The Home Energy Saving Book

LED Lamp

Save Energy For Benefit of Self and Nation

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Foreword

The rapid industrialization and urbanization have resulted in ever increasing demand for energy resources. Excessive use of fossil fuels have contributed significantly to generation of green house gases. The Green House Gases (GHG) are causing global warming and climate change which results in increase of temperatures, changing weather patterns, impacts on food production and health.

It should be realized that the climate change is caused by human actions and we must be wise enough to use technology in finding the solution like shifting to energy efficient appliances. For instance, by using energy efficient lighting, energy consumption and CO_2 emissions could be reduced as high as 30%, and that would also save the users' expenses on electricity.

Everyone certainly can contribute towards energy conservation and reduction of greenhouse gas emissions by examining extent and schedule of one of their own home appliances and maintenance of those appliances. We should also be a part of a strategy in encouraging everyone to conserve the energy.

In this context, I appreciate the initiative taken by the Corporate Environment Department in bringing out a handbook titled "The Home Energy Saving Book". The book signifies the role, a household can play in reducing greenhouse gas emissions by adopting a more responsible lifestyle, starting from simple practices as recommended in the handbook.

I take this as an opportunity to suggest every singarenian to take initiative in the drive for energy conservation and stand as a role model for others to emulate. It is the only rational way to save our planet, before it is too late.

(S. Narsing Rao)

What is global warming? You must have heard about it on the news and from scientists, but what does it mean to you and what you can do about it.

The energy and resources we use for modern living can release a variety of gases into the atmosphere that trap heat from the sun and cause the earth to warm up. This process is called global warming and the gases contributing to it are collectively known as Green House Gases (GHG).

There is an urgent need for all of us to reduce our greenhouse gas emissions by saving energy and resources, and changing the way we live, work and travel.

Household energy accounts for about half of the India's total energy consumption. The energy we use in our homes and transport vehicles, the food we eat and the things we buy can all affect how much greenhouse gas we produce. The good news is that you can save energy, reduce your bills and remain comfortable, we can look at our diets and be healthier, and we can look at how we make purchases and save money. And with a bit of advice, all these strategies can help reduce global warming.

This book offers practical ideas that all of you can use to reduce your energy costs and greenhouse gas emissions.

Relation ship between fossil fuel and global warming:

All of us use more fossil fuels than any other kind of energy resource. This includes coal and gas for our electricity, oil for transport fuels and natural gas for heating as well as the energy it takes to make all the goods and services we buy.

In the global carbon cycle, animals exhale CO_2 which enters the atmosphere. Plants use sunlight to take this CO_2 to turn it into oxygen and vegetable matter rich in carbon.

Carbon dioxide in the atmosphere has increased by 25% in the last century and is currently higher than at any stage in almost a million years. With the increase in carbon dioxide content, the temperature of the atmosphere and ocean has increased by around 0.7^{0}C which result in melting of snow and polar ice causing rise in sea level.

What can we do to avoid / reduce?

We can't avoid some changes to our climate and we'll have to adapt how we produce food, use water, build our cities and look after natural environment. But, we can still avoid the worst case global warming projections and the potentially dangerous impacts they would bring.

The most important thing you can do as part of a global effort is to reduce your carbon dioxide emissions. To do this, you need to burn less fossil fuel, conserve the resources you use for the goods you buy and reduce land clearing. For example, every time you use gas in your homes, petrol in your vehicles or electricity produced by power stations that burn coal or gas, your are contributing to greenhouse gas emissions. Even the food you eat, the goods and services you buy and use have an impact. Fortunately, at an individual level there are many opportunities to use these resources more effectively and reduce emissions while continuing to live comfortably.

What is "Carbon Footprint"?

A "**carbon footprint**" is a measure of the impact our activities have on the environment and in particular climate change. It relates to the amount of greenhouse gases produced in our day-to-day lives through:

- ✓ using energy at home and for transport.
- ✓ producing the food you eat and the goods and the services you use.
- ✓ disposing of waste products such as newspapers, garden waste and packaging.

The carbon footprint is a measurement of all greenhouse gases we individually produce and has units of tonnes (or kg) of carbon dioxide equivalent. A carbon footprint comprises two parts, the primary foot print and secondary foot print.

The **primary footprint** is a measure of emissions of CO_2 from the burning of fossil fuels including domestic energy consumption and transportation (e.g. bike & car), the activities on which we have direct control.

The **secondary footprint** is a measure of the indirect CO_2 emissions from the whole lifecycle of products we use - those associated with their manufacture and eventual breakdown. To put it simply – the more you buy the more emissions will be caused on your behalf.

How to measure your carbon footprints?

Carbon dioxide is the most abundant greenhouse gas but there are many others such as methane, ozone, nitrous oxides and fluorocarbons which trap different amounts of heat. You have to be careful about all these gases because even though you send

far more CO_2 into the atmosphere than any of these other gases, they are still extremely powerful global warming agents. For example, fluorocarbons can be many thousands of times more potent than the same volume of CO_2 in warming the atmosphere.

Instead of listing all the greenhouse gases, we can calculate for each greenhouse gas, how much CO_2 it would take to produce the same amount of warming. This equivalent amount of CO_2 is called 'CO_2-e', where 'e' stands for 'equivalent'.

Using garbage bags to measure CO_2-e

Talking about CO_2-e is one thing, but trying to visualize it requires some imagination. Traditionally, scientists measure CO_2-e by its mass, in kilogram or tonnes. It is easy enough to understand what is meant by a kilogram of mangoes, but what does a kilogram of gas look like?

Luckily for you, the garbage bags in the photo hold 100 grams of CO_2-e. So you can use these garbage bags to talk about how much CO_2-e you produce or avoid. For example, a household of three people could easily produce enough CO_2-e in a year to fill 5,00,000 garbage bags.

From now on, you will know how much CO_2-e you produce or avoid in terms of **garbage bags**. The following thumb rules might be useful:

- ✓ 10 garbage bags of CO_2-e have a mass of about 1 Kg.

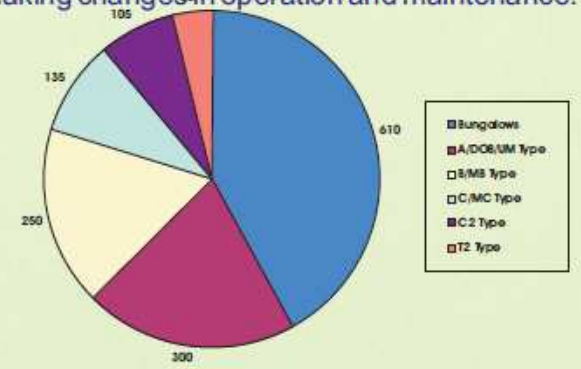
- ✓ 10 garbage bags of CO_2-e are produced from a kilowatt - hour (kWh) of electrical energy usage. Our electricity bills are calculated basing on consumption in kWh and for example if we use a 100 Watt light for 10 hours, the electricity consumption will be one kWh.
- ✓ 24 garbage bags of CO_2-e are produced by using a litre of petrol.

This Home Energy Saving Handbook is a practical guide to help you save energy, save money and reduce your carbon footprint at home. The handbook includes energy-saving tips and information on home cooking, lighting, room cooling, building construction and renovation, shopping, transport and more.

POWER CONSUMPTION SCENARIO IN SCCL

The annual power consumption in SCCL including industrial and domestic during 2008 - 09 was 619.50 million units at a cost of Rs. 257.68 Crores. Out of this the domestic consumption was 140.60 million units with an expenditure of Rs. 56.24 Crores. The following pie diagram shows the estimated power consumption in units (1 unit = 1 kWh) for different types of company quarters.

In many houses, it is possible to save 10 - 30% of the energy usage by making changes in operation and maintenance.



Therefore, an attempt is made through this hand book to show exactly what you, as individuals, can do to cut your energy use without cutting back on your lifestyles. It is possible to be eco-friendly, save money and be comfortable.

The suggested activities for reducing carbon footprints at household level cover the following strategies.

- **Simple energy - saving tricks around the house.**
- **Maximizing your home's potential for easy heating and cooling.**
- **Ways to save on shopping and transport.**
- **Making the most of your garden.**
- **Tips for building and renovating your home.**

A. Easy Energy Savings around the Home:

Energy saving appliances

- ✓ New and improved appliances use less electricity than older models. Energy can be saved by using existing appliances more wisely and by investing in modern "energy star approved appliances".
- ✓ Look for energy or water star ratings while buying household appliances like air conditioners, fridges, ceiling fans, fluorescent lights, shower heads, water heaters, washing machine, toilet flush tanks etc.

- ✓ The star rating will help you in saving energy and reducing carbon footprint as well. More the number of more stars on the label, more energy / water efficient the appliance will be.
- ✓ In case of air conditioners, the measure of energy efficiency is the Energy Efficiency Ratio (EER). The EER is defined as the Cooling Capacity (in Watts) divided by the / Power Consumption (in Watts)

- ✓ Refrigerators in homes are responsible for about 9000 garbage bags of CO_2-e per year. Moving to five-star refrigerators could avoid about 5000 garbage bags of CO_2-e per year.

Kitchen

- ✓ Replacing old refrigerator with the one having energy efficient rating will conserve lot of energy.
- ✓ Select refrigerator with capacity that is just large enough for your family's need. Anything larger uses more energy than is necessary.
- ✓ Place refrigerators out of direct sunlight and away from the stove and other heat producing appliances.
- ✓ When dust builds up on refrigerator's condenser coils, the motor works harder and uses more electricity. Clean the coils regularly to make sure that air can circulate freely.
- ✓ Make sure refrigerators have tight fitting door gaskets to prevent infiltration of warm air.
- ✓ For manual defrost refrigerator, accumulation of ice reduces the cooling power by acting as unwanted insulation. Do not allow ice to accumulate more than one-fourth inch on manual defrosting refrigerators and periodical defrosting of the fridge will reduce your carbon footprints.
- ✓ Refrigerator motors and compressors generate heat, so allow enough space for continuous airflow around refrigerator. If the heat can't escape, the refrigerator's cooling system will work harder and use more energy.
- ✓ Bring items taken out of refrigerators (like vegetables, milk etc) to room temperature before placing on the gas stove for heating. Similarly, avoid putting hot or warm food straight into the refrigerators.
- ✓ Do not open the doors of the refrigerator frequently and don't leave the refrigerator door open for longer than necessary as cold air will escape.
- ✓ When going out on a long vacation for more than a week, it is a good time to empty, defrost and leave the fridge door open to prevent mould growth, while on short breaks, leave the fridge at optimal cooling or in energy saving mode.
- ✓ Replace electric oven with LPG oven. Replace gas oven that has a pilot lamp with a gas oven with no pilot light. Changing from electric to gas oven avoids 1800 garbage bags of CO_2-e per year.
- ✓ Replace typical electric cooker with a gas based cooker.
- ✓ Energy star approved dish washers use 25 per cent less energy than other new models.
- ✓ Always run dishwasher with a full load. Most of the energy used by a dishwasher is spent heating water, and since you can't decrease the amount of water used per cycle, filling machine is more effective than running half loads.
- ✓ Use pots and pans with absolutely flat bottoms on your cooking range to transfer heat directly to the pan. Warped bottoms leave an air gap, which provides an escape route for heat.
- ✓ Develop the habit of "lids on" cooking. Tight-fitting lids help in keeping the heat within the pan, causing less energy consumption and shorter cooking times.

- ✓ Make more use of pressure cooker to cut down cooking time to one-third that of conventional methods.
- ✓ Avoid dry grinding in your food processors (mixers and grinders) as it takes longer time than wet grinding.
- ✓ Use your microwave oven instead of your conventional electric oven which cooks food in one fourth or less than the normal cooking time.
- ✓ Microwaves save energy by reducing cooking times. In fact, one can save up to 50 percent on your cooking energy costs by using a microwave oven instead of a regular oven, especially for small quantities of food.
- ✓ Remember, microwaves cook food from the outside edge toward the centre of the dish, so if you're cooking more than one item, place larger and thicker items on the outside.
- ✓ When cooking on a gas burner, use moderate flame settings to conserve LPG and remember that a blue flame means your gas stove is operating efficiently.

Bathroom

- ✓ Replace electric water heaters with solar water heaters to avoid from 15,000 to 20,000 garbage bags of CO_2-e annually.
- ✓ Install the water heater as close as possible to the tap.
- ✓ Gas water heating produces only 30% of greenhouse emissions as compared to direct electric heating.
- ✓ Switch over to instant water heaters so that wastage of energy can be avoided considerably.
- ✓ By reducing the temperature setting of water heater from 60 degrees to 50 degrees C, one could save over 18 percent of the energy used at the higher setting.

- ✓ Use of dual flush toilets will reduce water consumption by 25 - 50% as compared to single flush toilet. Moving from an old toilet to a 4 star dual flush toilet could save a typical household 2500 litres of water and 250 garbage bags of CO_2-e.
- ✓ Usage of low flow and aerated taps will use one third of water when compared to normal taps.

Laundry

- ✓ While buying a washing machine with a hot water soaking facility, then a front loader is the better choice since it uses 60% less hot water and energy than a top loader.
- ✓ Fill your washing machine with a full load - this will save you water, electricity, and washing powder.
- ✓ For a six-kilogram hot wash load every day of the week, switching from a one-star top loader to a four-star front loader washing machine can save as much as 6000 garbage bags of CO_2-e per year. If you keep the old machine but move to cold water you would save 8000 garbage bags annually.

Power saving

- ✓ Maximize use of day lighting against artificial lighting.
- ✓ One of the best energy-saving devices is the light switch. Turn off lights when not required.
- ✓ Use venetian blind or curtains for windows to minimize the solar radiation heat. Reflective film reflects the sun's heat from your windows, and can block 40-60% of heat and modern films reflect heat away without blocking the sun light, so you can still have nice, bright rooms.

- ✓ Fluorescent tube lights and CFLs convert electricity to visible light up to 5 times more efficiently than ordinary bulbs and thus save about 70% of electricity for the same lighting levels.
- ✓ Ninety percent of the energy consumed by an ordinary bulb (incandescent lamp) is given off as heat rather than visible light.
- ✓ Replacing incandescent bulbs with CFL can reduce the Co_2-e from your household lighting by about 75%. For an average household this means avoiding 7000 garbage bags of CO_2-e annually. Good quality CFL lasts from 4 to 10 times longer than their incandescent equivalents.

Which bulb should I buy?	
Incandescent bulb	Equivalent compact fluorescent bulb
40W	11W
60W	15W
100W	25W
150W	40W

- ✓ Check the wattages of the incandescent light bulbs in your house. Replace your electricity-guzzling ordinary bulbs (incandescent lamps) with more efficient types.
- ✓ Look for the lumens of a bulb instead of watts. Lumens indicate the brightness of the bulb. Watts only tell you the amount of power it takes to make the bulb work.
- ✓ Many automatic devices can help in saving energy used in lighting. Consider employing infrared sensors, motion sensors, automatic timers, dimmers and solar cells wherever applicable, to switch on/off lighting circuits.
- ✓ Dirty tube lights and bulbs reflect less light and can absorb 50 percent of the light; dust your tube lights and lamps regularly.

- ✓ Use electronic chokes in place of conventional copper chokes.
- ✓ As for as possible, use task lighting, which focuses light where it's needed. A reading lamp, for example, lights only reading material rather than the whole room.
- ✓ Set computers, monitors, and copiers to use sleep-mode when not in use to cut energy costs.
- ✓ Pull out the plugs of battery chargers of laptops, cell phones and digital cameras which draw power whenever they are plugged in.
- ✓ Replace conventional regulators with electronic regulators for ceiling fans.

Appliances & Electronic Equipment

- ✓ Switch off music systems, DVD players, TV and computers when not in use. Switching off standby power and 'leaky' appliances can help to avoid upto 5000 garbage bags of CO_2-e.
- ✓ Look for equipment with low energy consumption while purchasing TV, oven, computers etc. Watching a large flat screen TV that uses 500 watts for 3 hours a day would be equivalent to producing about 5500 garbage bags of CO_2-e per year.
- ✓ Use ceiling or table fan as first line of defense against summer heat. Ceiling fans, for instance, cost about 30 paise an hour to operate - much less than air conditioners (Rs. 10.00 per hour).
- ✓ You can reduce air-conditioning energy use by as much as 40 percent by shading your home's windows and walls. Plant trees and shrubs to keep the day's hottest sun off your house.
- ✓ Keep the doors and windows closed, while using the air conditioner.

- ✓ Using ceiling or room fans allows you to set the thermostat higher because the air movement will cool the room.
- ✓ Check and clean the air conditioner filter every month to improve cooling, reduce compressor running time and save energy.
- ✓ Get the condenser / evaporator coils cleaned at the beginning of each season by an AC specialist.
- ✓ One will use 3 to 5 percent less energy for each degree air conditioner is set above 22°C (71.5°F), so set the thermostat of room air conditioner at 25°C (77°F) to provide the most comfort at the least cost.
- ✓ If room air conditioner is older and needs repair, it's likely to be very inefficient. It may work out cheaper on life cycle costing to buy a new energy-efficient air conditioner.

The following table gives you an idea of which appliances in your household are contributing the most to your carbon footprint.

Average CO_2 Emissions from different appliances

Appliance	Usage	Per Use	Garbage Bags CO_2-e / year
Microwave Oven	96 times / year	0.945 kWh per use	390
Washing Machine	187 washes / year	0.63 kWh / 2kg load	510
Gas Oven	135.1 uses / year	1.52 kWh per use	380
Electric Oven	135.1 uses / year	1.56 kWh per use	910
Dishwasher at 55°C	110 uses / year	1.07 kWh per use	510
Dishwasher at 65°C	135 uses / year	1.44 kWh per use	840
Fridge-Freezer A ++ spec	24 hours / day	206 kWh per year	890
Fridge-Freezer A+ spec	24 hours / day	270 kWh per year	1160
Fridge-Freezer A spec	24 hours / day	408 kWh per year	1750
Standard Light Bulb	4 hours / day	100 W	630
Low Energy Light Bulb	4 hours / day	18 W	110

B. Shopping:

Lot of green house gas is associated with the things you buy. Manufacturing and supplying your goods, services and food produce almost ten times as much as driving your cars. What you buy and how you dispose of goods at the end of their life can make a big difference to your carbon footprint and here we look at household items, personal goods and food.

Reduce, Reuse, Recycle

The popular slogan 'reduce, reuse, recycle' is used by environmental protection agencies all over the world as it prioritises our actions in order of their impact on the environment. Thinking like this can become a way of life.

Here are a few actions that put the idea into practice:

- ✓ Asking yourself, 'Do I really need this'? when you are purchasing goods.
- ✓ Sharing equipment.
- ✓ Investing in high quality rather than throw away goods.
- ✓ Repairing items rather than throwing them away.
- ✓ Buying goods made from recycled materials.
- ✓ Using recycled material for building renovation and construction.
- ✓ Recycling containers, paper and green waste.

Clothing

Here are a few ideas:

- ✓ Buy classic styles and colours and use accessories to update your wardrobe.

- ✓ Focus on quality clothes. They often cost more, but if they last longer they could be of better value for money and environment as well.
- ✓ Look for clothes made from recycled material. Some of the highest quality sports clothing is made from recycled plastic bottles.

Shopping for the kids

- ✓ Use environment friendly Nappies
- ✓ Borrowing toys, books, CD and DVD from libraries instead of buying to save money & environment as well.
- ✓ Use home made toys made of with old clothes and other waste material.

Disposables

- ✓ Rechargeable batteries could save you thousands of rupees compared to disposables. Assuming an AA rechargeable battery can be used 400 times, that is 400 disposable AA batteries you don't need to buy. Thus, each rechargeable battery would reduce the amount of waste to landfill and avoid about 1000 garbage bags of CO_2-e.

Food

There are so many humans on the planet, simply feeding ourselves has led to all kinds of environmental havoc – air and water pollution, loss of soil and reduced biodiversity. It's time to clean up our act. We can have a huge effect on climate change by simply changing a few of our food habits. Here's how :

- ✓ Choose foods that are local, organic and low on the food chain whenever possible. Make the most of seasonal foods.

- ✓ Try to buy and cook only as much food as you need to avoid unnecessary waste and expense.
- ✓ Most food waste won't happen if we take the time to plan better and sharpen our food storage skills.
- ✓ Take care of trash by composting all organic waste - and recycling paper, cardboard, cans and bottles which help in reducing the greenhouse gas emissions associated with landfills.
- ✓ Grow own / support locally grown food to reduce some of the greenhouse gas associated with transportation. It's possible to grow some great vegetables in even the smallest of spaces such as a balcony or terrace space. Try growing herbs, potatoes, carrots and other veggies.
- ✓ Try to use local community gardens that run their own mini markets.

Re-cycling shopping waste

Recycling saves enormous amounts of energy and greenhouse gases. Segregating different kinds of waste is critically important for an effective re-cycling. Hence, plan to dispose the domestic waste containing plastics, glass, steel cans, paper & cardboard, aluminium cans and newspaper to a nearby re-cycler. The benefits of re-cycling are:

- ✓ Minimising the environmental impact by reducing landfill.
- ✓ Saving the raw material.
- ✓ Saving the energy that goes into refining the raw materials, thereby avoiding the greenhouses gases associated with refining process.

Plastics

- ✓ Carry bags and containers made of virgin plastics in natural shade shall only be used for carrying food stuffs.
- ✓ Carry bags or containers made of recycled plastics or biodegradable plastics shall not be used for storing, carrying, dispensing or packaging of food stuffs.
- ✓ The energy used in making a 390 ml plastic bottle would run a 100 Watt light bulb for 2 to 3 hours.

Glass

- ✓ Recycling a plastic or glass bottle, or aluminium can every day for a year would reduce greenhouse gases by 500 garbage bags of CO_2-e.

Paper

- ✓ Recycling of waste paper generated in your homes is a very significant opportunity to dramatically lower your greenhouse impact.
- ✓ If paper is sent to a landfill instead of being recycled, it would produce about 2400 garbage bags of CO_2-e per household per year.
- ✓ Paper in a landfill is a lost resource and as it decomposes, it produces methane which is 21 times more potent a greenhouse gas than CO_2.

Packaging

- ✓ Plastic bags are handy but they have got some negative effects. In particular, most are non biodegradable and are made from a non-renewable source (oil). In fact, there is enough energy in 9 or 10 bags to drive a car one Kilo meter.

- ✓ A better option would be to use permanent fabric / jute bags since they tend to last from 50 to 100 shopping trips and consequently account for less greenhouse gas than a plastic bag over their life time. Always keep spare reusable bag either in your bike / car for quick super market visits and small purchases.

C. Sustainable backyards:

Maintaining green gardens in your backyards by growing fruits and vegetables will help in reducing your carbon footprints.

Green Garden

- ✓ Ground cover can replace the glare from paving and the heat that accumulates over asphalt, while trees, shrubs can be planted to improve the microclimate around your home, acting as windbreaks, providing evaporative cooling and shade and letting the winter sun through.
- ✓ The shade from trees and plants can save upto 30% of energy you use for cooling, a saving of 2500 garbage bags of CO_2-e.
- ✓ Start vegetable gardening in your home by growing different vegetables for your family needs.
- ✓ Think of composting green waste in your garden instead of sending to landfill which could reduce the carbon foot print from a house with a garden by upto 4000 garbage bags of Co_2-e per year. Well made compost supplies nutrients to the soil in a balanced way.
- ✓ Connect your overhead tank overflow outlet to your ground level tank for conserving precious water resource.
- ✓ Use cocks for all the garden taps for optimal use. Pumping of water for domestic use produces about 10 garbage bags of CO_2-e per 1000 litres.

D. Energy smart design for your home:

Here are some of the steps to be considered while renting / buying an energy efficient home or renovating your old home.

- ✓ The size of the property is not too large and matches your needs, whether house or apartment.
- ✓ Location of property may be preferred closer to the essential services. A convenient place to live reduces the amount you drive which means you'll lower your greenhouse gas emissions and other pollutants.
- ✓ Big size windows are for more light.
- ✓ Adequate shade in summer, potential shade by planting trees and shrubs.
- ✓ Adequate cross ventilation.
- ✓ Light colour blinds for windows for reflecting heat in summer.
- ✓ Efficient 3 or 4 star showerheads and aerators installed in taps, to save hot water.
- ✓ No dripping taps. A steady drip can waste 72 litres of water in a day.
- ✓ Natural gas and / or solar hot water heating system.
- ✓ Energy efficient appliances.
- ✓ Compact fluorescent lighting.
- ✓ Provide exhaust fans wherever required to remove heat generated by various appliances in day to day activities and to improve circulation of fresh air.

Here are some of the steps to be considered while building energy efficient homes:

- ✓ Make use of natural light to the maximum extent to avoid artificial illumination during day time.
- ✓ Maximise cross ventilation.
- ✓ Thermal insulation like false ceiling with plaster of paris / thermo coal for reducing heat thereby reduction in power bills.
- ✓ Use bath and kitchen exhaust fans to draw heated air out of your home.
- ✓ Choose window sizes and types that will not only save you energy but also give optimum light and view. Larger glass areas increase heat loss and gain. Try to hold glass area to 15 percent or less of the floor area.
- ✓ Select low emissive or insulated glass for windows throughout your home to keep heat inside during winter and outside in the summer.
- ✓ Select lighting fixtures on the basis of their efficiency. Fluorescent lamps produce about four times as much light per watt as compared to incandescent bulbs.
- ✓ Install fixtures on two or three separate circuits in large rooms where you may need high levels of lighting periodically but not all the time.
- ✓ Use three-way switches or dimmer control switches to keep lighting levels low whenever not required.

Power consumption and expenditure details of various appliances

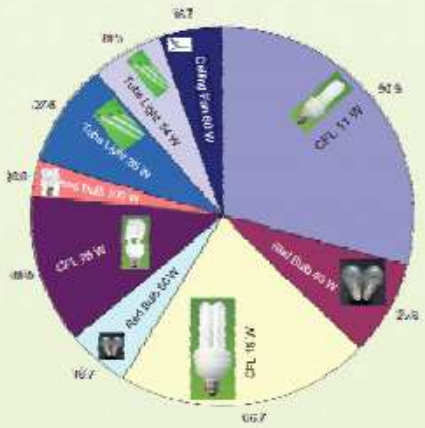
Type of appliance	Hours of usage /unit of power consumption	Daily usage in hours	Monthly energy consumption in units	Monthly expenditure in Rs. @Rs 4.00 per unit
CFL Bulb - 11 W	90.9	8	2.64	11
Incandescent Bulb - 40 W	25.0	8	9.6	38
CFL Bulb - 15 W	66.7	8	3.6	14
Incandescent Bulb - 60 W	16.7	8	14.4	58
CFL Bulb - 25 W	40.0	8	6	24
Incandescent Bulb - 100 W	10.0	8	24	96
Tube light (Electronic Choke) - 36 W	27.8	8	8.64	35
Tube light (Copper Choke) - 54 W	18.5	8	12.96	52
Ceiling fan - 60 W	16.7	12	21.6	86
Refrigerator - 165 Lits (225 W)	4.4	24	162	648
Washing Machine - 350 W	2.9	1	10.5	42
Colour TV - 150 W	6.7	6	27	108
Rice Cooker - 750 W	1.3	1	22.5	90
Wet Grinder - 400 W	2.5	1	12	48
Mixer - 750 W	1.3	0.5	11.25	45
Air Cooler - 300 W	3.3	12	108	432
Air Conditioner (1.5 ton) (1800 W)	0.6	6	324	1296
Geyser (15 - 50 lits) (2000 W)	0.5	6	360	1440
Computer (100 W)	10.0	6	18	72

Calculate your power consumption in units for any appliance by using the formula given hereunder:

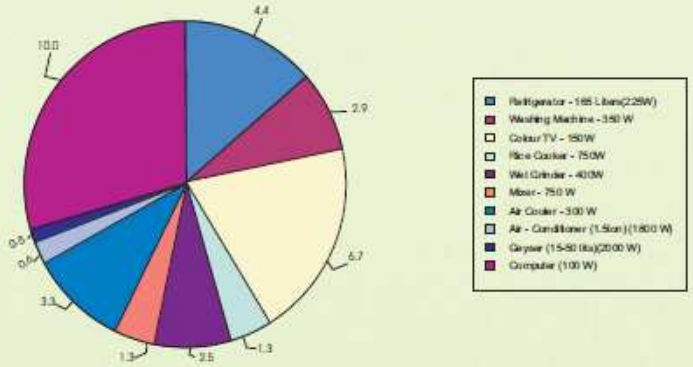
Power consumption (kWh or unit):

$$= \frac{\text{Wattage of appliance} \times \text{No. of hours of usage}}{1000}$$

Hours of usage per unit of power consumption (Table-I) (Lighting & Fans)



Hours of usage per unit of power consumption (Table-II) (Appliances)



E. Transport:

Domestic transport accounts for almost half of noxious air pollution, more than a third of greenhouse gas emissions, one quarter of common air contamination and almost one-fifth of water toxicity. Not surprisingly, cars are the worst offenders - they

contribute the most carbon dioxide (CO_2) emissions which contribute to global warming and changing weather patterns and pollute our water and air through exhaust and road runoff.

Apart from this, vehicle engines can also produce waste products including nitrogen oxides, carbon monoxide, hydrocarbons and particles of carbon which are harmful to our health and are partly responsible for brown haze or smog formation.

Of all the transport vehicles we use in our day-to-day lives, cars make the maximum contribution towards carbon footprint. Following measures help in reducing your carbon footprint.

- ✓ Use the bus or a train rather than your car.
- ✓ For short journeys either walk or cycle.
- ✓ Car share to work or for the kid's school run.
- ✓ Sharing a car with someone else and shopping in bulk so as to avoid number of trips thereby reducing fuel consumption dramatically.
- ✓ By opting to hire cars or use taxies instead of owning and running your own car, you save the CO_2-e that would have been produced in building the car. This ranges from 45000 - 60000 garbage bags of CO_2-e.
- ✓ Try to reduce the number of flights you take.
- ✓ Scooters and motorbikes upto 250 cc produce much less green house gases than a car. Four stroke engines tend to make less pollution.
- ✓ Electric scooters are becoming popular and have the potential to save your fuel cost and reduce greenhouse gas emissions.

- ✓ Petrol cars are likely to produce more greenhouse gas emissions. Typically less than 14% of petrol we put in our cars is used to keep the car moving. This poor fuel economy wastes money, valuable fuel resources and produce unnecessary greenhouse gases.
- ✓ Buses produce the least greenhouse gases per person and could be even more effective. Motorbikes and Scooters are good fuel savers with relatively less greenhouse gas emissions per passenger.
- ✓ Changing from typical four cylinder petrol car to a hybrid car could avoid 20,000 garbage bags of CO_2-e per year.
- ✓ Small to medium turbo diesel cars with fuel injection can give a 25 percent improvement in fuel consumption and 7-12 percent reduction in greenhouse emissions as compared with petrol car of same engine capacity.
- ✓ Changing from a typical four cylinder petrol car to a small diesel car could avoid 20,000 garbage bags of CO_2-e per year. Next time you replace your car - check out for diesel engines.
- ✓ Also, the multi point sequential gaseous injection system provides high performance LPG car with less fuel consumption and greenhouse gases reduction of around 10-20 percent compared to equivalent petrol car.
- ✓ A conversion from petrol car to LPG car can also reduce your fuel costs considerably and also reduce greenhouse gas emissions.
- ✓ It is significant to note that over the life of the car, 11% of greenhouse gases associated with small to medium sized car comes from building it and 89% from filing it with petrol and driving it.

Tips for low CO_2-e, emissions in vehicle use.

Buying Vehicles:

Select vehicles with lowest capacity engine and greenhouse gas emissions.

For a given fuel, low greenhouse gas emissions go hand in hand with low fuel consumption.

Loading:

Unnecessary loads will waste fuel and increase in greenhouse gas emissions. Each 50 kg of load in a car can add from 3-5 percent to your fuel consumption.

If you carry large load on the roof of the car, then drive slowly as energy lost due to drag at 110 Kmph can be twice that at 80 Kmph.

Planning a trip:

Share bike / car wherever possible.

Avoid traffic jams.

Plan your trip for multiple tasks.

AC in Cars:

Use fan rather than AC wherever possible which can save upto 10-20% fuel consumption.

Most refrigerants are very powerful greenhouse gases. Have your AC checked regularly for leaks.

Use sunshades on the windows when parked to reduce AC load later and park under cover wherever possible.

Maintenance:

Driving is the most polluting thing that most of us do. Burning gasoline, or any other fossil fuel, releases pollutants that cause

smog, global warming, and water pollution. Good vehicle maintenance can reduce this pollution and helps in protecting nature and our health.

- ✓ Follow the maintenance recommendations in your owner's manual which maximizes fuel, optimize its resale value, save on repairs, and reduce carbon dioxide emissions.
- ✓ Changing the oils as per owner's manual is one of the best ways to keep your engine in top condition.
- ✓ Follow the manufacturer's recommendations for engine, cooling and ignition system, brake and emission control system. Unmaintained mechanical systems can affect fuel performance.
- ✓ Check your tire pressure monthly, and on days when the temperature has dropped significantly. Rotating tires also helps prolong their life and improves fuel economy. Operating a vehicle with just one tire underinflated can reduce the life of the tire by thousands of kilometers and increase the vehicle's fuel consumption by three per cent.
- ✓ Faulty spark plugs and sensors can cost upto 40 percent of your fuel consumption.
- ✓ Air filters can cost upto 10% of fuel consumption in old model car.
- ✓ A well tuned engine saves upto 5%, correct tyre inflation easily saves 3 % and noticeably flat tires can cost you more than 10%.
- ✓ For a medium sized car good maintenance would save upto 15000 garbage bags CO_2-e per year compared to poorly maintained vehicle.

Smart driving

- ✓ Avoid unnecessary idling which wastes fuel and harms vehicle. If you're stopping for longer than 10 seconds (except in traffic of course!), turn off the engine. More than 10 seconds of idling uses more fuel than restarting.
- ✓ Travel light & pack smart by avoiding hauling unnecessary loads. Extra load increases pollutants and decreases fuel economy.
- ✓ To stay cool on the highway, use your car's flow-through ventilation. When driving in the city, open a window. If you must turn on the AC, set the controls to a comfortable level and shut it off once you're cool enough.
- ✓ Drive smoothly, avoiding speeding or unnecessary rapid acceleration and braking. Some studies have shown that this can save about 40 % of fuel consumption.
- ✓ For manual geared car, use the most appropriate gear and shift to the highest gear appropriate as soon as reasonably possible.
- ✓ Over a year for city driven car, good smooth driving can save 15000 garbage bags CO_2-e.
- ✓ Bio diesel can reduce a diesel car's greenhouse emission by upto 90% depending on how much energy was used in making the fuel and how much bio-diesel is used in a blend.
- ✓ Bio diesel is produced from vegetable oils or animal fats and can be made from used cooking oil which would otherwise go waste.

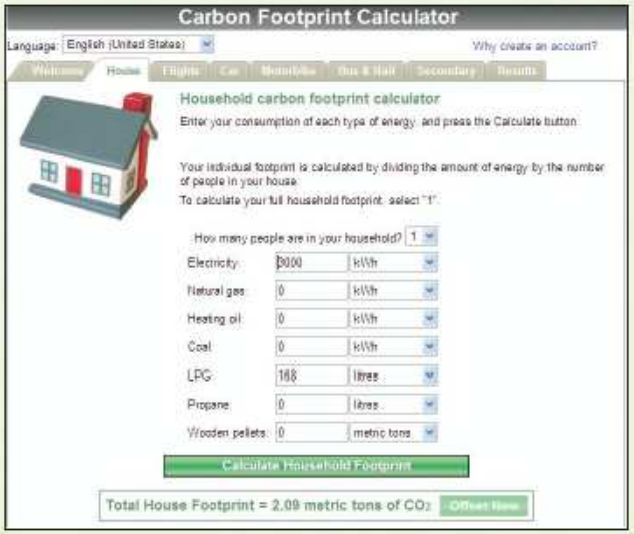
Now it is the time to calculate our individual carbon footprints. A calculator is available in the internet for calculating carbon foot prints and the calculator can be accessed at the URL *http://www.carbonfootprint.com/calculator.aspx* and the same is shown hereunder as a screen shot.

Now, carbon footprints can be calculated by selecting the appropriate tab shown above like house, car, bike etc.

For an illustration, house tab is selected to calculate annual carbon footprints of an individual and the same is given below as a screen shot.

The following input data has been taken while calculating carbon foot prints.

Electricity	: 3000 kWh (250 kWh/month)
Natural gas	: 0 kWh
Heating oil	: 0 litres
Coal	: 0 kWh
LPG	: 168 litres (14 litres cylinder/month)
Propane	: 0 litres
Wooden pellets	: 0 metric tons



From the above calculation, it is evident that a household will contribute **2.09 metric tons** of CO_2 per annum which is equivalent to **20,900 Garbage Bags of CO_2**. Similarly, primary carbon footprints for different modes of transport and also the secondary footprints can be arrived at from the above calculator.

In order to make the concept of carbon footprints more clear, different modes of transport have been taken into consideration for calculation and comparison of corresponding carbon footprints.

Sl. No	Starting Point	Destination	Carbon footprints in Garbage Bags of CO_2-e (for each journey)			
			Train	Bus	Car	Flight
1	Kothagudem	Hyderabad	100	300	500	--
2	Kothagudem	Ramagundam	100	300	500	--
3	Kothagudem	Bhoopalaplli	--	200	400	--
4	Kothagudem	Bellamapalli	100	400	600	--
5	Hyderabad	Delhi	300	--	--	1300
6	Hyderabad	Chennai	100	--	--	1000
7	Hyderabad	Bangalore	100	--	--	900
8	Hyderabad	Calcutta	300	--	--	1200
9	Hyderabad	Mumbai	100	--	--	1200

Note: While estimating carbon footprints, road, rail and flight distances were used separately.

The calculations of secondary emissions are based on estimates developed by Carbon Footprint to illustrate the impact on the environment from your day-to-day activities. Your actual secondary footprint may in reality be either lower or greater than that estimated here. **Your total carbon footprint is the sum of your primary and secondary emissions.**

Keeping the above aspects in view, every singarenian should think of adopting energy efficient practices in day-to-day life for reduction of individual carbon footprints and global warming of **Mother Earth**.