Environmental Management Systems for Educational Institutions: A Case Study of TERI University, New Delhi

Suresh Jain, Ph.D.
Professor, TERI University, 10 Institutional Area
Vasant Kunj, New Delhi-110070
Email: sureshj@teri.res.in; sureshjain_in@yahoo.com

National Training Program on “Training of Trainers for Environment Audit” from 11th July to 15th July, 2016, iCED, Jaipur
Background

- Need for professional, systematic approach for environmental sustainability
- Societal accountability for universities towards sustainable resource use, environmental protection
- A sustainable university has been defined as “A higher educational institution, as a whole or as part, that addresses, involves and promotes, on a regional or global level, the minimization of negative environmental, social, economic, and health effects, generated in the use of their resources, in order to fulfill its functions of teaching, research, outreach, partnership and stewardship in ways to help society make the transition to sustainable lifestyles.” (Alshuwaikhat & Abubakar 2006).
Major environmental concerns of a university

Core areas of concern

• Energy management
• Biodiversity, open spaces, gardens
• Water and waste management
• Air pollution control
• Materials management
Rationale for EMP for TERI University

- To ensure aim of environmental protection is achieved in a systematic way
- To reduce ecological footprint of the university
- To achieve integration of ethos of sustainability in learning as well as practice
Methodology used for developing environmental management plan for TERIU

Source: Jain and Pant, 2010

EMP for university
Initial Environmental Review

Need

- To identify key environmental aspects
- To know what already exists in terms of environmental management
- Conducted using a detailed questionnaire and interaction with concerned people
Environmental Domains

- Energy
- Water
- Waste
- Air Quality
- Landscaping/ Biodiversity
Primary Features

- Architectural features to support energy efficiency
  - Energy efficient building envelope
  - Efficient cooling/heating systems
  - Efficient lighting systems

- Dual-flush toilets
  - Low-flow/sensor taps
  - Rainwater harvesting unit
  - Wastewater treatment plant

- Bus service for students and staff
  - Car pooling encouraged
## Initial environmental review and identification of major environmental impacts

<table>
<thead>
<tr>
<th>Environmental domain</th>
<th>Activity description</th>
<th>Emissions to air</th>
<th>Waste generation</th>
<th>Impacts Wastewater generation</th>
<th>Noise</th>
<th>Impacts on biodiversity</th>
<th>Natural resource depletion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy</td>
<td><em>Use of electricity</em></td>
<td>*</td>
<td></td>
<td>*</td>
<td>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Heating and cooling</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Lighting</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Photocopying</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Computers, fax machines</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Microwave/refrigerator</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Transportation</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bus/car/train/air</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resources</td>
<td>Paper plates/cups/napkins</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Plastic bottles/spoons</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Paper cartons</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Marker/pen/pencil</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Paper</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Chalk</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Printer cartridge</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Waste</td>
<td>Canteen</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Laboratory</td>
<td></td>
<td>*</td>
<td></td>
<td>*</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Lavatory</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ambient/indoor air</td>
<td>Use of diesel generator (DG) sets</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Computer/printer</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Landscaping</td>
<td>Maintenance of gardens</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Use of pesticides/chemical fertilizers</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>Domain</td>
<td>Strengths</td>
<td>Weaknesses</td>
<td>Opportunities</td>
<td>Threats</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>----------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Energy</td>
<td>Use of energy efficient heating and cooling systems (e.g. earth air tunnel, thermal mass storage and variable refrigerant volume system, etc.); energy savings of the order of 60 per cent as compared to a conventional building. Building design and lighting arrangement support use of daylight. Building direction and design also prevents heating during summer.</td>
<td>Greenhouse gas emissions due to energy consumption have not been taken into account. Efficiency of cooling systems reduces under humid conditions necessitating use of supplementary cooling systems during rainy season. The solar water heating system is being used only in the hostel block. No strategy in place to safely dispose of used compact fluorescent lamps (CFLs).</td>
<td>Revenue generated through energy savings can be invested to make environment management more efficient in the university. Extending the facility to the academic and administrative blocks. Environmental consciousness may lead to a switch over to LEDs in the future.</td>
<td>Unsafe disposal of CFLs may prove to be an environmental threat.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water</td>
<td>Approximately 25 per cent savings in water usage due to use of low flow fixtures. Treatment of wastewater generated in the hostel block of the university; use of treated water for landscape irrigation. Rainwater harvesting for aquifer recharge.</td>
<td>Only hostel wastewater is treated.</td>
<td>Revenue generated through savings can be invested to make environment management more efficient in the university. The wastewater treatment facility can be extended to treat the wastewater generated from the other buildings of the campus. Treated water can be used for landscaping purpose.</td>
<td>Some portion of water is used from underground and this area is already declared as water scare area.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Waste</td>
<td>Hazardous waste to be processed through an external agency. Organic waste to be treated in-house and manure used for university gardens.</td>
<td>Paper waste is not being recycled at the university.</td>
<td>Waste segregation can be carried out and paper waste generated at the university can be recycled.</td>
<td>Accidental leakage/spill of hazardous waste from laboratories during storage.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Air quality</td>
<td>Use of stacks as per government notification for the DG sets six monthly monitoring of ambient/indoor air to keep track of the quality of air.</td>
<td></td>
<td>Air stacks are also used as a platform for students learning system in air quality management course for stack monitoring.</td>
<td>Chances of increase in level of air pollutants during peak hours due to increase in the number of vehicles plying in the area.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Results of SWOT analysis for TERI University

<table>
<thead>
<tr>
<th>Domain</th>
<th>Strengths</th>
<th>Weaknesses</th>
<th>Opportunities</th>
<th>Threats</th>
</tr>
</thead>
<tbody>
<tr>
<td>Landscaping/biodiversity</td>
<td>Approximately 30 per cent of total area covered by green open spaces</td>
<td>TERI University area is very rocky, so cannot allow all types of species to grow</td>
<td>Opportunity to develop roof gardens; plant vegetables in the gardens for canteen ERI University took an initiative greening the surrounding area with the help of Indian Oil corporation</td>
<td>New species may grow in the local region</td>
</tr>
<tr>
<td>Transport</td>
<td>Car pooling instead of one person one car mode is being practiced by students as well faculty members; university has provided for a bus service for students and staff</td>
<td>Area in which the university is located is not well connected to the main link road. This may result in an increase in the use of private transport</td>
<td>Infrastructural development because of a rise in institutional as well market facilities Government has started bus for students to save emission from private vehicles as an initiative of TERI University sustainability cell a part of EMS system</td>
<td>Emission may rise in future</td>
</tr>
<tr>
<td>Legislation/laws</td>
<td>The university is performing well under existing guidelines</td>
<td>There are no laws or guidelines in the Indian legal system for environmental management in universities</td>
<td>EMS system may help an initial model to develop such models for other universities in India</td>
<td>Absence of any prescribed guidelines for EMS in universities may result in a lack of impetus for continual improvement</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>Use of University Management System (UMS) which reduces resource consumption (like papers, prints, photocopy, etc.) University focused on environment, having a green building improves the image Small university, hence, if EMS established, the idea of environmental protection will become an integral part of university operation and management</td>
<td>University already has a UMS, can be made paper free/zero paper in the future to reduce the carbon footprint Can serve as the model for EMS implementation for universities across India Can serve as an excellent learning module for students at the university financial benefits can be used for further improvement of the system</td>
<td>Conflicts may arise between anthropogenic activities and environment, since the university campus is located in the fringe area of the Delhi ridge</td>
<td></td>
</tr>
</tbody>
</table>
Management Structure

**Review Committee**
- The Chancellor/VC/PVC, Dean & Registrar
- Monitor overall functioning of EMS

**Management Committee**
- 2 Faculty members, 3 students
- Supervision of activities of steering committees, link between review and steering committees

**Steering Committees**
- 3 students for each environmental domains
- Ensure that EMS is implemented, targets are met
TERI University acknowledges and understands its role in striving towards global environmental sustainability. It aims to set standards in terms of on-campus environmental performance through its continuous endeavors. In this regard, the university shall:

- comply with all requisite environmental legislation and government guideline, wherever applicable;
- ensure that there is optimum utilization of resources and waste generation is minimized;
- integrate environmental concerns in decision-making, e.g. purchasing policy;
- implement an EMS; and
- strive towards continual reduction in ecological footprint of the university as it grows.
Documentation

- Need for a documentation system (preferably online)
- Documentation of: legal, regulatory requirements, EMS, reports of internal and external audits etc.

Table 1: Suggested Format for Documentation

<table>
<thead>
<tr>
<th>Activity</th>
<th>Description</th>
<th>Environmental Effects</th>
<th>Actions undertaken</th>
<th>Future Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>e.g. Use of paper</td>
<td>For documentation, printouts, memos, letters etc</td>
<td>Contribution to carbon footprint, waste generation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lighting</td>
<td>In offices, classrooms, laboratories, hostel, canteen, washrooms, corridors etc</td>
<td>Energy consumption, contribution to carbon footprint</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Training & Communication

Training

- For staff, students, faculty, new employees, internal auditors
- Discussions, seminars, workshops
- Orientation/induction programme
- Encouragement to volunteering for steering committees’ work

Communication

- Maintain a communication log-internal and external
- Dedicated space on website for description of University EMS
- Notices/brochures etc for upcoming seminars etc on notice boards, website, canteen, etc
- Display of environment policy
- Setting up a drop-box to encourage remarks, suggestions on improvement of EMS etc
Energy Management

- Proper maintenance of existing infrastructure
- Assessing the GHG emission potential of the current energy system
- Switch to renewable sources like solar energy in the long run
- Efficient use of resources viz. switching off lights, LCD etc. when not in use
Water Management

- Calculating water footprint of the university; setting annual targets on the basis of that
- Efficient use of water
- Extending wastewater treatment facility to all blocks of university
- Reuse and recycling of water
Waste Management

- Waste segregation is essential
- Estimation of paper waste generated per capita per day through an assessment; recycling of paper in-house or through an external agency
- Use of University Management System to minimize paper usage
- Priority to eco-friendly products during purchases

Three-tier approach for waste management

1. Waste Avoidance and Reduction
2. Reuse and recycling
3. Eco-friendly disposal
Landscaping/ Biodiversity

- Inventory of species in and around campus
- Use of plants that are compatible with local conditions
Air Quality Management

- Baseline data on air quality to be generated using sampling exercise
- Regular monitoring of air quality - ambient as well as indoor
- Promoting car pooling, use of cycling, walking etc.
- Check on use of private cars, motorcycles, etc.
Monitoring Mechanism

- Setting indicators for environmental performance
- Monthly performance evaluation of each environmental domain
- Surprise checks by Management Committee
- Internal audit every 6 months
- External audit once in a year
Environmental management systems for educational institutions

A case study of TERI University, New Delhi

Suresh Jain and Pallavi Pant

Department of Natural Resources, TERI University, New Delhi, India

Abstract

Purpose – The purpose of this paper is to put forth a model for implementation of an environmental management system (EMS) in institutes of higher education in India.

Design/methodology/approach – The authors carried out initial environmental review (IER) and strengths, weaknesses, opportunities and threats (SWOT) analysis to identify the major environmental concerns in the university. This was followed by preparation of environmental policy and plan based on ISO 14001 guidelines.

Findings – The key concerns in the university have been identified as energy consumption, waste generation, transportation, etc. The SWOT analysis shows that the university is doing satisfactorily in energy efficiency and water conservation while there is scope for improvement in case of waste management, transportation and landscaping. The environmental management plan has been prepared keeping in mind the gaps observed through the IER and SWOT analysis.

Research limitations/implications – Carbon footprint and water footprint analysis have not yet been carried out and hence, quantifiable targets have not been included in the environmental management plan.

Practical implications – Implementing an EMS at the university will help reduce the impact on environment due to various day-to-day activities. It will also lead to developing environmental consciousness in the minds of young professionals who graduate from the university as well university staff.

Originality/value – There have been very few examples of environmental consciousness in educational institutions in India. There is a need for model systems for incorporating environmental management in the university set-up. This research documents the process of identification of environmental concerns followed by preparation of the management plan for an educational institution. The research also documents the need for different aspects of the environmental management plan.

Keywords Environmental management, Universities, Sustainable development, India
How we have started this work?

A case study of TERI University
Framework for Campus Sustainability

Environmental Management & Sustainability in Educational Campuses

EMS in Educational Campus

- Green Campus to showcase students where they learn and implement those ideas when they go out of campus

Sustainability Aspects in Research & Teaching

- Conferences, Seminars, Workshops related to sustainable development, energy efficiency etc.
- Sustainability aspects should be included in course curriculum
- Research and Development on climate change, energy efficiency, sustainable development etc.

Students and Faculty Participation in Projects and Social Equity

- Students and faculty participation in environmental management
- Students and faculty participation in awareness and participation in different projects
- Involvement of students and community for education to students (poor/handicap) who are not able to get education

Source: Jain and Pant, 2010
CARBON NEUTRAL & SUSTAINABLE CAMPUS

Suresh Jain, Ph.D.
Professor, TERI University, 10 Institutional Area
Vasant Kunj, New Delhi-110070
Email: sureshj@teri.res.in; sureshjain_in@yahoo.com

National Training Program on “Training of Trainers for Environment Audit” from 11th July to 15th July, 2016, iCED, Jaipur
Guidelines & Framework for Assessing Carbon Neutrality & Sustainability in Educational Campuses
Action group members

- **Dr Suresh Jain (Convenor)**
  - Professor, Department of Natural Resources, TERI University, New Delhi

- **Dr Ramesh Jalan**
  - Resource Person & Moderator, Climate Change Community, Solution Exchange, United Nations Development Programme, New Delhi

- **Dr Shaleen Singhal**
  - Associate Professor, Department of Policy Studies, TERI University, New Delhi

- **Dr Prateek Sharma**
  - Professor, Department of Natural Resources, TERI University, New Delhi

- **Mr Archit Agarwal**
  - Research Scholar, Indraprastha Institute of Information Technology, New Delhi

- **Ms Viveka Jani**
  - Research Scholar, Department of Natural Resources, TERI University, New Delhi

- **Mr Prabhjot Sodhi**
  - Country Program Manager, Global Environmental Facility (GEF), UNDP CEE SGP, New Delhi

- **Mr Anil Arora**
  - Senior Project Officer, Global Environmental Facility (GEF), UNDP CEE SGP, New Delhi

- **Dr Suneel Pandey**
  - Associate Director, Green Growth & Resource Efficiency Division, The Energy and Resources Institute (TERI), New Delhi

- **Mr Vaibhav Goel**
  - Manager, IGBC AP and GRIHA, Godrej & Boyce Mfg. Co. Ltd., New Delhi

- **Mr Aditya Pundhir**
  - Country Manager, The Climate Project Foundation, New Delhi

- **Dr Chetan Vaidya**
  - Director, School of Planning and Architecture
  - Chairman, All India Planning Education Board of AICTE 4-Block-B, Indraprastha Estate, New Delhi 110002, India

- **Mr Barun Aggarwal**
  - Director, Breathe EasyTM, Paharpur Business Centre, Nehru Place Greens, New Delhi

- **Dr. Anil Haritash**
  - Assistant Professor, DTU, New Delhi
OFFSETS
SEQUESTRATION:
trees taking carbon
dioxide from the
atmosphere

CARBON

CAMPUS SUSTAINABILITY

ECONOM
ENVIRONM
PEOPLE
Fostering sustainability through education, research and practice: a case study of TERI University

Suresh Jain*, Preeti Aggarwal, Neeraj Sharma, Prateek Sharma

Department of Natural Resources, TERI University, 10 Institutional Area, Vasant Kunj, New Delhi 110070, India

ARTICLE INFO

Article history:
Received 31 July 2012
Received in revised form 29 March 2013
Accepted 17 April 2013
Available online 25 April 2013

Keywords:
Sustainability
Blended learning
Interdisciplinary
Environmental management system

ABSTRACT

This paper reflects the philosophy of TERI University of intrinsically building the concept of sustainable development (SD) through higher education and research. This has been illustrated by taking up an example of its flagship postgraduate program in Environmental Studies and Resource Management. The program is built by seamless integration of sustainability concept that incorporates social, cultural, economic, scientific, technological, legal and policy perspectives to address issues related to environment and resource management by laying strong emphasis on experimental/empirical evidence. The pedagogy of the program is based on blended learning using face-to-face interactions, live case studies, field visits, conferences, seminars and active use of information and communication technology. The curriculum has been designed by seamlessly integrating the principles of SD in an interdisciplinary framework. This has resulted in creation of a cadre of motivated and trained students who have taken the initiative for achieving sustainability on the campus through an environmental management plan and policy that focuses on five key environmental aspects – energy, resources, waste (solid and hazardous), ambient/indoor air and landscaping.

© 2013 Elsevier Ltd. All rights reserved.
The TERI University (TU) in 2012 has signed the “Rio-20 Declaration of Higher Educational Institutions (HEIs)” and declared its sustainability project for the years 2012-2015.

The HEIs play a vital role in the training of teachers and reorientation of the curricula in addition to the promotion of ESD in formal, non-formal and informal learning environment on a lifelong basis.

Source: Jain et al., 2013
Sustainable Development (SD) for TU is “Development using principles of equity (regional, temporal, gender, intergenerational, ecological and economic), efficiency (optimization, minimization and conservation through use and advancement of technology), feasibility (economic and social acceptability), interdependence and integration, durability (through change in lifestyle and innovation), and decentralization (for planning and implementation)”.

The education at TU integrates the philosophies of “Learning for Sustainable Development” and “Learning as Sustainable Development”.

Source: Jain et al., 2013
Approach behind the ESRM Program

Source: Jain et al., 2013
Introduction to the study

- Educational institutions are complex systems.
- Concepts of campus carbon neutrality and sustainability create a culture of sustainability amongst the younger generations.
- In India, the field is still nascent. A systematic and cohesive approach towards campus sustainability and low ecological footprint is lacking.
- Heterogeneity between institutions; hence, need for a framework which reflects uniqueness of individual campuses and also commonalities between different campuses.

Sources: Jain & Pallavi, 2010; Alshuwaikhat & Abubakar, 2008; Cortese, 2005; Cole, 2003; Rodriguez et al., 2002; Bookhart, 2008; Shriberg, 2002; Dawe et al., 2005
Objectives

- To develop a framework for assessing and reporting campus carbon footprint and sustainability that can be implemented across educational institutions in India.
- To develop a Campus Sustainability Index to rank and compare educational institutions across India based on their carbon footprint and sustainability initiatives.
- To develop a guideline for assessing carbon neutrality and sustainability of educational campuses.
Existing frameworks

- The American College & University Presidents’ Climate Commitment (ACUPCC) framework
- Sustainability Tracking, Assessment & Rating System (STARS) rating system by the Association for the Advancement of Sustainability in Higher Education (AASHE)
- The GHG Protocol framework
- GHG Emissions Inventory Calculator and the Campus Sustainability Assessment Framework (CSAF) by Sierra Youth Coalition

Methodology

Carbon Neutral & Sustainable Educational Campuses
Steps followed for framework development

- Initial Environmental Review (IER) to understand the existence of tools and guidelines to assess the Carbon Neutrality and Sustainability of Educational Campuses (CaNSEC).
- Comprehensive literature review to identify the indicators and sub-indicators required for developing the framework/tool for assessing CaNSEC.
- Methodology for selection of indicators/sub-indicators and framework development has been finalized in the four Brainstorming Sessions with experts. A questionnaire has been developed for assigning weights to each indicator from experts from India and abroad.
- Finalisation of all the indicators after receiving comments from experts including weights for assessing CaNSEC.
- Data collection to assess the CaNSEC by taking a case study of TERI University.
Questionnaire survey

- Five point ‘Likert scale’ has been used with 5 being the most significant and 1 being the least significant.
  - 1. No Significance
  - 2. Little Significance
  - 3. Moderate Significance
  - 4. High Significance
  - 5. Very High Significance

- Questionnaire base survey has been used to estimate the weights to each ‘Indicator’ and ‘Sub-indicators’.

- http://tinyurl.com/kkxewko
Tiers of the Campus Sustainability Index

- Carbon Footprint: 5 indicators
- Environmental Component: 8 indicators
- Academic Component: 7 indicators
- Social Component: 5 indicators
- Economic Component: 4 indicators
Indicators - Carbon Footprint

- Energy consumption
- Waste generation
- Transport
- Water supply from external sources
- CO₂ offsets
Steps of Carbon Foot-printing

**Scoping**
- Identify the sources of GHG emissions in the institution
- Defining the ‘system boundary’ of the study

**Data Collection**
- Draw a data collection plan
- Compile the GHG conversion/ emission factors
- Collect the data for the direct and indirect (if the scope of the study includes these) emissions

**Footprint Calculations**
- Compile activity data
- Multiply the activity data with respective emission factors to generate carbon footprint

Source: BSI; DEFRA; DECC; BIS, 2011
Data collection

- TERI University chosen for pilot study.
- Data gathered for period of twelve months (Jan 2014- Dec 2014).
- Data collected from different sources—administrative professionals, technical personnel, faculty members and students.
Carbon Neutral & Sustainable Educational Campuses

Carbon footprint of a given activity
= Activity data (mass/volume/kWh/km)
× Emission factor (CO₂e per unit)
Carbon Footprint of TERI University

Source: TERI University
Contributions in Carbon footprints

- Energy consumption: 71%
- Transport: 28%
- Waste generation: 1%
- Water supply from external sources
- CO₂ offsets

Source: TERI University
Carbon footprints

Scores to carbon footprint exercise

<table>
<thead>
<tr>
<th>Indicator No.</th>
<th>Carbon Footprints</th>
<th>Scores (10000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Energy</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Waste Generation</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Transport</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Water Supply</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Carbon Sinks</td>
<td></td>
</tr>
</tbody>
</table>
Indicators - Sustainability Assessment

Environmental quality (8 indicators)

Social equity (5 indicators)

Economic prosperity (4 indicators)

Academic performance (7 indicators)

Sources: Cucek et al., 2012; Global Reporting Initiative, 2011; Lozano, 2006; Rodriguez et al., 2002
Campus Sustainability Index

Carbon Footprint: 50%
Campus Sustainability: 50%
Weightage - Sustainability components

Source: Experts opinion through questionnaire survey
Data Assessment and evaluation

- Each indicator was brainstormed to convert the data into mathematical value for scoring.
- We broadly identified two types of scoring methods for the indicators.
  - Level based scoring and
  - Continuous scoring
Level Based Scoring

- The data is qualitative and not in the form of numbers.
- A score is divided into two or more distinct levels, and the data is then converted to its score based on expert’s opinion.
  - For example, for the Indicator ‘Monetary savings by resource conservation’, total score is 400. In a three level score, an institute can score

\[
\text{Score} = \begin{cases} 
0 & \text{No savings}, \\
\frac{50}{100} \times \text{ScoreT} & \text{Saving without measurement}, \\
\frac{100}{100} \times \text{ScoreT} & \text{Savings with measurement},
\end{cases}
\]
Continuous scoring

- In continuous scoring, there is quantitative data available and the data itself is added in a formula to give a score anywhere between 0 and the 100%.
- For example, for the Indicator ‘Student Enrolment Rate’, the total score is 310 and the following formula is used

\[
Score = \begin{cases} 
  x > 50, & \frac{(x - 50) \times 2}{100} \times Score_T \\
  x < 50, & 0 \\
  x = \% Enrolment 
\end{cases}
\]

So if let say student enrolment is 75%,

\[
Score = \frac{(75 - 50) \times 2}{100} \times 310 = \frac{50 \times 310}{100} = 155
\]
## Scores to Campus Sustainability exercise

<table>
<thead>
<tr>
<th>Indicators</th>
<th>Scores</th>
<th>Indicators</th>
<th>Scores</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green Building</td>
<td>380</td>
<td>Sustainability in Research</td>
<td>360</td>
</tr>
<tr>
<td>Campus Sustainability Committee</td>
<td>360</td>
<td>Scholarships for Sustainability Studies</td>
<td>300</td>
</tr>
<tr>
<td>Energy Conservation</td>
<td>410</td>
<td>Training Programs</td>
<td>380</td>
</tr>
<tr>
<td>Paper Reduction</td>
<td>350</td>
<td>Indoor Environment</td>
<td>360</td>
</tr>
<tr>
<td>Water and Wastewater Management</td>
<td>1220</td>
<td>Student Safety and Discipline</td>
<td>780</td>
</tr>
<tr>
<td>Solid Waste Management</td>
<td>390</td>
<td>Non Discrimination - Gender</td>
<td>200</td>
</tr>
<tr>
<td>Landscape Utilization</td>
<td>360</td>
<td>Non Discrimination - Disability</td>
<td>200</td>
</tr>
<tr>
<td>Mode of Transport</td>
<td>390</td>
<td>Community Development</td>
<td>350</td>
</tr>
<tr>
<td>Student Enrolment</td>
<td>300</td>
<td>Income percentages</td>
<td>910</td>
</tr>
<tr>
<td>Employee Retention</td>
<td>290</td>
<td>Budget Allocation for training programs</td>
<td>340</td>
</tr>
<tr>
<td>Students to Teachers Ratio</td>
<td>280</td>
<td>Investment in community development</td>
<td>330</td>
</tr>
<tr>
<td>Sustainability in Curriculum</td>
<td>370</td>
<td>Monetary Savings by Resource Conservation</td>
<td>390</td>
</tr>
</tbody>
</table>
Scores assigned to Carbon Neutral & Sustainability Framework

<table>
<thead>
<tr>
<th>Carbon Footprint Scores</th>
<th>Maximum score points 10000</th>
</tr>
</thead>
<tbody>
<tr>
<td>The carbon footprint score has been given on the absolute basis between 0 to 100% out of 10000 total score points. The score will be assigned to the CARBON OFFSETS.</td>
<td>For example – If your institution is doing 10% CARBON OFFSETS, then you will get ‘1000’ score points. If your institution can achieve 30% CARBON OFFSETS, then you will get ‘3000’ score point out of total 10000 score points.</td>
</tr>
</tbody>
</table>
SUSTAINABILITY IS IN OUR NATURE!
References

References


