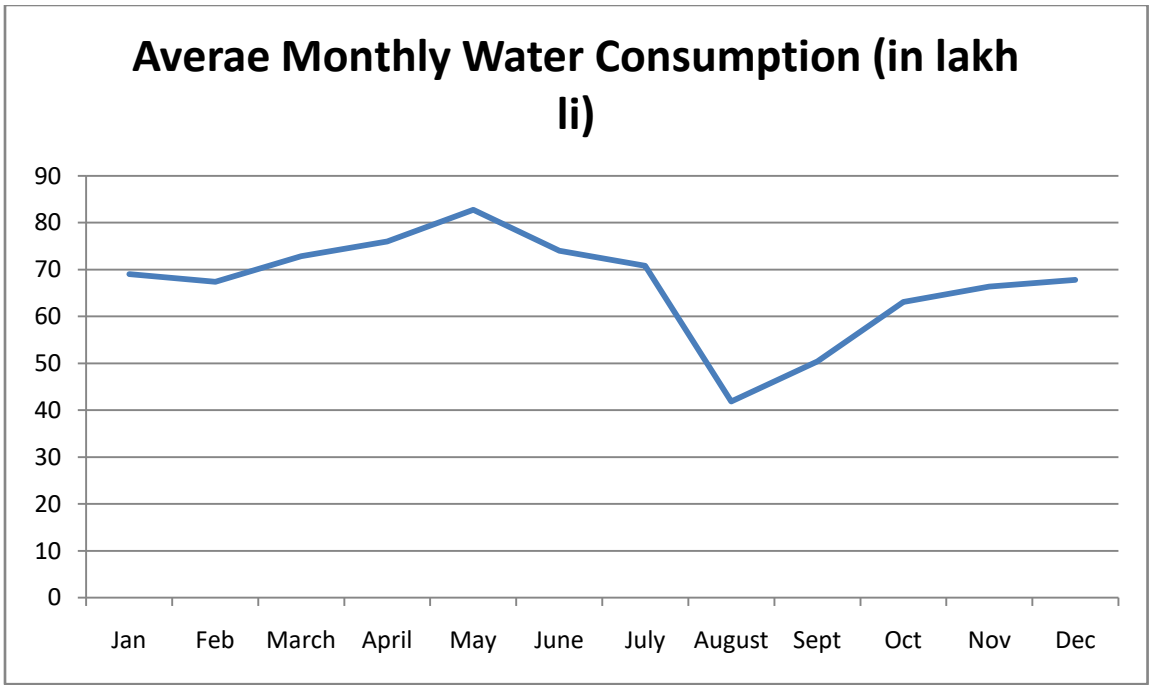

Fig 1: Water Consumption Details

Box 2: Water Conservation Measures

Sl.No.	Facility	Available
1	Rainwater harvesting	Yes.
2	Borewell /Open well recharge	Yes
3	Construction of tanks and bunds	Yes
4	Wastewater recycling	Yes
5	Maintenance of water bodies and distribution system in the campus	Yes

Upload:

- Geotagged photographs/videos of the facilities**(PLATE 4)**

Water Conservation Measures:

Geology of the University campus is undulating with a rocky surface that encourages fast runoff of rainwater and limited scope for groundwater table recharge. To increase the recharge of groundwater and to prevent soil erosion, suitable places were identified to build the check dams to reduce the runoff and to conserve the topsoil cover. Taking advantage of the natural topography of the area, several small percolation ponds were created by erecting bunds. As of now, in the campus, about 15,213 M^3area of percolation ponds were created. In addition, all the buildings have rainwater conservation measures in-built in their plans (Plate 4).

a) Runoff Storage Ponds

b) Rejuvenation of ponds

c)Rainwater Storage Structures

d) Landscaping

Plate 4: Water Conservation Measures

3.4 Green Concerns

Green campus initiatives:The institutional initiatives for greening the campus are as follows:

Box 3: Green Initiatives

Sl No	Initiatives	Details
1	Restricted entry of automobiles	NA
2	Use of Bicycles/ Battery-powered vehicles	NA
3	Pedestrian Friendly pathways	NA
4	Ban on use of Plastic	Yes
5	landscaping with trees and plants	Yes

Options:

Two of the above Initiatives are implemented in the University Campus

Upload

- Geotagged photos/videos of the facilities
- Various policy documents/decisions circulated for implementation

Any other relevant documents

Aforestationarea earmarked for the university campus initially was uneven, a rocky outcrop with very little topsoil cover and no vegetation with exception of seasons grasses. Over the years, vigorous efforts were made to increase the vegetation cover of the campus. Care was taken to give priority for the native species and a mix of fruit-bearing trees like Singapore Cherry, Acacia species to promote fauna and also to increase the organic content of the soil. By building check dams, the vulnerability of topsoil was reduced and percolation ponds were constructed in such a manner that the topsoil is collected there and silt can be collected during dry months. Due to care and attention are given to the young saplings, the survival rate recorded is significant.

Quality audits on environment and energy are regularly undertaken by the institution (5)

The institutional environment and energyinitiatives are confirmed through the following

Box 4: Quality Audits

Sl No	Imitative	Details
1	Green audit	Yes
2	Energy audit	NA
3	Environment Audit	NA
4	Clean and green campus recognition/awards	NA
5	Beyond the campus environmental promotional activities	Yes (Plate 5)

Options:

Two of the above initiatives are implemented in the University

Upload:

- Reports on environment and energy audits submitted by the auditing agency

Plate 5: Promotion of Biodiesel (File Photos)

Barrier Free and Disabled friendly Environment: The University has taken several measures to develop a barrier free environment and to encourage the disabled by developing a disabled-friendly environment in the campus Box 4.

Box 4: Barrier Free***Environment***

Sl.No.	Barrier-free environment	Availability
1	The built environment with ramps/lifts for easy access to classrooms.	Yes
2	Disabled-friendly washrooms	No
3	Signage including tactile path, lights, display boards and signposts	No
4	Assistive technology and facilities for persons with disabilities (*Divyangjan*) accessible website, screen-reading software, mechanized equipment	Yes
5	Provision for enquiry and information : Human assistance, reader, scribe, soft copies of reading material, screen reading	Yes

Options:

Three of the above initiatives are implemented in the University

Upload:

- Geotagged photographs/videos of the facilities
- Policy documents and information brochures on the support to be provided
- Details of the Software procured for providing the assistance

Any other relevant information

Carbon Sequestration in University Campus

A key feature of a tree is carbon sequestration – the process of capturing carbon dioxide, a greenhouse gas (GHG) from the atmosphere and converting into biomass and storing in organic form for long-term. This process helps remove the GHGs and slower the global warming process. The rate of carbon sequestration depends on the growth characteristics of the tree species, the density of its wood, microenvironment of the plant. A Census of plant species distribution in the University campus along with their Diameter at Breast Height (DBH) was conducted to estimate the approximate carbon sequestration levels due to the a forestation measures undertaken by the University. Tree census revealed that there are about 17 species with 1,593 individuals on the campus. The Vijayapura district comes under as Deccan plain. The University campus experiences a semi-arid climate with extreme summers. It enjoys a climate with hot summers and chilly winters. Incidence of drought occurs due to inadequate and erratic distribution of rainfall in space and time. The dust storms and severe heat waves are common

during April and May months. The district experiences the temperature variation between 20°C and 42°C. The temperature begins to rise by the end of February, till the month of May, which is the hottest month. Coldest months are December and January (Champion and Seth, 1968)The field observations indicated that the University campus area is devoid of tall or big trees due to barren rocky/stony wasteland. The soil is typically laterite and rock type, which is rich in Iron oxide. The typical laterite soil is porous and claylike hence it has very low water holding capacity. Thus it is not congenial for fast tree growth in the campus.

The floristic diversity information provides a complete picture of different species available in various seasons and associated faunal diversity. Existing botanical inventory of the university campus revealed that about 257 plant species belonging to 219 genera and 68 families have been documented (Kambhar*et al*., 2014). Of them, the families like Poaceae, Fabaceae, Caesalpiniaceae found dominant in the campus. Among these, *Salvia aegyptica* L., a member of Lamiaceae was rarely distributed in the University campus (Singh, 1988). Subsequently, the species of *Sennaitalica*Mill.subsp.*italica*, belongs to family Fabaceae has been reported as a new distributional for Karnataka State (Kambhar&Kotresha, 2020). It has been indicating that the present collection is overlapping of two subspecies of *Sennaitalica* in Karnataka.Thecarbon sequestration potential in the campus was calculated and summarized in Table 5 and as can be noticed, the present tree cover is able to capture more than 360 tonnes/year. As the green cover is increasing with every passing year, it is expected that the campus would soon become net-zero emissions (Alexander *et al*., 1986; DeWald*et al*., 2013 &Toochi, 2018).

Table 5: Details of Carbon Sequestration

Sl. No.	The scientific name of the tree	Vernacular name	Number of trees	Average GBH (inch)	Average Height (feet)	Organic carbon (kg/tree /year
01	Acacia nilotica (L.) Willd. ex Del.	Jalimara	1	12	13	4.23
02	Albizialebbeck (L.) Benth.	--	2	11	18	4.9
03	AzadirachtaindicaA.Juss.	Bevin mara	950	16.8	18	91.97
04	Bauhinia purpurea L.	Basavanpada	8	14	15	6.55
05	DalbergiasissooRoxb. ex DC.	Sisam	550	14.6	15	57.88
06	Delonixregia (Boj. ex Hook.f.) Raf.	Kempugulmohar	15	25	20	62.36
07	Erythrinavariegata L.	--	1	15	12	6.10

Sl. No.	The scientific name of the tree	Vernacular name	Number of trees	Average GBH (inch)	Average Height (feet)	Organic carbon (kg/tree /year
08	Eucalyptus globulusLabill.	Nilgiri	8	11	38	10.40
09	Ficusreligiosa L.	Aralimara	6	14.7	15	7.33
10	Leucaenaleucocephala (Lamk.) de Wit	--	30	13.9	30	13.11
11	Mangiferaindica L.	Mavinmara	2	9	20	3.66
12	Peltophorumpterocarpum (DC.) Backer and Heyne	--	8	20	25	22.62
13	Pithecellobiumdulce (Roxb.) Benth.	Seemehunase	1	15	20	10.18
14	Pongamiapinnata (L.) Pierre	HOngemara	2	30	20	40.73
15	Simaroubaglauca DC.		3	14.3	15	6.94
16	Tamarindusindica L.	Hunasemara	2	15	15	7.63
17	Terminaliacatapa L.	Badamigida	4	12	14	4.56
		Total	**1593**	**Total carbon sequester**		**361.15**

With respect to the faunal diversity, 14 species of birds have been documented belonging to 13 genera from the university campus (Table 6).

Table 6: Avifaunal diversity in KSAW University, Vijayapur

Sl.No	Common name	Scientific name	Family
1.	Red-wattled Lapwing	Vanellusindicus	Charadriidae
2.	Common babbler	Turdoides caudate	Leiothrichidae
3.	Intermediate Egret	Ardeaintermedia	Ardeidae
4.	Indian Pond-Heron	Ardeolagrayii	Ardeidae
5.	Brahminy Starling	Sturniapagodarum	Sturnidae
6.	White-browed Wagtail	Motacillamaderaspatensis	Motacillidae

7.	Rock Pigeon	Columba livia	Columbidae
8.	Black Drongo	Dicrurusmacrocerus	Dicruridae
9.	Red-vented Bulbul	Pycnonotuscafer	Passerines
10.	Indian Robin	Copsychusfulicatus	Muscicapidae
11.	Purple-rumped Sunbird	Leptocomazeylonica	Nectariniidae
12.	Scaly-breasted Munia	Lonchurapunctulata	Estrildidae
13.	House sparrow	Passer domesticus	Passeridae
14	Indian crow	Corvussplendens	Corvidae

References:

Alexander, C., Saucier, JR. and Henry, MW.**1986**. Total-tree weight, stem weight, and volume tables for hardwood species in the southeast. Georgia Forest Research Paper GF-RP-60.Georgia Forestry Commission.44 p.

Champion, HG. and Seth, SK. **1968.**A Revised Forest Types of India. Manager of Publications, Government of India, Delhi.

DeWald, S., Josiah, S., and Erdkamp, B. **2013**. Heating With Wood: Producing, Harvesting and Processing Firewood.University of Nebraska—Lincoln Extension, Institute of Agriculture and Natural Resources.

KambharSV.,Mirji B., Egappagol L. &Rachagond S. **2014**. Flowering plants of Karnataka State Women's University, Jnanashakti, Torvi Campus, Bijapur and its adjoining area. Research & Reviews: Journal of Life sciences 4(2): 17-27.

KambharSV. &Kotresha, K. 2020. *Sennaitalica*Mill.subsp. *italica* (Fabaceae; Caesalpinioideae): An Overlooked species from Karnataka State, India. Indian Forester, 146(5):461-462.

Singh, NP. **1988**. Flora of Eastern Karnataka. Vol. 1&2.Mittal Publications, New Delhi.

Toochi, EC. **2018**. Carbon sequestration: how much can forestry sequester CO2?. Forest Res EngInt J. 2(3):148-150. DOI:10.15406/freij.2018.02.00040.

Key Indicator - Best Practices (30)

Describe two best practices successfully implemented by the Institution as per NAAC format provided in the Manual.

4. Best Practice I:

4.1. Title of the Practice

Harnessing Renewable Energy at University Campus

Objectives of the Practice: Karnataka state is energy deficient, it needs to procure energy from Gujarat, Himachal and other energy surplus states. Being located in relatively socio-economically backward region of the state, intermittent power cuts are normal and the problem used to be high in summer months. Hence, considering its locational advantage of the solar rich area, considered harnessing the renewable energies as a supplementary source of energy. Otherwise, electric supply with intermittent breaks used to disturb the students in residential hostels.

The Context (in about 150 words)Being a nascent University, there is a dearth of in-house scientific and technical knowledge and this was a major problem. However, with the help of government agencies concerned with renewable energies, the University could select the most suitable technology to suit is purpose. Initially, the University has opted for Roof-top PV unit of about 10 KV and inspired by its performance, University has opted for the solar-powered street lamps. On the other hand, energy demand is increasing year after.

The Practice (400 words) The success of the 10KW Solar PV plant has encouraged the University to consider enlarging the capacity of solar PV technology. With help of Government of India, the University has made plans to harness solar radiation on rood top of two buildings, Science and Social science blocks. The requirement of energy in the campus for lighting and heating purposes, total energy requirement is given along with energy generated by Solar PV units are given in Tables 7to 9.

Table 7: Energy consumed (in KWh)

Sl. No.	Month	2019	2020
1	January	49888	54930
2	February	53584	21701
3	March	64608	54900
4	April	65195	53647
5	May	62137	40698
6	June	65737	41776
7	July	54997	34572
8	August	48336	26867
9	September	56916	27941
10	October	45763	38258
11	November	62176	38563
12	December	51807	39878

Table8: Energy Requirement (KWH)

Sl. No.	Month	2019 - Lighting	Heating	2020-Lighting	Heating
1	January	18800	2600	20600	2900
2	February	18600	3000	20600	2900
3	March	18600	2800	60610	1200
4	April	18900	2800	60650	1300
5	May	18800	2500	60700	1100
6	June	18800	2700	20700	3000
7	July	18800	2600	20180	2900
8	August	18900	2600	20080	2800
9	September	18900	2800	20000	3000
10	October	19000	2600	21000	3000
11	November	18000	2800	20400	3000
12	December	18990	2800	20800	3000

Evidence of Success is the amount of electricity generated and fed to the grid. The details of electricity uploaded to the grid are given in the Table 9.

Table 9: Energy Generated by Solar PV

Sl. No.	Month	2019	2020
1	January	23298	21520
2	February	21444	21701
3	March	26028	21890
4	April	29085	24007
5	May	26027	24568
6	June	26717	26826
7	July	17796	20562
8	August	19176	16637
9	September	17156	14561
10	October	19593	18584
11	November	22566	20953
12	December	18397	22178

4.2: Methane from Kitchen Waste

More than 60% of students stay in hostels at Jnanashakt Campus of University. There are four hostels working and more are under construction. Generation of kitchen waste generation to the tune of 30 – 40kg/day is common. This waste used to be taken away to serve as cattle feed. However, KSWU thought of converting the kitchen waste for the generation of methane by fermentation which can be hostels kitchen. Accordingly, the anaerobic reactor with a capacity of 4 cu. meter was established and all the decomposable waste generated is used as feedstock. Methane gas generated is used in the hostel and thus helped in reduced use of LPG, an equivalent of about 25kg/month.

4.3: Bio-Diesel from Oil Seeds

KSWU sought the help of Karnataka State Biofuel Board (KSBB) to seek Biofuel Demonstration in the campus. KSBB help was sought to establish plant with a capacity to generate 100li/month. At the same time, plantation activity was taken up in the University campus to ensure the supply of oilseeds. Neem is the most preferred species in this agro-climate zone (native and most common plant in this region). The supply chain was established to procure oil seeds from villages around to run the unit. An agreement was made with Karnataka State Forest Department to uplift 50% of biodiesel produced by the centre and remaining fuel to be used for the vehicle fleet of University. From its establishment till date, the Biofuel Center is working without any problems and its success has made University consider doubling the capacity of the Center. Further, increasing the crushing capacity would enable the university to tap the yield of the plantations within the university campus, b) to cater to a larger fleet of University vehicles.

Criterion VII–Institutional Values and Best Practices (100)

Key Indicator - 7.1 Institutional Values and Social Responsibilities (50)

Environmental Consciousness and Sustainability

Green Audit Report for the Year 2020-21

April 2021

List of Contents

Table of Contents

List of Tables

List of Boxes

List of Figures

1. Introduction:

India has one of the largest and diverse educational systems in the world. At the same time, it has also led to widespread concern on the quality and relevance of the higher education. To address these concerns, the National Policy on Education (NPE, 1986) and the Programme of Action (PoA, 1992) spelt out strategic plans for the policies, advocated the establishment of an independent National accreditation agency. Consequently, the National Assessment and Accreditation Council (NAAC) was established in 1994 as an autonomous institution of the University Grants Commission (UGC) with its head quarter in Bengaluru. The mandate of NAAC is in making quality assurance an integral part of the functioning of Higher Education Institutions (HEIs). The NAAC has been carrying out the process of quality Assessment and Accreditation (A&A) of HEIs over the past two decades. The A&A process is being revised and attempts to enhance the quality of higher education and focus is on quality culture of the institution In line with conviction that quality concerns are institutional, NAAC has placed greater importance on self-evaluation process and the subsequent preparation of the Self Study Report (SSR) to be submitted to NAAC.

NAAC has evolved a seven point criteria to represent the core functions and activities of a HEI, viz., 1. Curricular Aspects, 2.Teaching-Learning and Evaluation, 3.Research, Innovations and Extension, 4.Infrastructure and Learning Resources, 5.Student Support and Progression, 6.Governance, Leadership and 7.Management, Institutional Values and Best Practices. Under each Criterion, a few Key Indicators are identified and are further delineated as Metrics which actually elicit responses from the HEIs.

In Criterion VII: - Institutional Values and Best Practices, NAAC has laid out framework of the functional niche of HEI in changing national and global contexts an educational institution. NAAC has stressed on social responsibility of HEI to be proactive in their efforts towards development in the larger contexts and called for every institution to be responsive to at least a few pressing issues such as gender equity, environmental consciousness and sustainability, inclusiveness and professional ethics, however, the way it addresses the issues will always be unique. Further, NAAC has suggested some meaningful practices pertinent to such situations that are evolved internally by the institution leading to improvements in its functioning – academic,

administrative or organizational, - be recognized as a “best practices”. Over a period of time, due to such unique ways of functioning, each institution develops distinct characteristic which may become its recognizable attribute. NAAC has earmarked three Key Points in Criterion VII, viz., a) Institutional Values and Social Responsibilities, b) Best Practices and c) Institutional Distinctiveness. Environmental Consciousness is also given priority by NAAC in its guidelines and made the documentation of environmental management practices adopted at University as part of Self Assessment Report (SAR). NAAC has recommended a framework for the documentation purposes and this report is prepared accordingly for the Akkamahadevi Women’s University, covering the issues pertaining to the environmental consciousness.

2. Karnataka State Akkamahadevi Women’s University

Formerly known as Karnataka State Women's University, Akkamahadevi Women’s University (AMU) established in 2003 in the city of Vijayapura (Formerly Bijapur), is the only University in Karnataka dedicated exclusively for women's education. It has been recognized under 2(f) and 12(B) of the UGC Act. It has been accredited 'B' Grade by NAAC. One hundred and thirty seven women's colleges of Karnataka, are affiliated to this University, in addition to Post Graduate Centers at Sindhanoor and Udutadi, and Extension Center at Mandya. The University offers various UG programmes leading to Bachelor's degree in Arts, Business Administration, Computer Applications, Commerce, Education, Fashion Technology, Home Science, Physical Education, Science and Social Work. It also offers 32 P G Courses, P G Diploma and Certificate Courses in the Faculties of Arts, Commerce and Management, Social Sciences, Science and Technology and Education. At its Jnanashakti Campus, the University has initiated and implemented several ecofriendly measures and this report provides a brief description of these measures. This report, structured according to the Criterion VII: - Institutional Values and Best Practices of National Assessment and Accreditation Council (NAAC) Institutional Accreditation: Manual for Self Study Report Universities, 2017.

3 Environmental Consciousness and Sustainability

3.1 Energy Concerns

The University has implemented several measures to harness renewable energy sources such as Solar radiation, biofuels. It has installed the infrastructure like solar PV Units, Solar street lamps, biodiesel plants and methane gas plant from kitchen waste etc. The details of facilities for an alternate source of energy are given in the box 1.

Box 1: Different Sources of Renewable Energy

Sl	Energy Facility	Existing	Details of Photograph
1	Solar Energy	Yes	Plate 1
2	Biodiesel Plant	Yes	
3	Wheeling to the Grid	Yes	
4	Sensor-based energy conservation	No	
5	Use of LED bulbs/power-efficient equipment	Yes	

Options:

A.	Any 4 or all of the above	Yes

Any other relevant information

Energy Conservation: Light Emitting Diode (LED) bulbs or lighting products produce light approximately 90% more efficiently than incandescent light bulbs. LED lighting is more efficient, versatile, and lasts longer and "directional" light sources. That means LEDs are able to use light and energy more efficiently in a multitude of applications. In a University campus, a significant portion of total energy is used for lightening purposes and adoption of LED provides a measure to reduce the electricity consumption and the KSAWU has opted for LED lighting devices and year wise progress in replacing the traditional lighting systems with LED over the years is given in Table1. More than 80 per cent of lighting systems are of LED type. By shifting to the LED lighting sources, University has not only reduced its electricity bill but also the actual consumption of electricity thus, contributing to sustainable development.

Table 1: Per cent of LED Systems in 2020-21

Year/Month	2016-17 Base Year	2020-21
April	56	70
May	53	79
June	51	75
July	50	81
Aug	52	74
Sept	56	72
Oct	58	78
Nov	58	71
Dec	57	71
Jan	55	75
Feb	54	77
Mar	50	80
Average	54	75

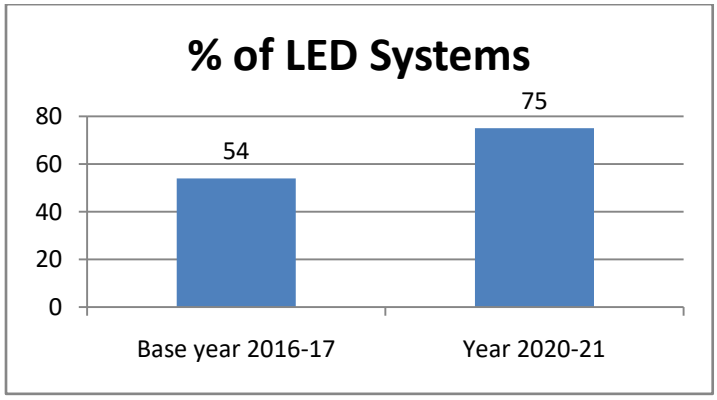

Fig : Per cent shift to LED systems from Base Year to 2020-21

Renewable Energy Generation: Solar Energy for Lighting Purposes

In addition to the power generation, University has opted for harnessing the solar energy for the lighting of common areas. Accordingly, it has initiated measures to replace the conventional streetlights with that of solar street lights. Details of Solar street lights are given in Table 2 and Plate 2.

Table 2: Solar Street Lights

Year	2020-21
April	150
May	150
June	150
July	150
August	150
Sept	150
Oct	150
Nov	150
Dec	150
Jan	150
Feb	150
March	150

Grid Connected Roof Top Solar PV Panels

University has installed grid connected roof top solar panels and elecctriicity generated is given in Table 3.

Table 3: Electricity Generation Details from Rooftop PV Panels

Month /Year	2020-21
April	24007
May	24569
June	26826
July	20562
Aug	16637
Sept	14562
Oct	18548
Nov	20954
Dec	22179

Jan	**21114**
Feb	**22316**
Mar	**25314**
Average	21466

a) Roof Top Grid Connected Solar Panel

Plate 2: Solar Powered Street Lamps

3.2: Waste Management

Describe the facilities in the Institution for the management of the following types of degradable and non-degradable waste (within 500 words)

Due to its nature of the function, University generates primarily biodegradable waste, falling into three broad categories, viz., a) paper waste generated from administration and examination sections of the university, b) organic/ food waste generated in the student hostels, and c) litter waste from the vegetation in the University campus. Other types of waste, such as biomedical waste, radioactive waste are not generated in the university. For each stream of waste, University has developed a system to recycle the waste to the extent possible and details are given below.

- **Solid Waste Management**: Significant amount of paper waste is generated from administrative and examination sections. General practice is to dispose of this material by burning it. But the University has opted for recycling and a Paper Recycling Unit (PRU) was established within the Women's Technology Part in the University Campus. It was established with dual purposes, viz., a) to recycle the paper waste that was generated within the campus and b) to train the women about the paper recycling process. The PRU has a capacity to process about 15kg/day of used papers, note-sheets etc, and recycle the same into various products like files, greeting cards etc., The produce is sufficient to cater to the needs of University and also for its P.G centres located elsewhere in Mandya and Bellary districts. In the normal course of time, the unit produced about 60 files in a month (Plate 3).

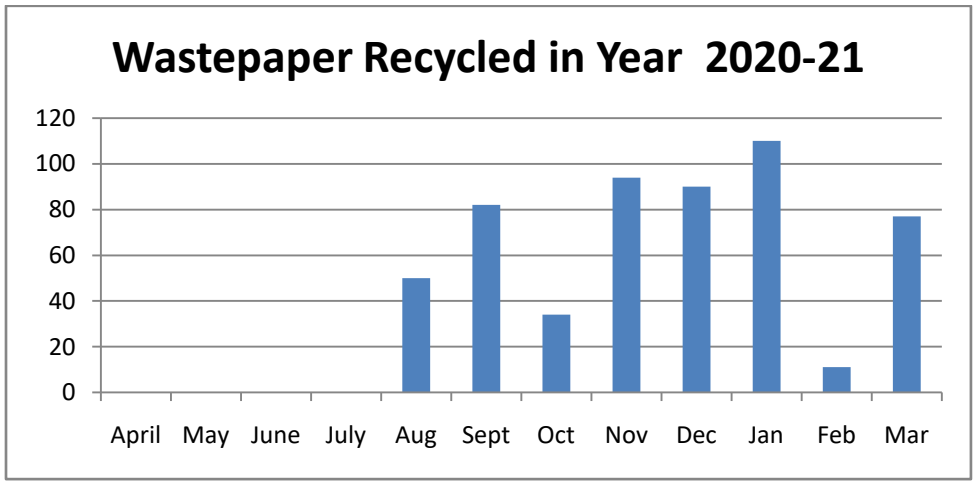

Fig 2: Wastepaper Recycling Details

Plate : Products from Paper Recycling Unit

- **Litter waste**: A significant quantity of leaf litter is generated in the University campus. To recycle the same and to enrich the scant soil cover in the campus, a vermi-compost unit was installed. Most of the leaf litter collected was converted into compost through this unit and is used in the university nurseries and gardens. By extensive use of vermi-compost, use of chemical fertilizers has been significantly reduced in the university campus (Plate 1g).

Plate : Vermicompost Unit for Litter Recycling

- **Liquid waste management**: Generation of liquid waste is primarily from the student hostels. University campus is located on a rocky area and is away from the Vijayapura City Underground Drainage Network, hence wastewater waster is let it into the ground.
- 7.1.3.4 Biomedical, Electronic and Hazardous chemicals and radioactive waste management: Not applicable /Negligible

Provide web link to

- Relevant documents like agreements/MoUs with Government and other approved agencies
    - Lenin Babu, Kamepalli., 2015. Karnataka State Women's University to be an energy-surplus campus by harnessing renewable energies. CURRENT SCIENCE, VOL. 109, NO. 4, 25 AUGUST 2015. http://www.indiaenvironmentportal.org.in/files/file/energy-surplus%20campus%20Karnataka.pdf
    - Lenin Babu, 2017. Step-upbiofuelR&D for energy security. Deccan Herald. Sept 13, 2017. https://www.deccanherald.com/content/633016/step-up-biofuel-rd-energy.html

a) Recycling Unit

c) Waste paper collected

Plate 3: Solid Waste Recycling

3.3 Water Conservation Measures

Water conservation facilities available in the University

Water Conservation Measures: Comparatively, the University is established recently and there are several constructions of buildings is going on in the campus for developing required physical infrastructure. To cater the water requirement for the construction activities, University is drawing water Vijayapura Municipal Corporation system. However, plans are afoot to shift to groundwater table for the university requirements after the completion of construction activities. Present water requirement is given in Table 4 and Fig 3.

Table 4: Details of Water Consumption (in lakh litres)

	Base year (2016-17)	**2020-21**
April	70.65	90.85
May	80.45	130.5
June	77.15	64.9
July	75.97	42.7
Aug	36.63	26.1
Sept	45.29	27.7
Oct	63.53	32.7
Nov	65.65	22.4
Dec	71.15	56
Jan	80.17	68.9
Feb	78.04	82.1
Mar	74.49	82.9
Average	68.3	60.6

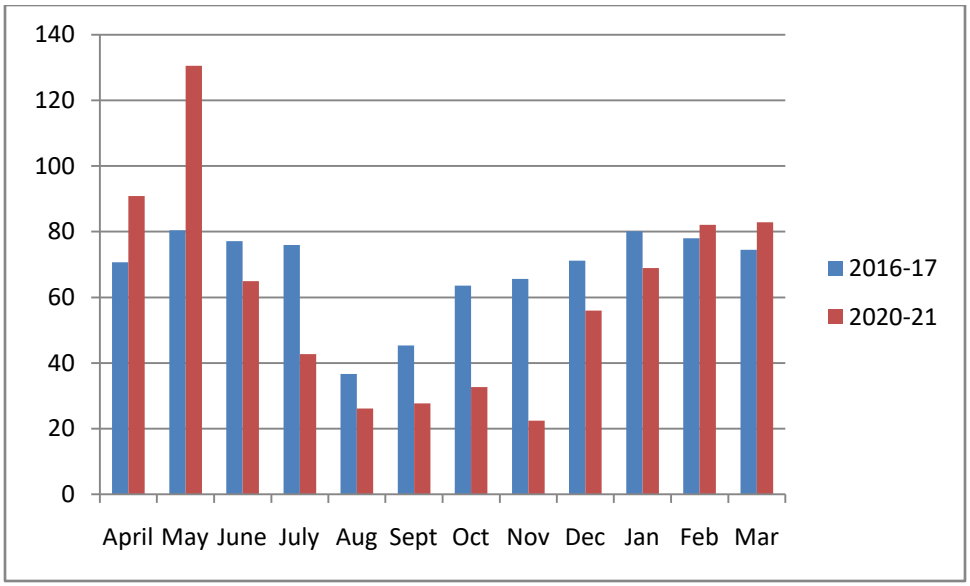

Fig 3: Water Consumption Details During Base year and 2020-21 (in lakh li)

Box 2: Water Conservation Measures

Sl.No.	Facility	Available
1	Rainwater harvesting	Yes.
2	Borewell /Open well recharge	Yes
3	Construction of tanks and bunds	Yes
4	Wastewater recycling	Yes
5	Maintenance of water bodies and distribution system in the campus	Yes

Water Conservation Measures:

Geology of the University campus is undulating with a rocky surface that encourages fast runoff of rainwater and limited scope for groundwater table recharge. To increase the recharge of groundwater and to prevent soil erosion, suitable places were identified to build the check dams to reduce the runoff and to conserve the topsoil cover. Taking advantage of the natural topography of the area, several small percolation ponds were created by erecting bunds. As of now, in the campus, about 15,213 M^3 area of percolation ponds were created. In addition, all the buildings have rainwater conservation measures in-built in their plans (Plate 4).

a) Runoff Storage Ponds b) Creation of Percolation Ponds

Plate 4: Water Conservation Measures

3.4 Green Concerns

Green campus initiatives: The institutional initiatives for greening the campus are as follows:

Box 3: Green Initiatives

Sl No	Initiatives	Details
1	Restricted entry of automobiles	NA
2	Use of Bicycles/ Battery-powered vehicles	NA
3	Pedestrian Friendly pathways	NA
4	Ban on use of Plastic	Yes
5	landscaping with trees and plants	Yes

Options:

Two of the above Initiatives are implemented in the University Campus

Upload

- Geotagged photos/videos of the facilities
- Various policy documents/decisions circulated for implementation

Any other relevant documents

Aforestation area earmarked for the university campus initially was uneven, a rocky outcrop with very little topsoil cover and no vegetation with exception of seasons grasses. Over the years, vigorous efforts were made to increase the vegetation cover of the campus. Care was taken to give priority for the native species and a mix of fruit-bearing trees like Singapore Cherry, Acacia species to promote fauna and also to increase the organic content of the soil. By building check dams, the vulnerability of topsoil was reduced and percolation ponds were constructed in such a manner that the topsoil is collected there and silt can be collected during dry months. Due to care and attention are given to the young saplings, the survival rate recorded is significant.

Quality audits on environment and energy are regularly undertaken by the institution (5)

The institutional environment and energy initiatives are confirmed through the following

Box 4: Quality Audits

Sl No	Imitative	Details
1	Green audit	Yes
2	Energy audit	NA
3	Environment Audit	NA
4	Clean and green campus recognition/awards	NA
5	Beyond the campus environmental promotional activities	Yes (Plate 5)

Options:

Two of the above initiatives are implemented in the University

Upload:

- Reports on environment and energy audits submitted by the auditing agency

Plate 5: Promotion of Biodiesel (File Photos)

Barrier Free and Disabled friendly Environment: The University has taken several measures to develop a barrier free environment and to encourage the disabled by developing a disabled-friendly environment in the campus Box 4.

Box 4: Barrier Free ***Environment***

Sl.No.	Barrier-free environment	Availability
1	The built environment with ramps/lifts for easy access to classrooms.	Yes
2	Disabled-friendly washrooms	No
3	Signage including tactile path, lights, display boards and signposts	No
4	Assistive technology and facilities for persons with disabilities (*Divyangjan*) accessible website, screen-reading software, mechanized equipment	Yes
5	Provision for enquiry and information : Human assistance, reader, scribe, soft copies of reading material, screen reading	Yes

Options:

Three of the above initiatives are implemented in the University

Upload:

- Geotagged photographs/videos of the facilities
- Policy documents and information brochures on the support to be provided
- Details of the Software procured for providing the assistance

Any other relevant information

Carbon Sequestration in University Campus

A key feature of a tree is carbon sequestration – the process of capturing carbon dioxide, a greenhouse gas (GHG) from the atmosphere and converting into biomass and storing in organic form for long-term. This process helps remove the GHGs and slower the global warming process. The rate of carbon sequestration depends on the growth characteristics of the tree species, the density of its wood, microenvironment of the plant. A Census of plant species distribution in the University campus along with their Diameter at Breast Height (DBH) was conducted to estimate the approximate carbon sequestration levels due to the a forestation

measures undertaken by the University. Tree census revealed that there are about 17 species with 1,593 individuals on the campus. The Vijayapura district comes under as Deccan plain. The University campus experiences a semi-arid climate with extreme summers. It enjoys a climate with hot summers and chilly winters. Incidence of drought occurs due to inadequate and erratic distribution of rainfall in space and time. The dust storms and severe heat waves are common during April and May months. The district experiences the temperature variation between 20°C and 42°C. The temperature begins to rise by the end of February, till the month of May, which is the hottest month. Coldest months are December and January (Champion and Seth, 1968)The field observations indicated that the University campus area is devoid of tall or big trees due to barren rocky/stony wasteland. The soil is typically laterite and rock type, which is rich in Iron oxide. The typical laterite soil is porous and claylike hence it has very low water holding capacity. Thus it is not congenial for fast tree growth in the campus.

The floristic diversity information provides a complete picture of different species available in various seasons and associated faunal diversity. Existing botanical inventory of the university campus revealed that about 257 plant species belonging to 219 genera and 68 families have been documented (Kambhar*et al*., 2014). Of them, the families like Poaceae, Fabaceae, Caesalpiniaceae found dominant in the campus. Among these, *Salvia aegyptica* L., a member of Lamiaceae was rarely distributed in the University campus (Singh, 1988). Subsequently, the species of *Sennaitalica* Mill.subsp. *italica*, belongs to family Fabaceae has been reported as a new distributional for Karnataka State (Kambhar&Kotresha, 2020). It has been indicating that the present collection is overlapping of two subspecies of *Sennaitalica* in Karnataka.The carbon sequestration potential in the campus was calculated and summarized in Table 5 and as can be noticed, the present tree cover is able to capture more than 360 tonnes/year. As the green cover is increasing with every passing year, it is expected that the campus would soon become net-zero emissions (Alexander *et al*., 1986; DeWald*et al*., 2013 &Toochi, 2018).

Table 5: Details of Carbon Sequestration

Sl. No.	The scientific name of the tree	Vernacular name	Number of trees	Average GBH (inch)	Average Height (feet)	Organic carbon (kg/tree /year
01	Acacia nilotica (L.) Willd. ex	Jalimara	1	12	13	4.23

Sl. No.	The scientific name of the tree	Vernacular name	Number of trees	Average GBH (inch)	Average Height (feet)	Organic carbon (kg/tree /year
	Del.					
02	Albizialebbeck (L.) Benth.	--	2	11	18	4.9
03	AzadirachtaindicaA.Juss.	Bevin mara	950	16.8	18	91.97
04	Bauhinia purpurea L.	Basavanpada	8	14	15	6.55
05	DalbergiasissooRoxb. ex DC.	Sisam	550	14.6	15	57.88
06	Delonixregia (Boj. ex Hook.f.) Raf.	Kempugulmohar	15	25	20	62.36
07	Erythrinavariegata L.	--	1	15	12	6.10
08	Eucalyptus globulusLabill.	Nilgiri	8	11	38	10.40
09	Ficusreligiosa L.	Aralimara	6	14.7	15	7.33
10	Leucaenaleucocephala (Lamk.) de Wit	--	30	13.9	30	13.11
11	Mangiferaindica L.	Mavinmara	2	9	20	3.66
12	Peltophorumpterocarpum (DC.) Backer and Heyne	--	8	20	25	22.62
13	Pithecellobiumdulce (Roxb.) Benth.	Seemehunase	1	15	20	10.18
14	Pongamiapinnata (L.) Pierre	HOngemara	2	30	20	40.73
15	Simaroubaglauca DC.		3	14.3	15	6.94
16	Tamarindusindica L.	Hunasemara	2	15	15	7.63
17	Terminaliacatapa L.	Badamigida	4	12	14	4.56
	Total		**1593**	**Total carbon sequester**		**361.15**

With respect to the faunal diversity, 14 species of birds have been documented belonging to 13 genera from the university campus (Table 6).

Table 6: Avifaunal diversity in KSAW University, Vijayapur

Sl.No	Common name	Scientific name	Family
1.	Red-wattled Lapwing	Vanellusindicus	Charadriidae
2.	Common babbler	Turdoides caudate	Leiothrichidae
3.	Intermediate Egret	Ardeaintermedia	Ardeidae
4.	Indian Pond-Heron	Ardeolagrayii	Ardeidae
5.	Brahminy Starling	Sturniapagodarum	Sturnidae
6.	White-browed Wagtail	Motacillamaderaspatensis	Motacillidae
7.	Rock Pigeon	Columba livia	Columbidae
8.	Black Drongo	Dicrurusmacrocerus	Dicruridae
9.	Red-vented Bulbul	Pycnonotuscafer	Passerines
10.	Indian Robin	Copsychusfulicatus	Muscicapidae
11.	Purple-rumped Sunbird	Leptocomazeylonica	Nectariniidae
12.	Scaly-breasted Munia	Lonchurapunctulata	Estrildidae
13.	House sparrow	Passer domesticus	Passeridae
14	Indian crow	Corvussplendens	Corvidae

References:

Alexander, C., Saucier, JR. and Henry, MW.**1986**. Total-tree weight, stem weight, and volume tables for hardwood species in the southeast. Georgia Forest Research Paper GF-RP-60.Georgia Forestry Commission.44 p.

Champion, HG. and Seth, SK. **1968.**A Revised Forest Types of India. Manager of Publications, Government of India, Delhi.

DeWald, S., Josiah, S., and Erdkamp, B. **2013**. Heating With Wood: Producing, Harvesting and Processing Firewood.University of Nebraska—Lincoln Extension, Institute of Agriculture and Natural Resources.

KambharSV.,Mirji B., Egappagol L. &Rachagond S. **2014**. Flowering plants of Karnataka State Women's University, Jnanashakti, Torvi Campus, Bijapur and its adjoining area. Research & Reviews: Journal of Life sciences 4(2): 17-27.

Kambhar SV. &Kotresha, K. 2020. *Sennaitalica* Mill.subsp. *italica* (Fabaceae; Caesalpinioideae): An Overlooked species from Karnataka State, India. Indian Forester, 146(5):461-462.

Singh, NP. **1988**. Flora of Eastern Karnataka. Vol. 1&2.Mittal Publications, New Delhi.

Toochi, EC. **2018**. Carbon sequestration: how much can forestry sequester CO2?. Forest Res EngInt J. 2(3):148-150. DOI:10.15406/freij.2018.02.00040.

Key Indicator - Best Practices (30)

Describe two best practices successfully implemented by the Institution as per NAAC format provided in the Manual.

4. Best Practice I:

4.1. **Title of the Practice: Harnessing Renewable Energy at University Campus**

Objectives of the Practice: Karnataka state is energy deficient, it needs to procure energy from Gujarat, Himachal and other energy surplus states. Being located in relatively socio-economically backward region of the state, intermittent power cuts are normal and the problem used to be high in summer months. Hence, considering its locational advantage of the solar rich area, considered harnessing the renewable energies as a supplementary source of energy. Otherwise, electric supply with intermittent breaks used to disturb the students in residential hostels.

The Context (in about 150 words) Being a nascent University, there is a dearth of in-house scientific and technical knowledge and this was a major problem. However, with the help of government agencies concerned with renewable energies, the University could select the most suitable technology to suit is purpose. Initially, the University has opted for Roof-top PV unit of about 10 KV and inspired by its performance, University has opted for the solar-powered street lamps. On the other hand, energy demand is increasing year after.

The Practice (400 words) The success of the 10KW Solar PV plant has encouraged the University to consider enlarging the capacity of solar PV technology. With help of Government of India, the University has made plans to harness solar radiation on rood top of two buildings, Science and Social science blocks. The requirement of energy in the campus for lighting and heating purposes, total energy requirement is given along with energy generated by Solar PV units are given in Tables 7 to 9.

Table 7: Energy Consumption Details (in KwH)

Sl. No.	Month	2019	2020
1	January	49888	54930
2	February	53584	21701
3	March	64608	54900
4	April	65195	53647
5	May	62137	40698
6	June	65737	41776
7	July	54997	34572
8	August	48336	26867
9	September	56916	27941
10	October	45763	38258
11	November	62176	38563
12	December	51807	39878

Table 8: Energy Requirement (KwH)

Sl. No.	Month	2019 - Lighting	Heating	2020- Lighting	Heating
1	January	18800	2600	20600	2900
2	February	18600	3000	20600	2900
3	March	18600	2800	60610	1200
4	April	18900	2800	60650	1300
5	May	18800	2500	60700	1100
6	June	18800	2700	20700	3000
7	July	18800	2600	20180	2900
8	August	18900	2600	20080	2800
9	September	18900	2800	20000	3000
10	October	19000	2600	21000	3000
11	November	18000	2800	20400	3000
12	December	18990	2800	20800	3000

Evidence of Success is the amount of electricity generated and fed to the grid. The details of electricity uploaded to the grid are given in the Table 9.

Table 9: Energy Generated by Solar PV

Sl. No.	Month	2019	2020
1	January	23298	21520
2	February	21444	21701
3	March	26028	21890
4	April	29085	24007
5	May	26027	24568
6	June	26717	26826
7	July	17796	20562
8	August	19176	16637
9	September	17156	14561
10	October	19593	18584
11	November	22566	20953
12	December	18397	22178

4.2: Methane from Kitchen Waste

More than 60% of students stay in hostels at Jnanashakt Campus of University. There are four hostels working and more are under construction. Generation of kitchen waste generation to the tune of 30 – 40kg/day is common. This waste used to be taken away to serve as cattle feed. However, KSWU thought of converting the kitchen waste for the generation of methane by fermentation which can be hostels kitchen. Accordingly, the anaerobic reactor with a capacity of 4 cu. meter was established and all the decomposable waste generated is used as feedstock. Methane gas generated is used in the hostel and thus helped in reduced use of LPG, an equivalent of about 25kg/month.

4.3: Bio-Diesel from Oil Seeds

KSWU sought the help of Karnataka State Biofuel Board (KSBB) to seek Biofuel Demonstration in the campus. KSBB help was sought to establish plant with a capacity to generate 100li/month. At the same time, plantation activity was taken up in the University campus to ensure the supply of oilseeds. Neem is the most preferred species in this agro-climate zone (native and most common plant in this region). Supply chain was established to procure oil seeds from villages in the region. From its establishment till date, the Biofuel Center is working without any problems and its success has made University consider doubling the capacity of the Center. Further, increasing the crushing capacity would enable the university to tap the yield of the plantations within the university campus, b) to cater to a larger fleet of University vehicles.

Plate : Biodiesel Demonstration Unit

Summary and Way Forward

Akkamahadevi Karnataka State Women's University is youngest university in the state, even then, it has became a leader in terms of planning and implementing the ecofriendly measures such as Solar PV, Solar thermal, Solar Lightening, Methane from kitchen waste, Wastepaper recycling etc. and in the process, carbon foot prints of university are getting reduced. Further, in the years to come, University has plans to increase the share of renewable energy in order to reduce the dependence on grid based electricity through increasing the roof-top PV units. Regarding fossil fuel for transportation, it is envisaged that in couple of years, the energy plantation of University will increase the supply feedstock to a level that significant portion of

university vehicles can shift over to biodiesel. Similarly, with increased focus on groundwater table recharge through construction of water percolation ponds, check dams, and recycling of wastewater, withdrawal from city water supplies is also likely to be reduced.

Criterion VII–Institutional Values and Best Practices (100)

Key Indicator - 7.1 Institutional Values and Social Responsibilities (50)

Environmental Consciousness and Sustainability

Green Audit Report for the Year 2021-22

May 2022

List of Contents

Table of Contents

List of Tables

List of Boxes

List of Figures

1. Introduction:

India has one of the largest and diverse educational systems in the world. At the same time, it has also led to widespread concern on the quality and relevance of the higher education. To address these concerns, the National Policy on Education (NPE, 1986) and the Programme of Action (PoA, 1992) spelt out strategic plans for the policies, advocated the establishment of an independent National accreditation agency. Consequently, the National Assessment and Accreditation Council (NAAC) was established in 1994 as an autonomous institution of the University Grants Commission (UGC) with its head quarter in Bengaluru. The mandate of NAAC is in making quality assurance an integral part of the functioning of Higher Education Institutions (HEIs). The NAAC has been carrying out the process of quality Assessment and Accreditation (A&A) of HEIs over the past two decades. The A&A process is being revised and attempts to enhance the quality of higher education and focus is on quality culture of the institution In line with conviction that quality concerns are institutional, NAAC has placed greater importance on self-evaluation process and the subsequent preparation of the Self Study Report (SSR) to be submitted to NAAC.

NAAC has evolved a seven point criteria to represent the core functions and activities of a HEI, viz., 1. Curricular Aspects, 2.Teaching-Learning and Evaluation, 3.Research, Innovations and Extension, 4.Infrastructure and Learning Resources, 5.Student Support and Progression, 6.Governance, Leadership and 7.Management, Institutional Values and Best Practices. Under each Criterion, a few Key Indicators are identified and are further delineated as Metrics which actually elicit responses from the HEIs.

In Criterion VII: - Institutional Values and Best Practices, NAAC has laid out framework of the functional niche of HEI in changing national and global contexts an educational institution. NAAC has stressed on social responsibility of HEI to be proactive in their efforts towards development in the larger contexts and called for every institution to be responsive to at least a few pressing issues such as gender equity, environmental consciousness and sustainability, inclusiveness and professional ethics, however, the way it addresses the issues will always be unique. Further, NAAC has suggested some meaningful practices pertinent to such situations that are evolved internally by the institution leading to improvements in its functioning – academic, administrative or organizational, - be recognized as a “best practices”. Over a period of time, due

to such unique ways of functioning, each institution develops distinct characteristic which may become its recognizable attribute. NAAC has earmarked three Key Points in Criterion VII, viz., a) Institutional Values and Social Responsibilities, b) Best Practices and c) Institutional Distinctiveness. Environmental Consciousness is also given priority by NAAC in its guidelines and made the documentation of environmental management practices adopted at University as part of Self Assessment Report (SAR). NAAC has recommended a framework for the documentation purposes and this report is prepared accordingly for the Akkamahadevi Women's University, covering the issues pertaining to the environmental consciousness.

2. Karnataka State Akkamahadevi Women's University

Formerly known as Karnataka State Women's University, Akkamahadevi Women's University (AMU) established in 2003 in the city of Vijayapura (Formerly Bijapur), is the only University in Karnataka dedicated exclusively for women's education. It has been recognized under 2(f) and 12(B) of the UGC Act. It has been accredited 'B' Grade by NAAC. One hundred and thirty seven women's colleges of Karnataka, are affiliated to this University, in addition to Post Graduate Centers at Sindhanoor and Udutadi, and Extension Center at Mandya. The University offers various UG programmes leading to Bachelor's degree in Arts, Business Administration, Computer Applications, Commerce, Education, Fashion Technology, Home Science, Physical Education, Science and Social Work. It also offers 32 P G Courses, P G Diploma and Certificate Courses in the Faculties of Arts, Commerce and Management, Social Sciences, Science and Technology and Education. At its Jnanashakti Campus, the University has initiated and implemented several ecofriendly measures and this report provides a brief description of these measures. This report, structured according to the Criterion VII: - Institutional Values and Best Practices of National Assessment and Accreditation Council (NAAC) Institutional Accreditation: Manual for Self Study Report Universities, 2017.

3 Environmental Consciousness and Sustainability

3.1 Energy Concerns:

The University has implemented several measures to harness renewable energy sources such as Solar radiation, biofuels. It has installed the infrastructure like solar PV Units, Solar street lamps, biodiesel plants and methane gas plant from kitchen waste etc. The details of facilities for an alternate source of energy are given in the box 1.

Box 1: Different Sources of Renewable Energy

Sl	Energy Facility	Existing	Details of Photograph
1	Solar Energy	Yes	Plate 1
2	Biodiesel Plant	Yes	
3	Wheeling to the Grid	Yes	
4	Sensor-based energy conservation	No	
5	Use of LED bulbs/power-efficient equipment	Yes	

Options:

A.	Any 4 or all of the above	Yes

Any other relevant information

Energy Conservation: Light Emitting Diode (LED) bulbs or lighting products produce light approximately 90% more efficiently than incandescent light bulbs. LED lighting is more efficient, versatile, and lasts longer and "directional" light sources. That means LEDs are able to use light and energy more efficiently in a multitude of applications. In a University campus, a significant portion of total energy is used for lightening purposes and adoption of LED provides a measure to reduce the electricity consumption and the KSAWU has opted for LED lighting devices and year wise progress in replacing the traditional lighting systems with LED over the years is given in Table1. More than 80 per cent of lighting systems are of LED type. By shifting to the LED lighting sources, University has not only reduced its electricity bill but also the actual consumption of electricity thus, contributing to sustainable development.

Table 1: Replacing Conventional Bulbs by LED lighting systems (%)

Year/Month	Base Year (2016-17)	**2021-22**
April	56	82
May	53	85
June	51	85
July	50	86
Aug	52	88
Sept	56	88

Oct	58	88
Nov	58	88
Dec	57	89
Jan	55	89
Feb	54	90
Mar	50	90

Fig : Per cent shift to LED systems from Base Year to 2021-22

Renewable Energy Generation: Solar Energy for Lighting Purposes

In addition to the power generation, University has opted for harnessing the solar energy for the lighting of common areas. Accordingly, it has initiated measures to replace the conventional streetlights with that of solar street lights. Details of Solar street lights are given in Table 2 and Plate 2.

Table 2: Harvesting Sun Light for Street Lighting

Year	2020-21
April	150
May	150
June	150
July	150
August	150
Sept	150
Oct	150

Nov	150
Dec	150
Jan	150
Feb	150
March	150

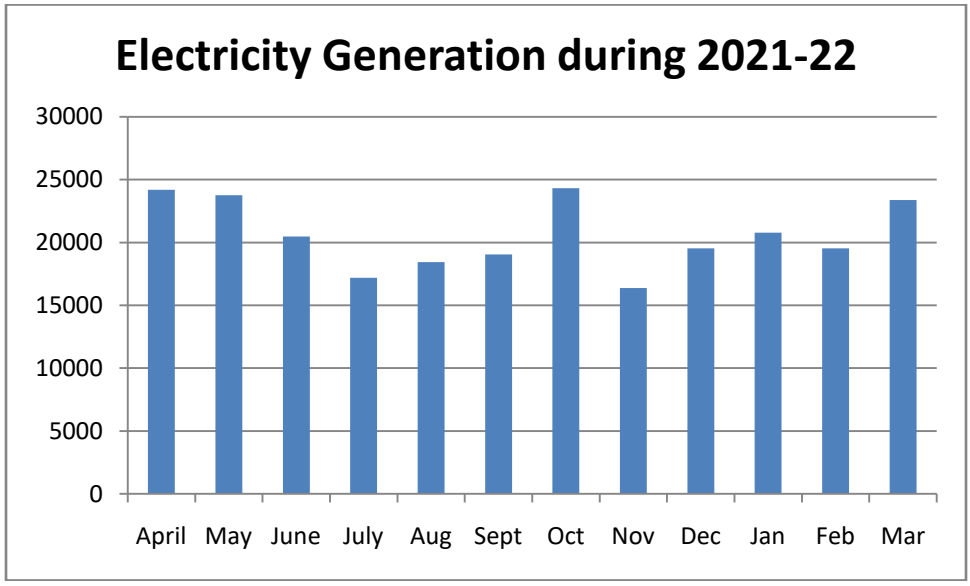

Table : Electricity Generation from Rooftop PV Panels in 2021-22

Plage : Grid Connected Solar PV Panel

Plate 2: Solar Powered Street Lamps

3.2: Waste Management

Describe the facilities in the Institution for the management of the following types of degradable and non-degradable waste (within 500 words)

Due to its nature of the function, University generates primarily biodegradable waste, falling into three broad categories, viz., a) paper waste generated from administration and examination sections of the university, b) organic/ food waste generated in the student hostels, and c) litter waste from the vegetation in the University campus. Other types of waste, such as biomedical waste, radioactive waste are not generated in the university. For each stream of waste, University has developed a system to recycle the waste to the extent possible and details are given below.

- **Solid Waste Management**: Significant amount of paper waste is generated from administrative and examination sections. General practice is to dispose of this material by burning it. But the University has opted for recycling and a Paper Recycling Unit (PRU) was established within the Women's Technology Part in the University Campus. It was established with dual purposes, viz., a) to recycle the paper waste that was generated within the campus and b) to train the women about the paper recycling process. The PRU has a capacity to process about 15kg/day of used papers, note-sheets etc, and recycle the same into various products like files, greeting cards etc., The produce is sufficient to cater to the needs of University and also for its P.G centres located elsewhere in Mandya and Bellary districts. During normal course of functioning, the unit can produce about 60 files in a month (Plate 3).

Month /Year	**2021-22**
April	33
May	-

June	-
July	22
Aug	66
Sept	77
Oct	44
Nov	11
Dec	55
Jan	22
Feb	55
Mar	66

Plate : Productions from Paper Recycling Unit

- **Litter waste**: A significant quantity of leaf litter is generated in the University campus. To recycle the same and to enrich the scant soil cover in the campus, a vermi-compost unit was installed. Most of the leaf litter collected was converted into compost through this unit and is used in the university nurseries and gardens. By extensive use of vermi-compost, use of chemical fertilizers has been significantly reduced in the university campus (Plate 1g).

Plate : Vermicompost Unit for Litter Recycling

- **Liquid waste management**: Generation of liquid waste is primarily from the student hostels. University campus is located on a rocky area and is away from the Vijayapura City Underground Drainage Network, hence wastewater waster is let it into the ground.
- 7.1.3.4 Biomedical, Electronic and Hazardous chemicals and radioactive waste management: Not applicable /Negligible

Provide web link to

- Relevant documents like agreements/MoUs with Government and other approved agencies
    - Lenin Babu, Kamepalli., 2015. Karnataka State Women's University to be an energy-surplus campus by harnessing renewable energies. CURRENT SCIENCE, VOL. 109, NO. 4, 25 AUGUST 2015. http://www.indiaenvironmentportal.org.in/files/file/energy-surplus%20campus%20Karnataka.pdf
    - Lenin Babu, 2017. Step-upbiofuelR&D for energy security. Deccan Herald. Sept 13, 2017. https://www.deccanherald.com/content/633016/step-up-biofuel-rd-energy.html

a) Recycling Unit

c) Waste paper collected

b) d) Different end products

Plate 3: Solid Waste Recycling

3.3 Water Conservation Measures

Water conservation facilities available in the University

Water Conservation Measures: Comparatively, the University is established recently and there are several constructions of buildings is going on in the campus for developing required physical infrastructure. To cater the water requirement for the construction activities, University is drawing water Vijayapura Municipal Corporation system. However, plans are afoot to shift to groundwater table for the university requirements after the completion of construction activities. Present water requirement is given in Table 3 and Fig 1.

Table 3: Details of Water Consumption (in lakh litres)

	Base year (2016-17)	2021-22
April	70.65	80.1
May	80.45	79
June	77.15	69.4
July	75.97	63.4
Aug	36.63	63.1
Sept	45.29	61.1
Oct	63.53	55.5
Nov	65.65	81.6
Dec	71.15	73.6
Jan	80.17	73.3
Feb	78.04	84.6
Mar	74.49	78.5
Average	68.3	71.9

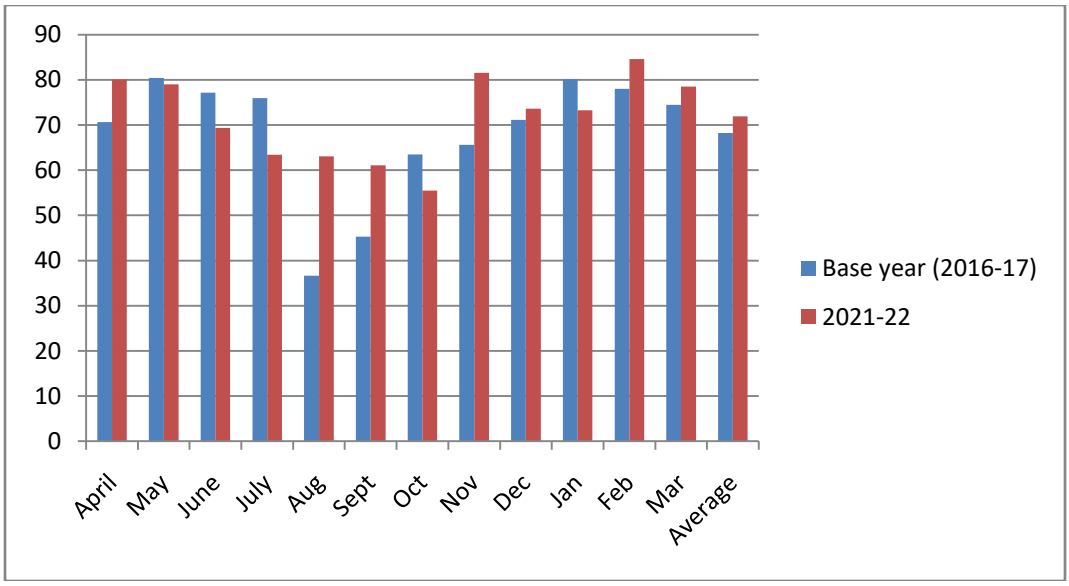

Fig 1: Water Consumption Base Year Vs 2021-22 (in lakh li)

Box 2: Water Conservation Measures

Sl.No.	Facility	Available
1	Rainwater harvesting	Yes.
2	Borewell /Open well recharge	Yes
3	Construction of tanks and bunds	Yes
4	Wastewater recycling	Yes
5	Maintenance of water bodies and distribution system in the campus	Yes

Upload:

- Geotagged photographs/videos of the facilities**(PLATE 4)**

Water Conservation Measures:

Geology of the University campus is undulating with a rocky surface that encourages fast runoff of rainwater and limited scope for groundwater table recharge. To increase the recharge of groundwater and to prevent soil erosion, suitable places were identified to build the check dams to reduce the runoff and to conserve the topsoil cover. Taking advantage of the natural topography of the area, several small percolation ponds were created by erecting bunds. As of

now, in the campus, about 15,213 M^3 area of percolation ponds were created. In addition, all the buildings have rainwater conservation measures in-built in their plans (Plate 4).

a) Runoff Storage Ponds b) Creation of Percolation Ponds

Plate 4: Water Conservation Measures

3.4 Green Concerns

Green campus initiatives: The institutional initiatives for greening the campus are as follows:

Box 3: Green Initiatives

Sl No	Initiatives	Details
1	Restricted entry of automobiles	NA
2	Use of Bicycles/ Battery-powered vehicles	NA
3	Pedestrian Friendly pathways	NA
4	Ban on use of Plastic	Yes
5	landscaping with trees and plants	Yes

Options:

Two of the above Initiatives are implemented in the University Campus

Upload

- Geotagged photos/videos of the facilities
- Various policy documents/decisions circulated for implementation

Any other relevant documents

Aforestation area earmarked for the university campus initially was uneven, a rocky outcrop with very little topsoil cover and no vegetation with exception of seasons grasses. Over the years, vigorous efforts were made to increase the vegetation cover of the campus. Care was taken to give priority for the native species and a mix of fruit-bearing trees like Singapore Cherry, Acacia species to promote fauna and also to increase the organic content of the soil. By building check dams, the vulnerability of topsoil was reduced and percolation ponds were constructed in such a manner that the topsoil is collected there and silt can be collected during dry months. Due to care and attention are given to the young saplings, the survival rate recorded is significant.

Quality audits on environment and energy are regularly undertaken by the institution (5)

The institutional environment and energy initiatives are confirmed through the following

Box 4: Quality Audits

Sl No	Imitative	Details
1	Green audit	Yes
2	Energy audit	NA
3	Environment Audit	NA
4	Clean and green campus recognition/awards	NA
5	Beyond the campus environmental promotional activities	Yes (Plate 5)

Options:

Two of the above initiatives are implemented in the University

Upload:

- Reports on environment and energy audits submitted by the auditing agency

Plate 5: Promotion of Biodiesel (File Photos)

Barrier Free and Disabled friendly Environment: The University has taken several measures to develop a barrier free environment and to encourage the disabled by developing a disabled-friendly environment in the campus Box 4.

Box 4: Barrier Free ***Environment***

Sl.No.	Barrier-free environment	Availability
1	The built environment with ramps/lifts for easy access to classrooms.	Yes
2	Disabled-friendly washrooms	No
3	Signage including tactile path, lights, display boards and signposts	No
4	Assistive technology and facilities for persons with disabilities (*Divyangjan*) accessible website, screen-reading software, mechanized equipment	Yes
5	Provision for enquiry and information : Human assistance, reader, scribe, soft copies of reading material, screen reading	Yes

Options:

Three of the above initiatives are implemented in the University

Upload:

- Geotagged photographs/videos of the facilities
- Policy documents and information brochures on the support to be provided
- Details of the Software procured for providing the assistance

Any other relevant information

Carbon Sequestration in University Campus

A key feature of a tree is carbon sequestration – the process of capturing carbon dioxide, a greenhouse gas (GHG) from the atmosphere and converting into biomass and storing in organic form for long-term. This process helps remove the GHGs and slower the global warming process. The rate of carbon sequestration depends on the growth characteristics of the tree species, the density of its wood, microenvironment of the plant. A Census of plant species distribution in the University campus along with their Diameter at Breast Height (DBH) was conducted to estimate the approximate carbon sequestration levels due to the a forestation measures undertaken by the University. Tree census revealed that there are about 17 species with 1,593 individuals on the campus. The Vijayapura district comes under as Deccan plain. The University campus experiences a semi-arid climate with extreme summers. It enjoys a climate with hot summers and chilly winters. Incidence of drought occurs due to inadequate and erratic distribution of rainfall in space and time. The dust storms and severe heat waves are common

during April and May months. The district experiences the temperature variation between 20°C and 42°C. The temperature begins to rise by the end of February, till the month of May, which is the hottest month. Coldest months are December and January (Champion and Seth, 1968)The field observations indicated that the University campus area is devoid of tall or big trees due to barren rocky/stony wasteland. The soil is typically laterite and rock type, which is rich in Iron oxide. The typical laterite soil is porous and claylike hence it has very low water holding capacity. Thus it is not congenial for fast tree growth in the campus.

The floristic diversity information provides a complete picture of different species available in various seasons and associated faunal diversity. Existing botanical inventory of the university campus revealed that about 257 plant species belonging to 219 genera and 68 families have been documented (Kambhar*et al*., 2014). Of them, the families like Poaceae, Fabaceae, Caesalpiniaceae found dominant in the campus. Among these, *Salvia aegyptica* L., a member of Lamiaceae was rarely distributed in the University campus (Singh, 1988). Subsequently, the species of *Sennaitalica* Mill.subsp. *italica*, belongs to family Fabaceae has been reported as a new distributional for Karnataka State (Kambhar&Kotresha, 2020). It has been indicating that the present collection is overlapping of two subspecies of *Sennaitalica* in Karnataka.The carbon sequestration potential in the campus was calculated and summarized in Table 5 and as can be noticed, the present tree cover is able to capture more than 360 tonnes/year. As the green cover is increasing with every passing year, it is expected that the campus would soon become net-zero emissions (Alexander *et al*., 1986; DeWald*et al*., 2013 &Toochi, 2018).

Table 5: Details of Carbon Sequestration

Sl. No.	The scientific name of the tree	Vernacular name	Number of trees	Average GBH (inch)	Average Height (feet)	Organic carbon (kg/tree /year
01	Acacia nilotica (L.) Willd. ex Del.	Jalimara	1	12	13	4.23
02	Albizialebbeck (L.) Benth.	--	2	11	18	4.9
03	AzadirachtaindicaA.Juss.	Bevin mara	950	16.8	18	91.97
04	Bauhinia purpurea L.	Basavanpada	8	14	15	6.55
05	DalbergiasissooRoxb. ex DC.	Sisam	550	14.6	15	57.88
06	Delonixregia (Boj. ex Hook.f.) Raf.	Kempugulmohar	15	25	20	62.36
07	Erythrinavariegata L.	--	1	15	12	6.10

Sl. No.	The scientific name of the tree	Vernacular name	Number of trees	Average GBH (inch)	Average Height (feet)	Organic carbon (kg/tree /year
08	Eucalyptus globulusLabill.	Nilgiri	8	11	38	10.40
09	Ficusreligiosa L.	Aralimara	6	14.7	15	7.33
10	Leucaenaleucocephala (Lamk.) de Wit	--	30	13.9	30	13.11
11	Mangiferaindica L.	Mavinmara	2	9	20	3.66
12	Peltophorumpterocarpum (DC.) Backer and Heyne	--	8	20	25	22.62
13	Pithecellobiumdulce (Roxb.) Benth.	Seemehunase	1	15	20	10.18
14	Pongamiapinnata (L.) Pierre	HOngemara	2	30	20	40.73
15	Simaroubaglauca DC.		3	14.3	15	6.94
16	Tamarindusindica L.	Hunasemara	2	15	15	7.63
17	Terminaliacatapa L.	Badamigida	4	12	14	4.56
		Total	**1593**	**Total carbon sequester**		**361.15**

With respect to the faunal diversity, 14 species of birds have been documented belonging to 13 genera from the university campus (Table 6).

Table 6: Avifaunal diversity in KSAW University, Vijayapur

Sl.No	Common name	Scientific name	Family
1.	Red-wattled Lapwing	Vanellusindicus	Charadriidae
2.	Common babbler	Turdoides caudate	Leiothrichidae
3.	Intermediate Egret	Ardeaintermedia	Ardeidae
4.	Indian Pond-Heron	Ardeolagrayii	Ardeidae
5.	Brahminy Starling	Sturniapagodarum	Sturnidae
6.	White-browed Wagtail	Motacillamaderaspatensis	Motacillidae

7.	Rock Pigeon	Columba livia	Columbidae
8.	Black Drongo	Dicrurusmacrocerus	Dicruridae
9.	Red-vented Bulbul	Pycnonotuscafer	Passerines
10.	Indian Robin	Copsychusfulicatus	Muscicapidae
11.	Purple-rumped Sunbird	Leptocomazeylonica	Nectariniidae
12.	Scaly-breasted Munia	Lonchurapunctulata	Estrildidae
13.	House sparrow	Passer domesticus	Passeridae
14	Indian crow	Corvussplendens	Corvidae

References:

Alexander, C., Saucier, JR. and Henry, MW.**1986**. Total-tree weight, stem weight, and volume tables for hardwood species in the southeast. Georgia Forest Research Paper GF-RP-60.Georgia Forestry Commission.44 p.

Champion, HG. and Seth, SK. **1968.**A Revised Forest Types of India. Manager of Publications, Government of India, Delhi.

DeWald, S., Josiah, S., and Erdkamp, B. **2013**. Heating With Wood: Producing, Harvesting and Processing Firewood.University of Nebraska—Lincoln Extension, Institute of Agriculture and Natural Resources.

KambharSV.,Mirji B., Egappagol L. &Rachagond S. **2014**. Flowering plants of Karnataka State Women's University, Jnanashakti, Torvi Campus, Bijapur and its adjoining area. Research & Reviews: Journal of Life sciences 4(2): 17-27.

Kambhar SV. &Kotresha, K. 2020. *Sennaitalica* Mill.subsp. *italica* (Fabaceae; Caesalpinioideae): An Overlooked species from Karnataka State, India. Indian Forester, 146(5):461-462.

Singh, NP. **1988**. Flora of Eastern Karnataka. Vol. 1&2.Mittal Publications, New Delhi.

Toochi, EC. **2018**. Carbon sequestration: how much can forestry sequester CO2?. Forest Res EngInt J. 2(3):148-150. DOI:10.15406/freij.2018.02.00040.

Key Indicator - Best Practices (30)

Describe two best practices successfully implemented by the Institution as per NAAC format provided in the Manual.

4. Best Practice I:

4.1. Title of the Practice

Harnessing Renewable Energy at University Campus

Objectives of the Practice: Karnataka state is energy deficient, it needs to procure energy from Gujarat, Himachal and other energy surplus states. Being located in relatively socio-economically backward region of the state, intermittent power cuts are normal and the problem used to be high in summer months. Hence, considering its locational advantage of the solar rich area, considered harnessing the renewable energies as a supplementary source of energy. Otherwise, electric supply with intermittent breaks used to disturb the students in residential hostels.

The Context (in about 150 words) Being a nascent University, there is a dearth of in-house scientific and technical knowledge and this was a major problem. However, with the help of government agencies concerned with renewable energies, the University could select the most suitable technology to suit is purpose. Initially, the University has opted for Roof-top PV unit of about 10 KV and inspired by its performance, University has opted for the solar-powered street lamps. On the other hand, energy demand is increasing year after.

The Practice (400 words) The success of the 10KW Solar PV plant has encouraged the University to consider enlarging the capacity of solar PV technology. With help of Government of India, the University has made plans to harness solar radiation on rood top of two buildings, Science and Social science blocks. The requirement of energy in the campus for lighting and heating purposes, total energy requirement is given along with energy generated by Solar PV units are given in Tables 7 to 9.

Table 7: Details of Electricity Consumption During 2021-22 (in KWh)

Year/Month	Base Year (2016-17)	2021-22
April	42044	31020
May	41310	1000
June	46938	4220
July	38070	13170
Aug	30928	36840
Sept	24660	28100
Oct	32878	24120
Nov	30934	28870
Dec	29836	29490
Jan	33609	28280
Feb	27686	30250
Mar	33508	43520
Average	34366	24906

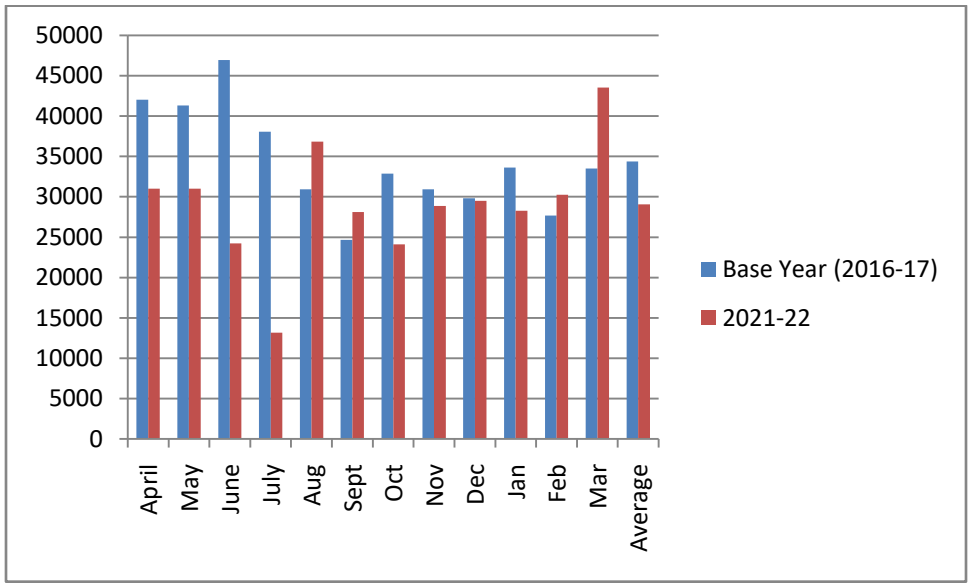

Fig : Comparison of Electricity Consumption between base year and 2021-22

Evidence of Success is the amount of electricity generated and fed to the grid. The details of electricity uploaded to the grid are given in the Table 9.

Table 9: Energy Generated by Solar PV

Month /Year	2021-22
April	**24181.18**
May	**23773.22**
June	**20479.55**
July	**17184.15**
Aug	**18448.62**
Sept	**19058.44**
Oct	**24327.1**
Nov	**16386.97**
Dec	**19521.47**
Jan	20770.66
Feb	19532.31
Mar	23385.22
Total	247048.89

4.2: Methane from Kitchen Waste

More than 60% of students stay in hostels at Jnanashakt Campus of University. There are four hostels working and more are under construction. Generation of kitchen waste generation to the tune of 30 – 40kg/day is common. This waste used to be taken away to serve as cattle feed. However, KSWU thought of converting the kitchen waste for the generation of methane by fermentation which can be hostels kitchen. Accordingly, the anaerobic reactor with a capacity of 4 cu. meter was established and all the decomposable waste generated is used as feedstock. Methane gas generated is used in the hostel and thus helped in reduced use of LPG, an equivalent of about 25kg/month.

4.3: Bio-Diesel from Oil Seeds

KSWU sought the help of Karnataka State Biofuel Board (KSBB) to seek Biofuel Demonstration in the campus. KSBB help was sought to establish plant with a capacity to generate 100li/month. At the same time, plantation activity was taken up in the University campus to ensure the supply of oilseeds. Neem is the most preferred species in this agro-climate zone (native and most common plant in this region). Supply chain was established to procure oil seeds from villages in the region. From its establishment till date, the Biofuel Center is working without any problems and its success has made University consider doubling the capacity of the Center. Further, increasing the crushing capacity would enable the university to tap the yield of the plantations within the university campus, b) to cater to a larger fleet of University vehicles.

Plate : Biodiesel Demonstration Unit

Summary and Way Forward

Akkamahadevi Karnataka State Women's University is youngest university in the state, even then, it has became a leader in terms of planning and implementing the ecofriendly measures such as Solar PV, Solar thermal, Solar Lightening, Methane from kitchen waste, Wastepaper recycling etc. and in the process, carbon foot prints of university are getting reduced. Further, in the years to come, University has plans to increase the share of renewable energy in order to reduce the dependence on grid based electricity through increasing the roof-top PV units. Regarding fossil fuel for transportation, it is envisaged that in couple of years, the energy plantation of University will increase the supply feedstock to a level that significant portion of university vehicles can shift over to biodiesel. Similarly, with increased focus on groundwater table recharge through construction of water percolation ponds, check dams, and recycling of wastewater, withdrawal from city water supplies is also likely to be reduced.

K. Lenin Babu
(K. Lenin Babu)
Mob: 9343007438
Centre for Economic Management Studies (CEMS)
227, KAVYA' 6th Block, Sir M V. Layout,
Sri Vasavilamma Temple Road, Ullal,
Bangalore 560 056