

## CORPORATE ECOLOGICAL FOOT PRINT (CEF) OF SRM UNIVERSITY TOWARDS SUSTAINABILITY

### A Pilot Study

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**Abstract** - Global warming and climate change are the foremost environmental challenges facing the world today. They will only be tackled effectively if actors at all levels in society including governments, businesses, communities and individuals take responsibility for, and attempt to minimize their greenhouse gas emissions. The CEF assesses the demand for bio-capacity by inhabitants of a geographical area to maintain their consumption of resources and waste generation using existing technology. Companies choose 'Carbon Footprint' as a tool, similar to the ecological foot print to calculate the green house gas emission to compare the impact of activities on the environment. This working paper explores the current dimensions in the development of an educational institution and targets on the reduction of carbon foot print. Greenhouse gas emitting protocol for SRM campus in terms of tones of equivalent CO<sub>2</sub> per year is projected using 3 basic steps.

- Establishment of the assessment boundaries
- Collection of data.
- Calculation of emissions using appropriate emission factors

The estimation SRM campus foot print shows an emission of 9868.19 tonnes of equivalent CO<sub>2</sub> per year by accounting direct emission from sources owned/controlled by the campus and from indirect emission from purchased electricity and other outsourced distribution.

The information of Corporate Carbon Footprint helps us identifying the GHG emission "hot spots" and identifies where the greatest capacity exists in reductions of GHG emissions. This enables us to benchmark our activities and develop an effective carbon management.

**Keywords** – Eco audit, GHG emission, Green initiatives, CO<sub>2</sub>

#### I. INTRODUCTION

Tools such as the carbon footprint help us to gain a better understanding of how our actions are connected to the climate change [1]. While the term carbon foot print has a number of definitions, generally a carbon foot print can be defined as the estimated emission of carbon dioxide and other green house gases associated with a particular activity, use of company owned assets or use of a particular product or service. Through the process of a footprint analysis, we can more deeply grasp the cause-and-effect that lies behind climate change.

Different approaches have been used to estimate CEF. However, there is still no consensus regarding certain matters that determine its content. For example the inclusion of carbon-di oxide or other gas emissions, defining the Scopes of direct or indirect emissions, being embodied in the purchase of goods and services that need energy in their production and also in the methodology. 'Method composed of financial accounts '(MC3) based on household footprint has also been suggested in some reports [2]

In this paper, we are describing what parts of Scopes have been investigated for measuring SRM University's campus corporate foot print. It is also aimed at identifying carbon emitting hotspots in the campus in order to have mitigation measures that can be implemented. Calculating the CEF of SRM campus makes the campus more sustainable.

#### II. METHODOLOGY

Green house gas emission accounting and reporting approach undertaken in this study follows guidance and principles set out in the 'green house gas corporate accounting and reporting standards', developed by 'Green house gas protocol'. This is the most widely used and accepted methodology for conducting corporate carbon foot print. [3,4] This protocol gives a good model to follow different steps in our study. The first step is setting organization and operational boundaries. This includes defining the scopes as follows:

Scope 1: Direct emission from sources owned or controlled by the Institution, (like emission from combustion of fuels). This includes the campus stationary sources such as heating, cooking, and refrigeration.

Scope 2: Indirect emission associated with the generation of purchased electricity consumed.

Scope 3: All other indirect emissions are a consequence of activities that the institution neither owns nor controls.

This study also takes into account campus size, population of students, staff, faculty and workers that form the core of SRM University's functioning. [5]

To find all the required information, we have collected data by fixing the assessment boundaries to the following departments: hostels, canteens, administrative services and laboratories in the campus in the time frame of 50 weeks.

Matrices have been prepared for each category of product/service consumed. They are classified into (i) energy

consumption, subdivided into electricity, fuels, materials, services and waste products. (ii) Use of land, agricultural resources, fishing resources included by accounting food and water consumption in the hostels, laboratories and the related energy associated in its pumping (iii) All other indirect emission sources include travel, paper consumption and solid wastes. Necessary approximations were brought in on the standard conversions adopted from respective standards.

### III. CALCULATION

- A total of 107131 Kwh of grid electricity is consumed on yearly basis which translates into a carbon emission of 101.77 KgCO<sub>2</sub>/yr. The Conversion factor includes the carbon generated at the production and transmission stages. The Electricity produced by the generators has 2 primary functions, one to power the campus during power cuts and for the running of our auditorium. This Translates into Direct Carbon Emissions of 1670.22 Kg CO<sub>2</sub>/yr.
- SRM has a fleet of 476 Vehicles that emit 540840.28 Kg of Co<sub>2</sub> Emissions. This literally translates into a ton of Carbon emissions per vehicle per year. Delving a little deeper will show us the reason for this mammoth emission and which vehicles is the more polluting type.
- The 25 canteens considered in the study emit 1789.84 tones of Co<sub>2</sub> Directly into the atmosphere every year in the form of LPG.
- Pumping of Water in contributes to 131.40 tonnes of Co<sub>2</sub> being emitted which stresses the need for Better

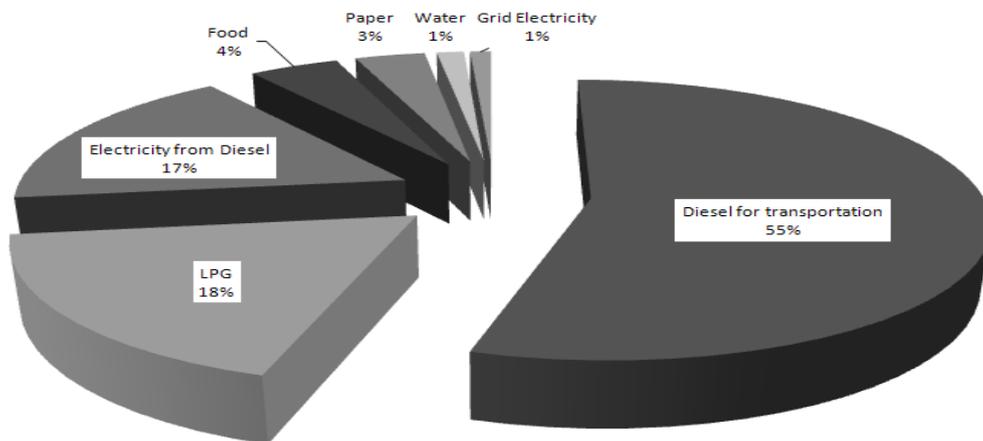
water harvesting structures to reduce dependence on pumped water.

- Wastage of food is an indirect emission of Co<sub>2</sub> but the amount of food wasted itself is staggering at 107.95 tonnes a year.

Results have shown graphically in the pie-chart.

Materials	Conversion factor [6,7,10]
	Kg of CO <sub>2</sub> per unit of consumption
Grid electricity	0.950 per kWh
Fossil fuel	2.68 /lr
LPG gas	2.01/kg
Small diesel vehicle	0.12 /km
Large	0.14 /km
Lorry/bus	2.68/km
Water	0.08 hectare/million litre; 1 hectare=1.8 t-CO <sub>2</sub>

**Percentage of Emitted CO<sub>2</sub>**



#### IV. INFERENCE

S. No.	Consumption Activity	Tonnes CO2/year	Percentage
1	Grid Electricity	101.77	1.03
2	Electricity from Diesel	1670.22	16.92
3	Diesel for transportation	5410	54.82
4	Food	431.83	4.37
5	Water	131.4	1.33
6	LPG	1784.89	18.08
7	Paper	338.08	3.42
	Final	<b>9868.19</b>	

The major contributors to the carbon footprint are the diesel used for the automobiles of SRM and the Grid electricity consumed. The ecological foot print calculated on some part of the area in the campus during the year 2006-07, indicated the largest foot print is for food it is about 3.1 ha per person per year [8]. It is attributed to increased consumption of processed food items and also large amount wastes of packaging materials.

Accounting all the important emission spots, considering the total population in this study, a total of 9868.19 tonnes of CO<sub>2</sub> is observed to be emitted per annum. This accounts to 17.94 tonnes per acre per annum. This value is in between medium and high level of CO<sub>2</sub> emission for a corporate sector.

#### V. GREEN INITIATIVES

SRM's Environmental policy provides the strategic framework for the university to protect environmental system and frame environmental objectives. These objectives address the areas such as workplace safety, conservation of energy and natural resources and environmental protection. The policies are supported by university practices and environmental programs. [9]

- I. Part of SRM's Commitment to minimize our carbon foot print is maintaining our campus facility as 'Green Campus'. Our management is constantly looking for methods to minimize the consumption of natural resources and manufactured products functioning under ably managing team leaders.
- II. The main goals are to minimize the consumption of water, energy, paper, promotion of maximum recycling, re-use of goods, design and manage its buildings to maximize the use of natural sources of heating and lighting.

Greening activities have been incorporated in the whole university campus, both administrative blocks and hostels. SRM resource conservation programs are governed by 3R principle (Reduce, Reuse and Recover). Our management has raised awareness to all the stakeholders about waste reduction and has encouraged the greening activities by

maximizing the use of Information Communication Technology to reduce paper use.

Committee monitors paper use and helps implement policies to reduce it. Regular recycling of paper has been carried out. Substantial reduction of usage is attributed to installation of multifunctional printers, electronic document storage and retrieval system. Usage of intranet by staff, faculty and students is regularly been practiced. Effective communication through internet, video conferencing, on line dealing in applications, examinations have been practiced by administrative and examination wing.

In order to reduce green house gas emissions from its vehicles we have developed transport options such as mass transport, car pooling, careful monitoring of emission levels and also considering the fuel efficient rating when procuring new vehicle. We are encouraging staff and student walking reasonable distance rather than using motorized transport.

Energy conservation teams in the university and hostel monitor consumption of electricity and water in order to formulate conservation strategies. The reduction of consumption has been primarily achieved by optimizing the operation of chillers, replacing incandescent bulbs with energy efficient compact fluorescent lamps, separating control switches from group control to individual, fixing sensors for on/off control. Solar panels have been added to provide electricity for lighting and heating. Regular energy audits help us to control the consumption. Fixation of occupancy sensors to automatically turn off lights and other items is under progress.

In hostels and canteens, staff, student volunteers work along with food service providers to limit the waste generated. We are able to reduce 20 % of the solid wastes effectively via vermi-composting and biogas production unit.

Water savings mainly come from increased awareness among staff, student and workers, spot cleaning of floors rather than pressurized spray washing, fixing sensors to control overflows from tanks and introducing treated water to gardening.

SRM university is planning to apply ISO 14001 certification for our environment and safety management. All these efforts will be linked to the continued reduction of our carbon foot print.

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