



Ingredients of Technovation Towards Sustainable Development of Educational Institutions

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ABSTRACT

Sustainable development is one of the major challenges facing the world today. It is a development that meets the needs of the present without compromising the ability of future generations to meet their own needs. This implies a balance between and an integration of the environmental, economic and social aspects of development, with attention also paid to the cultural dimension. Education for Sustainable Development (ESD) is everyone's business. It seeks to integrate the tenets, values and practices of sustainable development into all aspects of education and learning. Among other things, ESD promotes a sense of both local and global responsibility, encourages future-oriented, anticipatory thinking, builds recognition of global interdependence and emphasizes cultural changes. Rather than remaining passive in the face of the above-mentioned challenges, ESD seeks to empower societies, communities and individuals everywhere to shape their future actively and responsibly. Periyar Maniammai University (PMU) does innovative teaching programmes and research with cutting - edge technologies, both in Master's Degree and Research, focusing on Energy, Environment and Empowerment with a close connection into societal programmes such as extramural, extension and field research.

The University is inspired by the philosophy of its mentor Periyar to encourage free thinking for which he received the appellation from UNESCO as Socrates of the South East Asia.

KEYWORDS : Environment Sustainability, Educational Institutions, PMU, Periyar PURA, Sustainable Development.

INTRODUCTION

Sustainable Development

Sustainable development has become the guiding principle for achieving just and equitable development options that benefit all people everywhere. It takes into account the needs of future generations, and equally the needs of people today in every part of the world.

Education for Sustainable Development (ESD)

ESD is a teaching and learning process through which understanding of and orientation towards sustainable development become embedded in the core education and learning.

ESD implies new ways of teaching and learning. The four main thrusts of ESD are access to quality education, reorienting of existing education systems public awareness and understanding initiatives, and training programmes to address specific social, environmental and economic issues. The importance of ESD is everyone should have the opportunity to derive the benefit from education for positive societal transformation. The complexity, breadth and diversity of sustainable development issues require that a wide range of stakeholders become active such as governments and non-governmental organizations, media, the private sector, education institutions, research institutes, individual educators and students. and come together to implement the ESD.

Optimization of Resources

PMU strictly follows the PDCA (Plan-Do-Check-Act) Cycle in all its activities. It is working with the concept "Waste is Wealth". It leads to environment sustainability. Environmental management concept embodies the concept of sustainable development through various mechanisms that combine technological processes, sustainability and economic growth in the production processes of goods and services.

The government of India has prescribed regulations and standards to adopt emission control strategies and to use eco -friendly technolo-

gies. Eco Marks are awarded to products that are environmentally safe and that have been manufactured through the application of environment friendly and efficient technologies.

ENVIRONMENT MANAGEMENT

Clean and Green Initiatives

PMU is encompassing with lush greenery and its location in a sylvan atmosphere speaks well of the environmental hygiene and enticing greenery all around the campus which makes this place suitable for intensive education. PMU strives to achieve the twin factors of Environmental

- Protection and Environmental Management by
- Eco-friendly Constructions
- Rainwater Harvesting
- Demonstration on practical technologies in the Rural areas and at selected field sites
- Training, capacity building and awareness on Solid Waste Management
- Creating and maintaining the Bio diversity of the campus
- Solid Waste Management through Biomethanation
- Enhancing the Green cover for reducing Carbon emission and increasing nitrogen Cycle.
- Zero waste management campus keeping the philosophy of Waste from Wealth
- Energy conservation steps right from the planning, execution and ensuring them through frequent green audits
- Demonstrations and usage of Bio-compost, Vermicompost, Bio-fertilizer, Protected cultivation, Water harvesting, Cultivation of medicinal & aromatic plants, Bio fencing, Bio briquetting etc. have been set up in our campus.

The eco-friendly activities carried out in our campus clearly prove that we are marching towards Clean Development Mechanism (CDM) and carbon footprint initiative.

ENVIRONMENT SUSTAINABILITY IN PMU

Paper Recycling Unit

An allied unit of PMU is Periyar TBI which runs a paper recycling unit. Two tonnes of paper/ year are produced by recycling as a result of this, 8.5 m³ of wood pulp is saved. As a part of our mission towards green initiatives, here 1.2 tonnes of recycled paper is produced per year. As per the recent survey, 500 tonnes of fresh paper equals 401 tonnes of carbon where-as recycled paper reduces the total carbon emissions by 329 tonnes of Carbon. This unit is also serving as a demonstration unit for an entrepreneur to establish recycle paper unit.

Alternate Building Materials Research Unit

Alternative building materials like hollow blocks, interlocking blocks, paver blocks are manufactured using innovative technologies to meet our own infrastructural requirements.

This technology has avoided deforestation and soil erosion due to which 36,337 tonnes of wood and 21,173 m³ of fertile top soil are saved. Cement less fly ash bricks are produced with same structural properties of conventional fly ash bricks that reduce 7.2 tonnes of CO₂ emission with less contribution to pollution.

Energy Management Systems

In PMU, a sizeable portion of electricity demand is satisfied by generating power from various techniques and methodologies through the following units.

Bio Mass Gasifier Unit

In this University, there is a 200 kWe bio mass gasifier for power generation (100% producer gas mode) with attractive ROI and it is also a cost effective system, through which we are able to save the energy approximately 25,000 units per month worth of Rs.1,25,000. In addition the environmental pollution is avoided. 20% of our campus electricity demand is fulfilled by using the biomass gasifier.

Thermal Gasifier

20 kWe Biomass thermal mode gasifiers are used for hostel cooking and heating purposes. By this unit, we attain energy savings as 30 cylinder per month worth of Rs.37170/ \$833.97.

Briquetting Unit

Briquetting by using powdery or granular products i.e. agri wastes such as Rice husk, Sawdust and Coconut coir pith is done in this campus and they are used as fuel in various thermal plants.

Biomethanation Unit

PMU is identified as the Nodal Agency by MNRE, Govt. of India for providing technical know-how and guidance for installing the bio-gas based power generation units in some of the educational institutions. 60 kWe-500m³ Biomethanation plant in this University is a multi feed unit with the feeds like Cattle dung, Night soil, Vegetable wastes and Food wastes. The gas producing capacity of the digester is 500cu.m per day. The volume of gas produced will generate 60 kWe of electricity. This will not only generate significant quantity of Bio-gas but also generated digested material. This is used as a high grade soil conditioner. The Digester is of 16.2m diameter and 5.7m height. Quantity of feeding required per day is 10 tons. In addition, the environment is kept clean because of this unit.

The following Research works are being carried out in this plant:

- Characterization of various solid wastes as input in this anaerobic digester
- Study of Suitable environmental factors which favours the anaerobic digestion.
- Lab scale study for optimisation of the digestion using feed stocks

EFFECTIVE UTILIZATION OF SOLAR POWER

In PMU, we are using Solar Dryer (250 kg/d – 179 kWe), Solar Water Heater (13000 LPD -3300 kWe) for hostel usage. Solar water heaters installed in the hostels save electricity and result an annual savings of Rs. 1,65,000/- along with reduction of 195 tonnes of CO₂ emission is achieved. Solar PV panels are installed at the hostels resulting in an annual savings of Rs.67,000/-, and also reduces 10 tonnes of CO₂

emission. Pathway lights in the campus are powered by solar panels.

Solar Campus Rider is specially designed to ride inside the campus avoiding CO₂ emission. It is a dual powered rider which can be charged using both solar and electrical energy. It is cost effective. Eco Challenger is solar powered battery operated vehicle for differently abled people. This vehicle carries 120 kg, accelerates to about 25 km/hr and the mileage comes upto 45 km/ charge.

Solar Car Fabricated by our students: Maruti 800 engine has been remodeled by using traction batteries and motors. By utilizing all the renewable energy resources and wastes in our campus, the environmental pollution is avoided and the campus continues to flourish in a sustainable way.

CAPTIVE MANAGEMENT PMU Governance

PMIST, which has the distinction of a public trust, was started in the year 1974 by the great social leader Madam E.V.R.Maniammiayar who donated all her wealth for this institution, following the footsteps of popular social leader Thanthai Periyar E.V.Ramasamy. Now it is managed by Dr. K.Veeramani, who is not a legal heir to the founder, but his ideological successor. He was all along working with Thanthai Periyar and was identified by him as the successor for him.

COMMUNITY DEVELOPMENT Extension & Research Activities

- All our Research programmes are application oriented in the emerging areas of
- Renewable and Alternate Energies, Alternate Building Materials.
- Environmental Engineering Management Practices towards Zero Carbon.
- Herbal based Medical Research.
- Nano-Technology and Information and Communication Technologies interventions.

This University has been experimenting on bamboos for energy production from biomass gasification of 200 kWe capacity, and for higher calorific value of (Prosopis and Casuarinas, etc.). Ethanol fuel production from bamboo cellulose has been taken up as our ongoing research project in the Biotechnology and Chemical Engineering divisions.

Professional Bodies

PMU holds institutional membership in professional organizations like Indian Institute of Architecture (IIA), Institution of Engineers (India) (IEI), Indian Society for Technical Education (ISTE), Institute of Electrical and Electronics Engineers (IEEE), Computer Society of India (CSI), Shockwave Society of India (SSI), Solar Energy Society of India (SESI), Broadcast Engineering Society-I (BES-I) and Indian Nuclear Society (INS) to encourage active research in cutting edge technologies and other professional activities.

PMU makes it compulsory to file patents and copyrights to their ideas & innovations in their area of active research. To promote and encourage the young faculty members, it publishes in-house quarterly and bi-annual R&D Journals.

EXTENSION ACTIVITIES

Climate Change

Analytical Services

PMU houses sophisticated state of the art instruments such as Scanning Electron Microscope (SEM), Atomic Force Microscopy (AFM), Atomic Absorption Spectrophotometer (AAS) and Gas Chromatograph (GC), to detect heavy metals and organic pollutants. PMU is currently concentrating on 'Electro-kinetic remediation of heavy metals contaminated soils' and their removal from the soils. PMU is educating through training programmes in wastewater analysis, treatment, remediation technologies, Environmental impact Assessment (EIA) and Environmental Management Systems (EMS).

Socio – Economic Activities

PMU practices a replicable national model on sustainable development for rural areas called as PERIYAR PURA (Providing Urban Amenities in Rural Areas) which strengthens the livelihood of rural people through four important connectivities as Physical, Electronic, Knowledge and Economic connectivities.

Cluster Concept

All the 67 adopted villages of Periyar PURA are grouped as seven clusters based on natural resources (soil water, weather, biodiversity, geographical boundaries and human resources).

- I. Physical Connectivity focuses on resources required for human beings.
- II Electronic Connectivity is mainly useful for connecting all village people to disseminate it for knowing the latest development ICT enabled services.
- III Knowledge Connectivity is primarily providing idea for making them as skilled employable persons.
- IV Economic Connectivity educates the rural people to earn money from various agro-based training for maintaining Agri fields and Industries.

Clean Thanjavur Movement

PMU involves through Periyar PURA as part of its Clean initiative to manage the solid waste generated in Thanjavur Municipality and later extended to the entire Thanjavur District, involving various NGO, Public, Educational Institutions (Universities, Colleges & Schools), Professional bodies, Local Merchants and business establishments.

Farmer Producer Organization (FPO)

PMU has mentored and guided to establish a FPO namely Cauvery Delta Agro Producer Company Ltd. (CDAPCL) under companies act 2013 as its economic connectivity to local farming communities under Periyar PURA Mission.

Its primary objectives are to organize Small, Medium & Marginal farmers into CDAPCL, enabling market linkage, promoting agricultural technologies, enhancing the productivity and livelihood of farmers, removing hurdles in market access. Its activities are focused towards Collective Functioning, Input Supply, Production Services, Financial Services, Training, Quality Control, Output Marketing, Processing, Trading, Retailing, products development, Agro-Technological Research etc.

ACADEMIC SUSTAINABILITY

Teaching Learning Practices

PMU follows qualitative and innovative teaching learning methods. Outcome based Education is scrupulously followed. To enhance the students understandability, it mandates the Knowledge Enrichment Programmes to the students equally and it is awarded with credits.

Enhancing the Learning Process

The faculty members use indigenously developed e-contents by them for all the subjects and they are available in Periyar Net (Intranet). PMU has strong association with one of the senior member institutions under NME-ICT, MHRD, Government of India. It also encourages the students and staff to undergo the "Spoken Tutorial" classes and "Talk to Teacher" programme in association with IITB, Mumbai. The students are availing the library which has been equipped with a lot of e-contents, NPTEL repositories, CDs, DVDs, Audio and Video cassettes including Digital library with 100 systems. The students are experimenting Aakash Tablet PC in the classrooms. The faculty members practice Five minutes Student Teacher Programme in each and every class, to make the students to better comprehend their understandability. PMU, in line with its motto (Think-Innovate-Transform) insists its teaching / learning practice to focus on Product / Process / Demo / Case Study / Model and SW package development in all the class room and laboratory teaching.

Consultancy

PMU, encourages both the students and staff to involve themselves in *earn while learn* and *earn while teach & practice*.

e-Governance

The indigenously developed software package called " Brilliant Resources in Academic Institutions (BRAIN v2.13) was jointly developed by the School of Computing Sciences and Engineering staff and Students. The entire university activities are accessed through this BRAIN software.

Career Development

PMU organizes Concurrent Career Development Programmes and

Open House-Technical Expo & Showcasing regularly.

To offer real time experiences to the students PMU has established three centres;

- a) *Centre of Excellence for Training and Research in Automation Technologies* established jointly with M/s. Bosch Rexroth, Bengaluru, aims to focus research in the field of Automation Technology. This facility extensively used by P.G. students and Research Scholars in Engineering Technology.
- b) *Centre of Excellence for Enterprise Resource Planning* is established in collaboration with M/s. SAP India Pvt. Ltd., Bengaluru. The aim of the Centre is to offer the right support, mentoring and insight that are needed to prepare highly successful industry ready engineers.
- c) *Centre of Excellence for Next Generation Networks* is established in association with M/s Tejas Networks, Bengaluru to offer Industry Oriented Telecommunication Research and Training & Certification on the emerging and prevalent Telecommunication technologies.

Examination Management

PMU examination system is in line with European Credit Transfer and Accumulation System (ECTS) which follows relative grading with Grade Point Average (GPA) and Cumulative Grade Point Average (CGPA). It is purely transparent meaning that valued answer scripts are distributed to the students for their endorsement.

Examination and Evaluation System

The students can appear for the examination if they possess the minimum eligibility of attendance as 80%. To promote the Zero Carbon Practice, PMU conducts multiple choice question & answering online examination for 20 Marks as part of its Mid and End Semesters written examination. The objective of the MCQs is to expose the student to think analytically. Its evaluation system comprises of Continuous Internal Assessment (CIA) with 25% weightage and written examination with 75% weightage. It gets further divided as Mid and End Semesters, taking 50% of the syllabus with 25% weightage and 100% of the syllabus with 50% weightage.

Award of the Degree

A student shall be awarded a degree if she/he:

Earns the minimum total number of credits specified in the curriculum within a fixed duration. Completion of NSS / NCC / YRC / NSO is required for UG Courses.

She or he should be free from any disciplinary action and any dues to the Institution.

CONCLUSION

PMU takes the role of not only imparting the knowledge to the students and staff members by educating through innovative teaching learning process but also practicing in and around the campus by concentrating on Environment, Climate Change, Resource Optimization and Social- Economic developmental activities, thereby establishing a model sustainable, developed campus, preventing annually 25,000 tonnes CO₂ emission. These activities can be replicable in any educational institution across the globe.