CLEANER PRODUCTION IN HOUSEHOLD

"a proactive step towards environmental friendly house"

Prepared By:

Gujarat Cleaner Production Centre

ENVIS Centre on: Cleaner Production & Clean Technology

Supported by: Ministry of Environment, Forest & Climate Change, Government of India

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The document is intended to provide guidance to the housewives, primary teachers about waste minimization, pollution prevention and cleaner production in house including its benefits to the society. Any use made of this publication, or reliance on, or any decision to make based on it, is the responsibility of such user. GCPC accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions taken based on this document.

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About us

Gujarat Cleaner Production Centre (GCPC) was established in the year 1998 by the Department of Industries and Mines, Government of Gujarat with technical support of United Nations Industrial Development Organization (UNIDO). GCPC is a regular member of RECPnet – The Global Network for Resource Efficient and Cleaner Production of UNIDO and CTCN- Climate Technology Centre and Network, a working arm of UNFCCC- The United Nations Framework Convention on Climate Change.

GCPC is acting as an Environmental Information System (ENVIS) Centre for Ministry of Environment. Forest and Climate Change, Government of India since 2005, with objective to disseminate and promote the concept of "Cleaner Production" (CP) and "Clean Technology" (CT) across industries for sustainable industrial development in the state of Gujarat.

GCPC provides guidance to industries in implementing cleaner production measures, conducting cleaner production orientation programmes, training and dissemination programmes and conducting cleaner production assessment projects.

GCPC has played active role in framing Industrial Policy 2004, 2009, 2015 and many financial assistance schemes pertaining to Cleaner Production and Clean Technology for the State of Gujarat.

GCPC has so far conducted more than 200 orientation programmes in various industries associations and academic institutions. The centre has successfully completed more than 100 Cleaner Production Demonstration Projects in various industrial sectors such as Textile, Dairy, Pulp and Paper, Chemical, Petrochemical, Pharmaceutical, Fish Processing, Ceramic, Glass etc.

Foreword

The United Nations Environment Programme (UNEP) introduced the concept of Cleaner Production and defined as "the continuous application of an integrated preventive environmental strategy to processes, products and services to increase eco-efficiency and reduce risks to humans and the environment".

Cleaner Production activities include measures such as pollution prevention, source reduction, waste minimization and eco-efficiency. It involves better management and housekeeping, substitution of toxic and hazardous materials, process modifications and reuse of waste products. The concept is about the 'prevention', rather than the 'control' of pollution.

The objective behind the preparation of a this document on 'Cleaner Production in Household' is to provide guidance on the concept of Cleaner Production and its benefits to reduce domestic waste and resource conservation at domestic level.

GCPC-ENVIS disseminates the concept of 'Cleaner Production' to housewives conducting Cleaner Production promotion programme inviting housewives and primary school teachers at the centre on regular basis.

Environmental Information System (ENVIS) provides a single knowledge sharing platform to students, academicians, technocrats and researchers. GCPC disseminates the concept of Cleaner Production to industries, students and housewives through ENVIS a programme supported by Ministry of Environment, Forest and Climate Change, Government of India.

Dr. Bharat Jain,
Member Secretary, GCPC & Coordinator, ENVIS
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Background

Pollution can take many forms: the air we breathe, the water we drink, the soil we use to grow our food, the lit-up skies and even the increasing noise we hear every day can all contribute to health problems and a lower quality of life with major disruptions and effects on wildlife and ecosystems. One of the greatest problems that the world is facing today and since long run is that of environmental pollution, which is causing grave and irreparable damage to the natural world and human society.

A polluted environment is a polluted society – one we created and one only we can renew.

When we think about the past incidents about the pollution and major industrial accidents the first thing comes in our mind is the incident happened in the year 1952 at London which is known as London Smog and Bhopal Gas Tragedy in the year 1984, these are the two worst incidents mankind has ever faced.

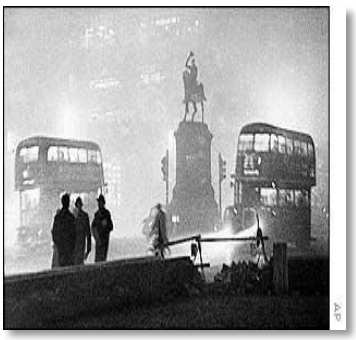
Major Industrial Incidences:

1. London Smog, 1952

The London Smog occurred after a period of cold snowy weather as a result of burning low quality sulphurous coal to stay warm. Around the same time an anticyclone was hanging over London which trapped cold air and chimney smoke close to the ground. The particles and gasses from power stations, vehicle exhausts and industrial pollution blown over from Europe were also trapped.

The main air pollutants during the London Smog episode includes: smoke particles, sulphuric acid, hydrochloric acid and fluorine compounds of huge amount in air.

It is estimated that over 4,000 people had died in over a five-day period because of smog and an additional 8,000 deaths occurred during the next two and a half months.



2. Bhopal Gas Tragedy, 1984

Bhopal Gas Tragedy was catastrophe that had no parallel in the world's industrial history. The incident was occurred on the night of 3rd Devember,1984 at the Union Carbide India Limited (UCIL) pesticide plant in Bhopal, Madhya Pradesh. Over 500,000 people were exposed to Methyl Isocyanides (MIC) and other chemicals.

Over 60,000 people being exposed to the deadly gas cloud that night. The gases stayed low to the ground, causing victims throats and eyes to burn, including nausea, and many deaths. The government figures now refer to an estimate of 15,000 killed over the years. Toxic material remains, and 30 years later, many of those who were exposed to the gas given birth to physically and mentally disabled children.

While the Industrial Revolution was the cause of positive change for the industrial world, there is no question that it has wreaked havoc on the environment. Industrial Revolution and unsustainable consumption and production resulted in depletion and wastage of natural resources, the carbon emissions, pollution, hazardous waste generation and human health problems have only been disastrous for the world environment.

Waste Dumping Site at Pirana, Ahmedabad

Pirana Site is Municipal Solid Waste disposal site located in Ahmedabad. Since 1980, 65 hectares of land has been used up so far for the disposal of waste. The average depth/height of the waste is 22 meters.

Health & Environmental Hazards caused by waste

Surface Water Contamination takes place when the wastes reach water bodies. It pollutes rivers, lakes and ground water leads to water borne diseases to humans and animals.

Ground Water Contamination takes place when residues from waste, leach into the ground water. A specific environmental hazard caused by waste is leachate which is the liquid that forms as water trickles through contaminated areas leaching out the chemicals.

Movement of leachate from landfills, effluent treating plants and waste disposal sites may result in hazardous substances entering surface water, ground water and soil.

Soil Contamination is caused by dumping of waste. It can harm plans and can indirectly adversely impact the health of humans and the animals.

Air Contamination is by emissions from incinerators, other waste burning devices & from landfills. Dioxins, furans & polychlorinated by-phenyls (PCB), are deadly toxins, causing cancer & endocrine system damage Mercury, heavy metals.

Wastage of Natural Resources

1. Wastage of Water
2. Wastage of Energy
3. Electronic Waste
4. Food Waste
5. Plastic Waste

Water Scarcity

Water and Energy is one of the major resources used by the people in their routine. Unsustainable Consumption and Production of the most valuable resources like water and energy has resulted in water and energy scarcity.

Water covers 70% of our planet, and it is easy to think that it will always be plentiful. However, freshwater-the stuff we drink, bathe in, and irrigate our farm fields with-is incredibly rare. Only 3% of the world's water is fresh water and less than one third of 1% of this fresh water is available for human use. The rest is frozen glaciers or polar ice caps or is deep within the earth, beyond our reach. To put it another way, if 100 litres represents the world's water about half a tablespoon of it is fresh water available for our use.

Water Problem Identified

- Limited and irregular rainfall
- Aquifer and reservoir levels are low
- Conflict over valuable commodity
- Water is inexpensive to consumer
- Water is being misused
- Population continues to grow

Scenario of water scarcity in Dharavi, Mumbai

In Dharavi, Asia's largest slum, water scarcity has been the rule rather than the exception that tests it. People's daily routine revolves around water. The people wake up every morning at 6am then they waits half-an-hour at a common tap to get water.

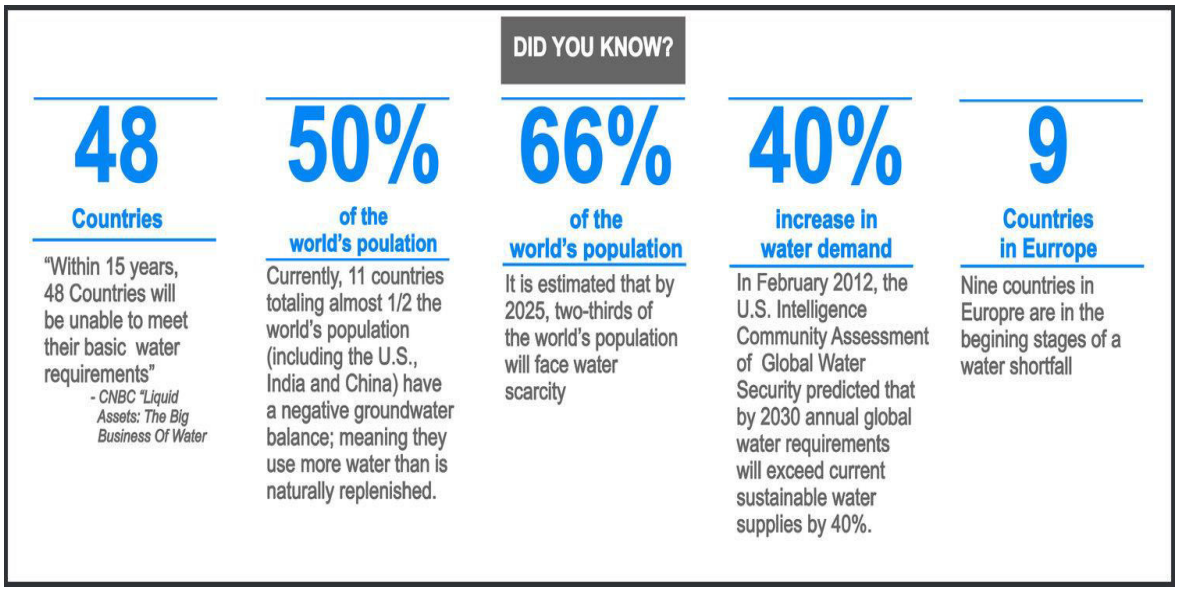
Conflicts in People

Several areas of India were suffering from acute water shortages, aggravated by the plummeting groundwater levels, rising temperatures and irregular rain fall in this Year (2016). Women are gathered at the well to collect the water in some villages of India and at such places residents rush to fill water from tanker.

Disappointed Farmers

In Agriculture field, farmers are fully dependent upon rain water. As country faces urgent water crisis, farmers are very disappointed and suicide rate of Indian farmers increased.

Highlight of global water scenario



Declining availability of water per capita

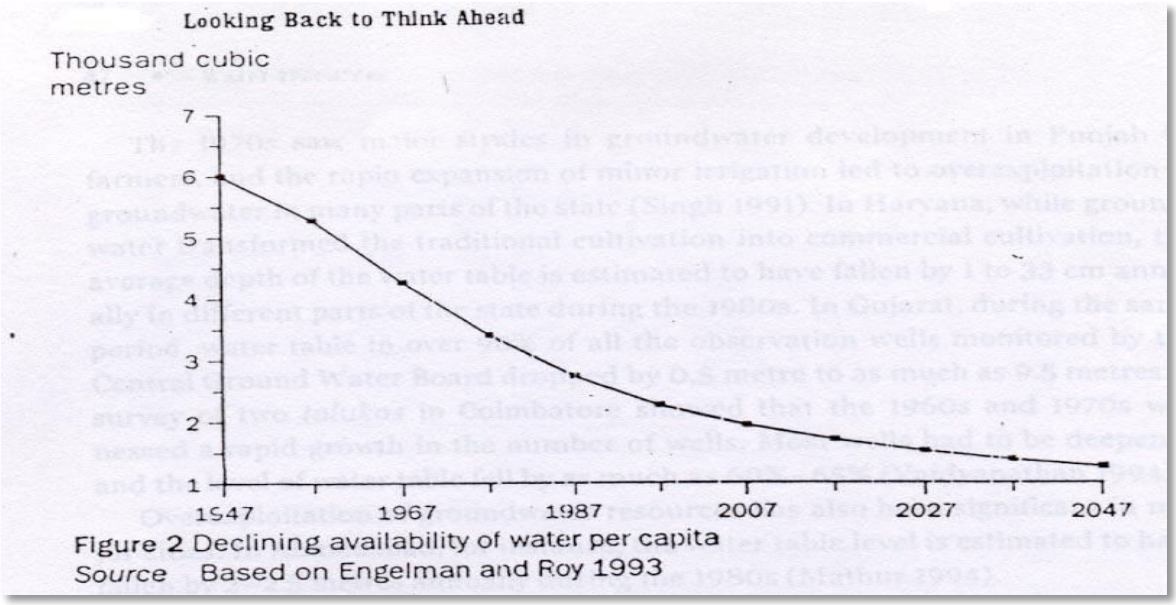


Figure 2 Declining availability of water per capita
Source Based on Engelman and Roy 1993

Scenario of wastage of water at home

- 30% of water is used for flushing toilets
- 21% is consumed while taking bath and running taps
- 13% for washing clothes
- 12% of water is used while taking shower
- 8% for washing utensils
- 7% while watering garden and washing car
- 4% for drinking
- 5& other usages

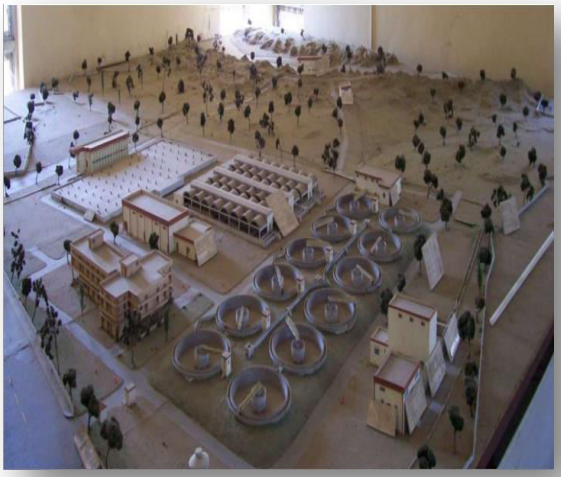
Some people don't have enough freshwater where they live and wastage of water and per capita average consumption of water is very high. It is important for everyone to conserve, or save, water and it is mandatory to move towards sustainable consumption of water resources so that there is enough for everyone.

Receiving portable water at a huge cost

Water Source (Intake & French Well) From Sabarmati River

Water Source Gravity Line from Narmada Canal

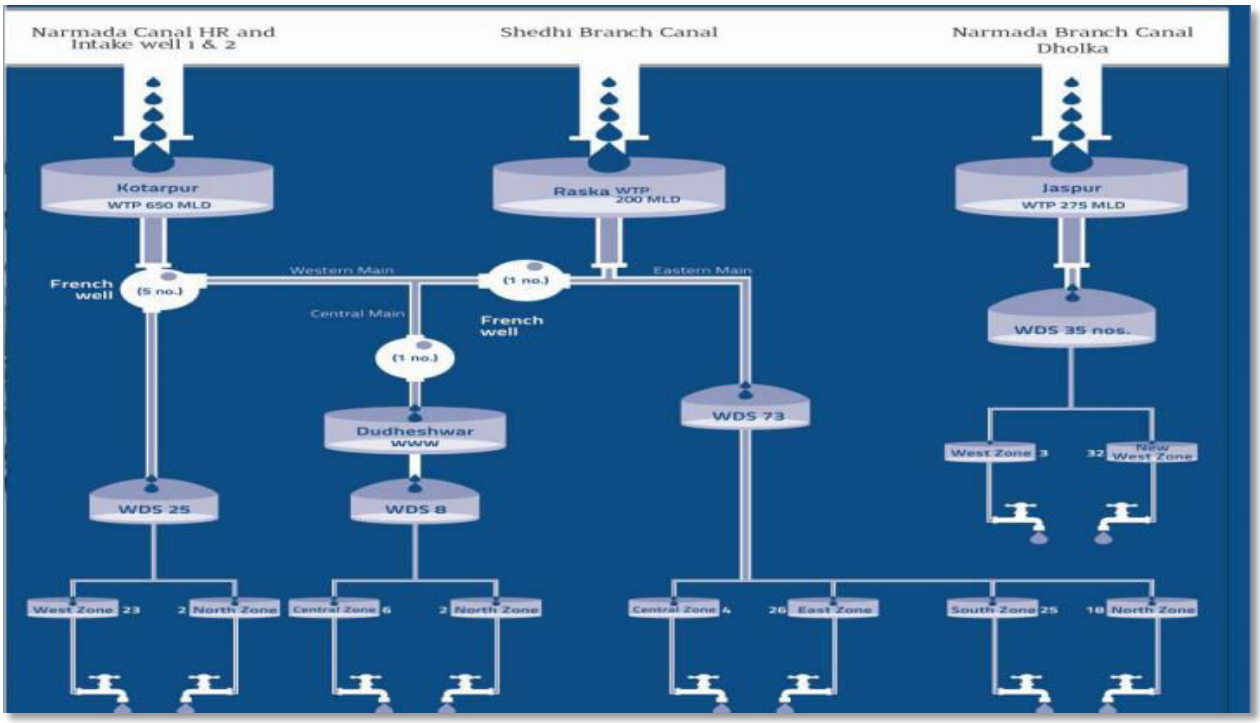
Kotarpur Water Treatment Plant



Jaspur Water Treatment Plant

200 MLD Raska Water Treatment Plant

Water Distribution System in Ahmedabad



Water Distribution Station of Bapunagar, Ahmedabad

Tips for water conservation at home

Water is one of the most valuable resources after oxygen for existence of living beings on the earth. So, it is our duty to use water wisely without wasting it.

The Concept of Cleaner Production focuses minimizing the usage of water including its reuse and recycling in different household applications for example waste water can be used for gardening purposes rather than throwing it which leads to fresh water conservation.

Water Saving Tips:

- Always turn off running water
- Take shorter showers
- Eliminate any and all leaks
- Reduce the flow of toilets & Showerheads

Check faucets and pipes for leaks. A small drip from a worn faucet washer can waste 35 litres of water per day. Larger leaks can waste hundreds of litres.

- **Eliminate any and all leaks**
  - LEAKY FAUCET

One drop per second = 35 litres a day

  - LEAKY TOILET

56 litres of water a day lost

When washing dishes by hand, don't let the water run while rinsing. Fill one sink with wash water and the other with rinse water

Use a Broom not a Hose to Clean driveways and walkways.

- Change your teeth brushing and shaving behaviors
  - Turn off The Water While Soaping Hands and Brushing Teeth.
  - Wet your toothbrush and then turn the tap off
  - Turn the tap on and off while shaving

Water Your Yard And Outdoor Plants Early Or Late In the Day To Reduce Evaporation. It saves water upto 100 litres.

Use a sponge and bucket of water to clean your car rather than a hose. If you use the hose, ensure you use a shut off nozzle so the water is not constantly running. This simple practice can save as much as 560 gallons when washing a car.

Wash in a filled sink: Wash vegetables and dishes in a filled sink instead of under a running tap.

Reuse: Collect rinse water from the washing machine for flushing the toilet or mopping the floor.

Fill your washing machine on a full load

Grey water pipe running washing-machine water onto lawn

Dual-flush Toilets:

It uses 6 liters on full and 3 liters on a half-flush.

Urinals:

Low water Use Urinal:

- It uses an average of 4 liters per flush.
- While water efficient urinals uses 2.8 litres per flush.
- Smart Flush systems

Sensor operated:

- Urinals detect the presence of people through movement sensors or door switches.

Attached Wash basin and Flushing Tank

Attached Rain water storage Tank and Flushing Tank

Use of Grey water from washing machine in flushing tank

Taps:

Aerators:

- Modern taps often have aerators at the tip to help save water and reduce splashes.
- Without an aerator, water usually flows out of the tap in one big stream.

Flow Fixtures:

- It controls volume of water.

Sensor taps:

- It is automatic shut-off taps.
- Operated taps shut off automatically after a set time.
- For e.g. a 6-star WELS-rated tap has a running time set between 5 to 10 seconds at a flow rate of 4 litres per minute.

Tap with Aerator

Tap with Flow Fixtures

Recycling of Wastewater and Rain Water Harvesting

To avoid water scarcity in near future it is mandatory to use water wisely and efficiently. One should step forwards towards recycling and rain water harvesting to avoid freshwater consumption on a large scale. When we think of recycling of water one name that comes to our mind is the country named Israel, it is its location who teaches it about the importance of water resources. It is located in Southwest Asia between the Mediterranean and the deserts of Syria and Arabia.

The country recycles about 85% of its wastewater and by 2020 it is estimated that 50% of its agricultural activities will be fulfilled from recycled water. In addition to that more than 300 companies working on water technology has specialization in desalination systems and it earns approximately about Rs. 12,000 Crores (INR) annually by exporting its recycled water into other countries. Including this rain water

harvesting measures is one of the simplest and cost effective technologies one can adopt in their houses.

Example of Rain Water Harvesting in Kerala, India

Kerala the state located in the Southern India, is a blessed land with green vegetation, rivers, backwaters and vast natural resources. The state receives an average annual rainfall of 3000 mm.

But though Kerala is faces severe water scarcity between February and mid May every year which leads to acute water shortages during summer, especially in the drinking water sector.

Rain Water Harvesting Measures at Kazhikode, Kerala (India)

Government of Kerala has embarked on a special campaign for promoting Rain Water Harvesting (RWH) and Roof Water Harvesting systems have been made mandatory for new houses falling under Municipal Corporations since 2004.

India streets with Rainwater Harvesting

Energy Scarcity

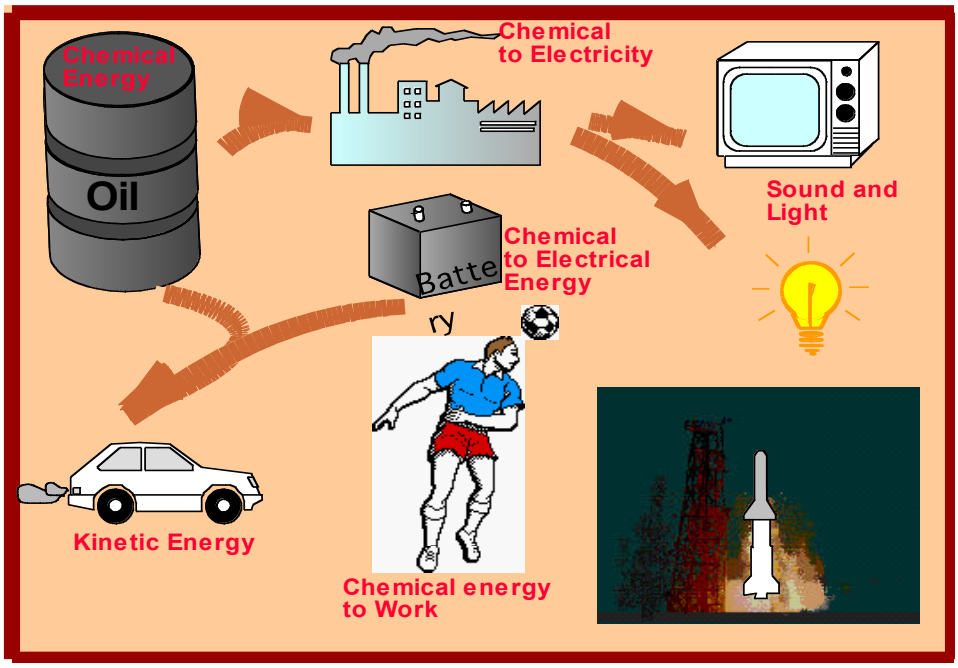
The energy crisis is debatable topic. Industrial development, over population, unsustainable consumption has led to a surge in the global demand for energy in recent years. The energy crisis of the 1970's powerfully illustrated this pairing of environmentalism with concerns over resource scarcity. At once, quality of life was inseparable from natural resource degradation. On top of this the effects that the crisis embedded into history elicited serious questioning of our perspectives toward natural resources in the United States. Furthermore, the "crisis" triggered great developments in the way of alternative energy forms.

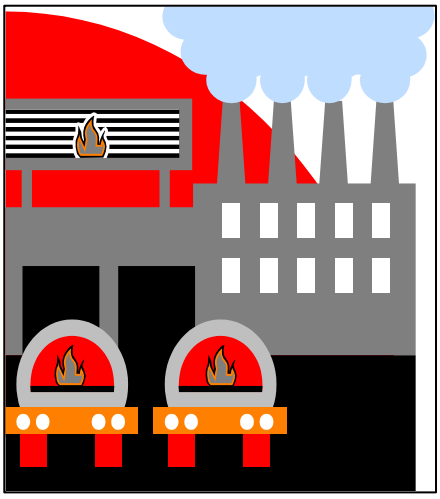
At present consumption level it is estimated that the non-renewable sources of energy such as crude oil will last for 40 years, gas will last for 60 years and coal will be finished in nearly around 200 years.

Quick action is required to conserve energy sources and it is better if we move towards renewable energy sources in near future, because energy plays a crucial role in development of any region. To secure our future generations from energy crisis it is important to use energy efficiently.

Day-to-Day Energy Use

Energy Transformations





An energy transformation is the change of energy from one form to another. Energy transformations occur everywhere every second of the day. There are many different forms of energy such as electrical, thermal, nuclear, mechanical, electromagnetic, sound, and chemical.

The Electricity which we use is mostly made by burning coal or gas in Power stations.

Limited Fuels

At Present Consumption Levels:

- Crude oil will last only for 40 years.
- Gas will last for 60 years.
- Coal will be finished in nearly 200 years.

Ever thought of life without oil and gas?

Tips for energy conservation at home

The concept of cleaner production focuses on resource conservation and waste minimization it focuses on reuse and recycle of energy sources in different applications as well as it provides necessary information about the wastage of resources and solutions for it.

The simple tips to conserve energy at home and public places are as follows:

At Home

- We should not keep lights unnecessarily switched on.
- Reduce the energy your appliances consume by analyzing star ratings.
- Improve your water heating efficiency to reduce energy costs.

At Public Places

- Switch of the fans and lights in the places like bus, terminal and railway stations when not necessary.
- Switch off the street lights.
- Big Hoardings, lightened up for the whole evening and nights are other wastage of power which can be and should be avoided

We save our money when we save energy

We reduce pollution when we save energy.

We save our valuable energy when we save energy.

- Use room air conditioning only where needed and install energy efficient models.
- Install a central air conditioning system only when whole house air conditioning is needed
- Regularly change air conditioning system filters and clean the condenser
- Cook food on medium flame because it provides same heating value then the high heating value.
- Always cook food using cover.

Refrigerator

- Adjust the refrigerator temperature settings.
- Minimize door openings as much as possible.
- Allow hot foods to cool before placing them in the refrigerator.
- Keep the refrigerator full.
- Do not overfill your refrigerator or freezer since that will interfere with the circulation of cold air inside.
- Turn on your refrigerator's "energy saver" switch.
- Keep your refrigerator away from heat sources, such as an oven, a dishwasher and direct sunlight from a window. A 10°F increase in surrounding temperature can result in 20% higher energy consumption.
- Check door seals (also called the gasket) on the refrigerator.

Kitchen Appliances

1. Mixers

- Avoid dry grinding in your food processors (mixers and grinders) as it takes longer time than liquid grinding

2. Microwaves ovens

- Consumes 50 % less energy than conventional electric/

3. Gas stoves

- Do not bake large food items
- Unless you're baking breads or pastries, you may not even need to preheat Don't open the oven door too often to check food condition as each opening leads to a temperature drop of 25°C

4. Electric stove

- Turn off electric stoves several minutes before the specified cooking time
- Use flat-bottomed pans that make full contact with the cooking coil

Electronic Devices

- Do not switch on the power when TV and Audio Systems are not in use , i.e idle operation leads to an energy loss of 10 watts/devices

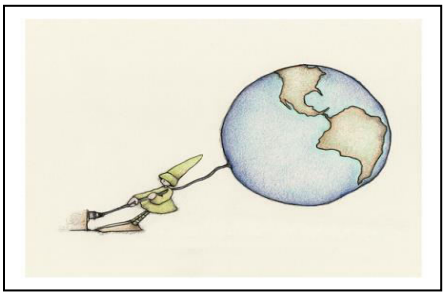
Gas stove

- When cooking on a gas burner, use moderate flame settings to conserve LPG
- Remember that a blue flame means your gas stove is operating efficiently
- Yellowish flame is an indicator that the burner needs cleaning
- Use pressure cookers as much as possible
- Use lids to cover the pans while cooking
- Bring items taken out of refrigerators (like vegetables, milk etc) to room temperature before placing on the gas stove for heating

Electric Iron

- Select iron boxes with automatic temperature cutoff
- Use appropriate regulator position for ironing
- Do not put more water on clothes while ironing
- Do not iron wet clothes

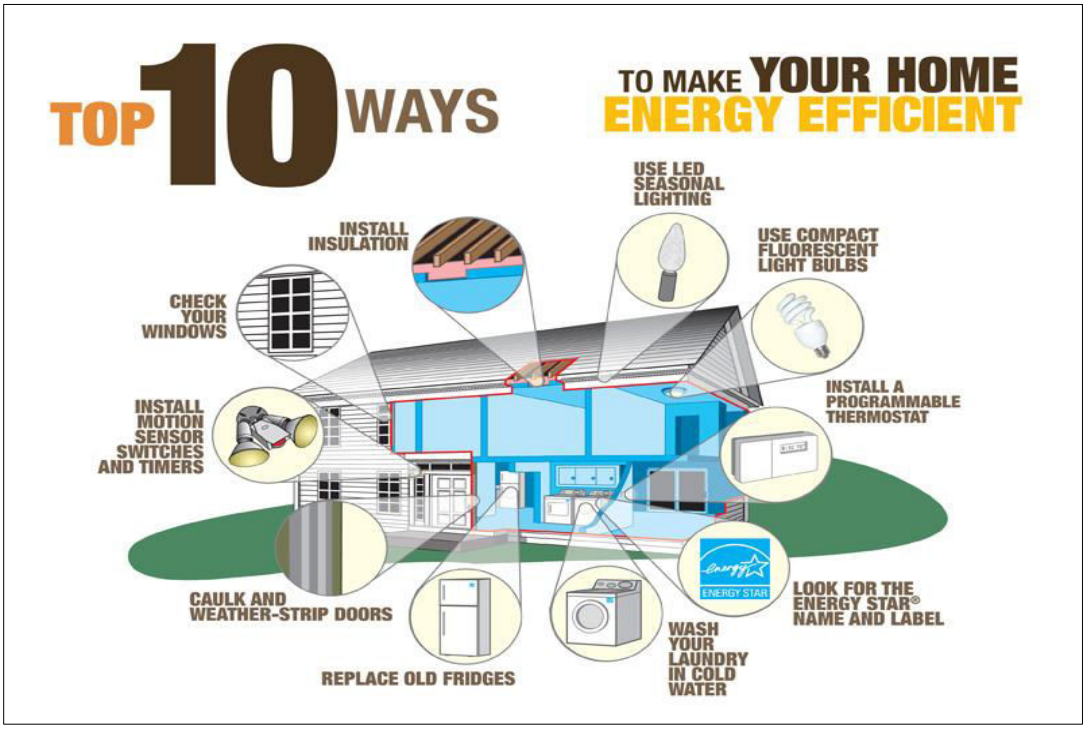
- Shut down home computers when not in use or put them on sleep mode.
- Setting computers, monitors, and copiers to use sleep-mode when not in use helps cut energy costs by approximately 40 %.



- Turn off lights when not in use.
- Use task lighting whenever possible instead of brightly lighting an entire room.
- Install compact fluorescent lamps in the fixtures which receive high use.

Application of LED over CFL

CFL	LED
Save up to 75 % a year in energy costs	Save up to 80 % a year in energy costs
Last up to 9 years	Last up to 20 + years
Contain a small amount of mercury	Do not contain mercury
Available in medium bases to fit standard light sockets , such as table lamps	Available in medium bases to fit standard light sockets, such as table lamps
Less expensive	Slightly more expensive



Recyclable Items from Domestic Places

- Old mobile phones, printer cartridges, televisions and computers (known as e-waste)
- White goods (for example, fridges and washing machines)
- Cooking and motor oils
- Chemicals and paints
- Batteries (including car batteries)
- Portable gas bottles
- Tyres
- Metals
- Building materials (including window glass, bricks, wood and concrete)
- Polystyrene
- Toys, clothing and soft furnishings
- Bicycles
- Furniture

Renewable Energy Application at Domestic Level

India has vast solar power potential, where sunshine is available for long hours per day and in great intensity. This technology is important because the sun is a sustainable source of energy that can be used to power homes and businesses globally. Fossil fuels are finite, so it's important that alternative energy sources be embraced. As of 2014, it is widely believed that fossil fuels are causing global warming. Solar energy is a potential solution to the environmental problems being caused by fossil fuels. When fossil fuels are burned to generate electricity, they release harmful greenhouse gases into the atmosphere. The vast majority of scientists believe that continuing to depend on fossil fuels is going to cause serious environmental problems in the future.

Solar Energy applications at domestic level include:

- Solar Cooking through solar cooker
- Solar Water Heater
- Solar Cells

Benefits of Solar Cooking

We are all dependent on the earth's limited resources of fossil fuels and as a result forests are being depleted for firewood. Cooking with the sun reduces the dependence on these resources.

Solar Cooking (How Long Does it Take?)

- Vegetables: 1.5 hrs
- Rice/Wheat: 1.5 to 2 hrs
- Beans: 2 to 3 hrs
- Meats: 1 to 3 hrs

Solar Water heating Systems and Solar cooking has huge potential of saving energy.

Gujarat Energy Development Agency (GEDA), Government of Gujarat initiated a mobile van to aware citizens about benefits of using solar energy applications at domestic level

(Solar Charged vehicle launched in Sachivalaya, Gandhinagar)

Gujarat Government arm Gujarat Power Corporation Ltd (GPCL) has under its Gujarat State Electrical Vehicle -01 (GSEV01) project put six battery operated vehicles on road within Sachivalaya campus. Each vehicle is 10 seater. 50 kw solar power oriented charging facility has been set up under this project.

The visitor will be provided free internal transportation under this project. In total 1,64,000 solar power units will be generated under this project which will save 20,000 liter fuel and prevent 60 tonne CO2 pollution.

Energy Savings from Solar Heater

For every 1000 liters of water heated from room temperature (25°C) to 80°C, approximate equivalent energy savings per day are as follows:

Electricity: 45 Units	Gas : 5.5 kgs
Diesel: 5.3 liters	Wood/ Biomass

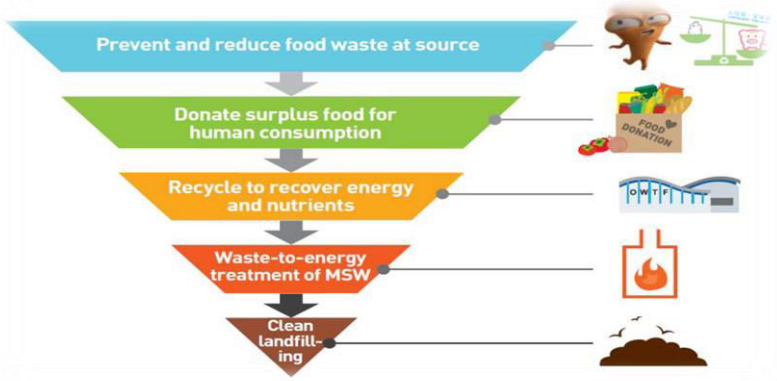
Food Waste

It is said that Indian's waste as much food as the whole United Kingdom (U.K.) consumes. According to The United Nations Development Programme (UNDP), up to 40% of the food produced in India is wastes. About 21 million tonnes of wheat are wasted in India and 50% of all food across the world meets the same fate and never reaches the needy. In fact, according to the agriculture ministry, 2015 Rs. 50,000 crore worth of food produced is wasted every year in the country. The sustainable consumption and production is the right way to tackle scarcity of food.

Including the wastage of food management of food waste is also big issue in our country; this increases the burden of Municipal Solid Waste landfill sites. Rather than sending the food waste to landfill sites it can be:

- transformed into a natural fertilizer
- be used to generate renewable energy

First and foremost thing to avoid food waste is its prevention. Then it can be used as organic waste composting or waste-to-energy applications.



Example: Waste-to-Energy

In Oakland, California, EBMUD's main wastewater treatment plant was the first sewage treatment facility in the nation to convert post-consumer food scraps to energy via anaerobic digestion. Waste haulers collect post-consumer food waste from local restaurants and markets and take it to EBMUD. In an anaerobic digester, bacteria break down the food waste and release methane as a by-product. EMUD then captures the methane and uses it as a renewable source of energy to power treatment plant. After the digesting process, the leftover material can be composed and used as a natural fertilizer.

It is said that if 50% of the food waste generated each year in the U.S. was anaerobically digested, enough electricity would be generated to power over 2.5 million homes for a year.

Organic Waste Composting

Composting is a nature's way of recycling. Composting biodegrades organic waste. i.e. food waste, manure, leaves, grass trimmings, paper, wood, feathers, crop residue etc. and turns it into a valuable organic fertilizer.

- organic waste composting turns waste into a valuable resource
- extends the life of the region's landfill and maintains soil fertility
- prevents green house gas emissions caused by decomposing organic landfill waste
- produces valuable products, such as compost and fertilizer, that enhance soil and aids in plant growth

Organic waste can be recycled at the household level to produce animal feed, biogas (i.e. anaerobic digestion small-scale; anaerobic digestion of organic waste) or compost. Among these options, composting is probably the most simple and common method for recycling household organic waste. Composting is the process of optimizing the environment in the waste for microbial activity to decompose organic matter into valuable nutrients for the soil. Household composting involves waste preparation, degradation of waste and finishing of waste.

Steps for the organic waste composting

- Mix the waste to ensure that the carbon to nitrogen ratio (C: N) is close to 25.
- If the waste has too much carbon (normally brown waste such as dried leaves) it should be mixed with waste that has high nitrogen content (also known as green waste such as green grass clippings). Kitchen waste only normally has a suitable C:N ratio for composting.
- Chop the waste into small pieces. Large pieces of organic waste should be cut to small pieces to accelerate the composting process.
- Adjust the moisture content to about 50 per cent. A compost pile with 50% moisture should feel moist but water should not be dripping from it.
- Add a starter such as mature compost or effective microorganisms (EM) to speed up the composting process.

Sixty-five-year-old. Mr. Kaustubh Tamhankar from Pune sets one of the best examples of composting. He has not produced any trash since last 12 years, not even a single pierce of waste paper. He fertilizes waste at his home. Tamhankar is making a big difference in his home by recycling. Tamhankar started by segregating dry waste and wet waste.

His balcony has three bags, one for wet waste, other for dry waste and the last one to collect plastic and the recycled plastic waste is used by him for manufacturing and delivering purposes.

Organic Waste Converter

The organic waste from the houses, establishments, canteens/restaurants in general contains food waste from the pre-cooking operation and post cooking remnant or excess food. The organic waste is inspected for contamination like metal, glass, stone, plastic etc and then fed into the container of OWC. It is a mixed, aerated & fluidized and crushed for 5 minutes. Then container of the OWC is opened and observations are noted. If the crushed material has more moisture content which can be seen by visual observation, then absorbing media is added into the container upto 20% of the weight of the waste depending on the moisture content in the waste. The odour control powder "Bioculum" is added at the dosage rate of 1 gm of Bioculum/kg of waste. Then the lid of the container is closed and again the OWC is operated for 5 minutes. After the completion of 5 minutes, the system will give audio-video indication by a beep---beep sound and indication of light. The lid is then opened and the processed material is observed. If it is turned to granular free flowing material, then lid is closed and the system is restarted. The bottom valve is opened for draining of the material. The material is collected in the trolley placed underneath of OWC System.

For maturing and curing the compost, the material from the trolley is shifted in the crates which have perforation for aeration and then the crate is placed in the curing system. Depending on the waste generation capacity, number of curing systems has to be proposed. Single Curing System has 100 kg/day capacity whereas Double Curing System has 200 kg/day capacity. After 10 days curing period, the material from the tray can be used for application to the plants or any other mode of usage of manure in the agriculture. In order to make the granular texture of the material, it is advisable that before using the organic manure from the crates, it should be passed through the OWC System for one minute.

If you have waste from garden containing pruning's and small branches of the trees upto 2 cm diameter and/or bones, will be required to pass through Shredder before it is placed into the container of the OWC.

Mobile Organic Waste Composting Machine

Machine Operation

Operation of the Machine is very simple; just open the door and deposit food waste along with 20 % Saw Dust & 0.1 % composting culture. Saw Dust can be replaced by output compost or dry leaves.

Outlet of the Machine

Fresh and clean compost comes out in the bag or tray. Just replace the bag when it is full.

Compostable and Non Compostable Waste

CAN COMPOST	CANNOT COMPOST
Vegetables	Coconut Shell
Spoilt vegetables	Plastic bags and bottles
Fruit skins and spoilt fruits	Glass, metal
Cooked and uncooked meat	Newspapers and magazines
Bones, egg shells	Dog or cat dropping
All cooked food waste	Nappies or sanitary waste
Garden Waste	Pharmaceutical and cosmetics
Temple Waste	

Organic Farming

Definition:- Organic farming is a form of agriculture that relies on techniques such as crop rotation, green manure, compost, and biological pest control.

Support to Organic Farming based Products

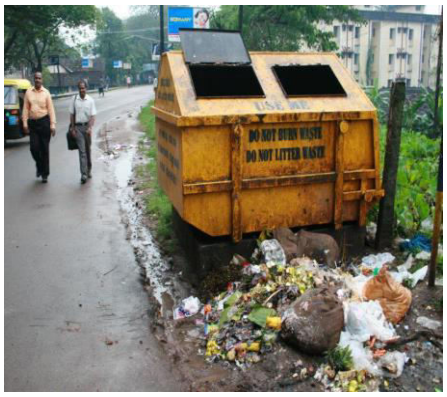
30% of growth in the organic food industry over the past 5-6 years and yet increasing.

Benefits of Organic Farming:

- No damage to soil due to Fertilizer, pesticides, Fungicides. Prevent premature aging Boost Immune system
- Prevent cancer.
- Reduce heart disease.
- Promotes Animal welfare.
- Start Purchasing Organic based food items.

Make the living place Clean and Green

Benefits of Cleanliness



- Prevents Illness and Allergies
- Boosts Mental Health
- Prevents Food Contamination
- Increase the Social values.

Famous sayings in Hindi

- सभी रोगों की एक दवाई घर मे रखो साफ सफाई !
- स्वच्छ भारत स्वस्थ भारत !
- हम सब ने अब ये ठाना हैं, भारत स्वच्छ बनाना है !
- Supports the cleanliness inside house as well as outside.

Plastic Waste

Plastic waste generation and its management is one of the major concerns in India. The estimated generation of plastic waste in our country is 5.6 million tonnes per annum, which is about 15342 tonnes per day.

Littering of plastics in open spaces creates unhygienic conditions, as it acts as a breeding ground for insects and mosquitoes that cause diseases like malaria and dengue.

Plastics do not undergo degradation, thus stay in the soil for many years, which affects the soil fertility and degrades the soil quality.

The waste from the plastic manufacturing industry is thrown directly into the water bodies, thus affecting the chemical property of water, causing hazards on a vary large-scale.

Benefits of Reuse and Recycling of Plastics

It has been observed, to reduce bad effects of waste plastics, it is better to recycle and re-utilize waste plastics in environment-friendly manner. As per statistics, about 80% of post-consumer plastic waste is sent to landfill, 8% is incinerated and only 7% is recycled. In addition to reducing the amount of plastics waste requiring disposal, recycling and reuse of plastic can have several other advantages, such as:

i. Conservation of non-renewable fossil fuels- Plastic production uses 8% of the world's oil production, 4% as feedstock and 4% during manufacturing
ii. Reduces consumption of energy and solid waste going to landfill
iii. Reduces carbon dioxide (CO_2), nitrogen-oxides (NO_x) and sulphur dioxide (SO_2) emissions.

Segregation of the plastic waste from mix waste

Washing of the dirty plastic waste

Collection of the plastic waste

E-Waste

E-waste is the toxic legacy of our Digital Age. Our waste electronics are polluting drinking water and harming ecosystems around the world. India, which has emerged as the world's second largest mobile market, is also the fifth largest producer of e-waste, discarding roughly 18.5 lakh tonnes of electronic waste each year.

The rising levels of e-waste generation in India have been a matter of concern in recent years. With more than 100 crore mobile phones in circulation, nearly 25% end u in e-waste annually.

Minimizing E- Waste is important

The manufacturing of these devices and the use of rare materials that go into their production represent a huge source of embodied energy. Minimizing e-waste helps to conserve resources and reduces the amount of energy we take from the earth.

Reusing the precious metals and plastics in old cell phones alone instead of making or mining more of them leads to savings of energy.

Tips to minimize E-Waste

i. **Re-evaluate:** do you really need that extra gadget ? Try finding one device with multiple functions
ii. **Extend the life of your electronics:** buy a case, keep your device clean, and avoid overcharging the battery

iii. **Buy environmentally friendly electronics:** look for products labeled Energy Star or certified by the Electronic Product Environmental Assessment Tool (EPEAT)

iv. **Donate used electronics to social programs-** and help victims of domestic violence, children safety initiatives, environmental causes and more

v. **Recycle Electronics-** recycling electronics reduces the amount of waste in landfills. Recycling ensures that all of the raw materials used in electronic equipment get re-used and put back into the production cycle for new products. So instead of digging more steel, aluminium or other earth material we can use the recycled products and save our environment. Recycling of e-waste helps creating job opportunities.

Mobile waste Hazards

- Mobile phones and accessories contain concentrations of toxic heavy metals or other metals including cadmium, lead, nickel, mercury, manganese, lithium, zinc, arsenic, antimony, beryllium, and copper.

- If any of these metals are allowed to leak into the environment, they may leach into the water or contaminate the soil and through soil they can then enter the food chain and in sufficient concentrations may cause health problems.

- Cadmium: It is considered as the 7th most dangerous substance known to man. It is a toxic heavy metal that can harm humans and animals that ingest it. It is also carcinogenic.

- Nickel and mercury are toxic and are classed as hazardous substance

It is suggested avoid excessive usage of mobile phones, especially by children because mobile phones can cause:

Precautions for the same

1. Use a headset or speaker phone mode, that moves the phone and it's antenna away from your head
2. Consider reserving the use of mobile phones for shorter conversations or when a conventional phone is not available
3. Effects of cellular damage are greatest on growing, developing organisms (i.e., the young), so limit children's use of cell phones

On the Road: Save Fuel – Save Money

- Keep your vehicle well maintained. A poorly maintained engine both creates more air pollution and uses more fuel.
- Replace oil and air filters regularly, and keep your tires properly inflated.
- Drive less. Walking, bicycling, riding the bus, or working from home can save you money as well as reducing air pollution.
- Don't idle your vehicle. If you stop for more than 30 seconds, except in traffic, turn off your engine.
- Don't buy more car than you need. Four-wheel drive, all-wheel drive, engine size, vehicle weight, and tire size all affect the amount of fuel your vehicle uses. The more fuel it uses the more air pollution it causes.

Application of 4R's at Domestic Level

Refuse

- Instead of buying new containers from the market, use the ones that are in the house.
- Refuse to buy new items though you may think they are prettier than the ones you already have.

Reuse

- Do not throw away the soft drink cans or the bottles; cover them with homemade paper or paint on them and use them as pencil stands or small vases.

Recycle

- Use shopping bags made of cloth or jute, which can be used over and over again. Segregate waste to make sure that it is collected and taken for recycling.

Reduce

- Reduce the generation of unnecessary waste, e.g. carry your own shopping bag when you go to the market and put all your purchases directly into it.

"Run home now to save water, energy, before it runs out on you!"

Cleaner Production – "a step towards pollution prevention"

"Cleaner Production is the **continuous** application of an **integrated, preventive,** environmental strategy towards **processes, products** and **services** into order to increase overall efficiency and **reduce risks** to **humans** and the **environment".**

The concept of Cleaner Production not only minimizes waste but it also provides you suggestion and opportunities to use your waste as a resource.

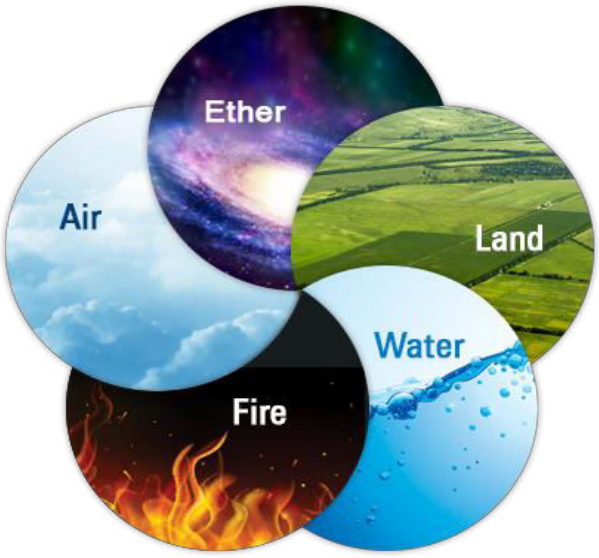
The objective behind conducting cleaner production in house is:

- to minimize household waste
- to create awareness towards reducing the wastage of resource such as water, energy, food, plastic and electronic waste at household
- to use waste as a resource in other household applications

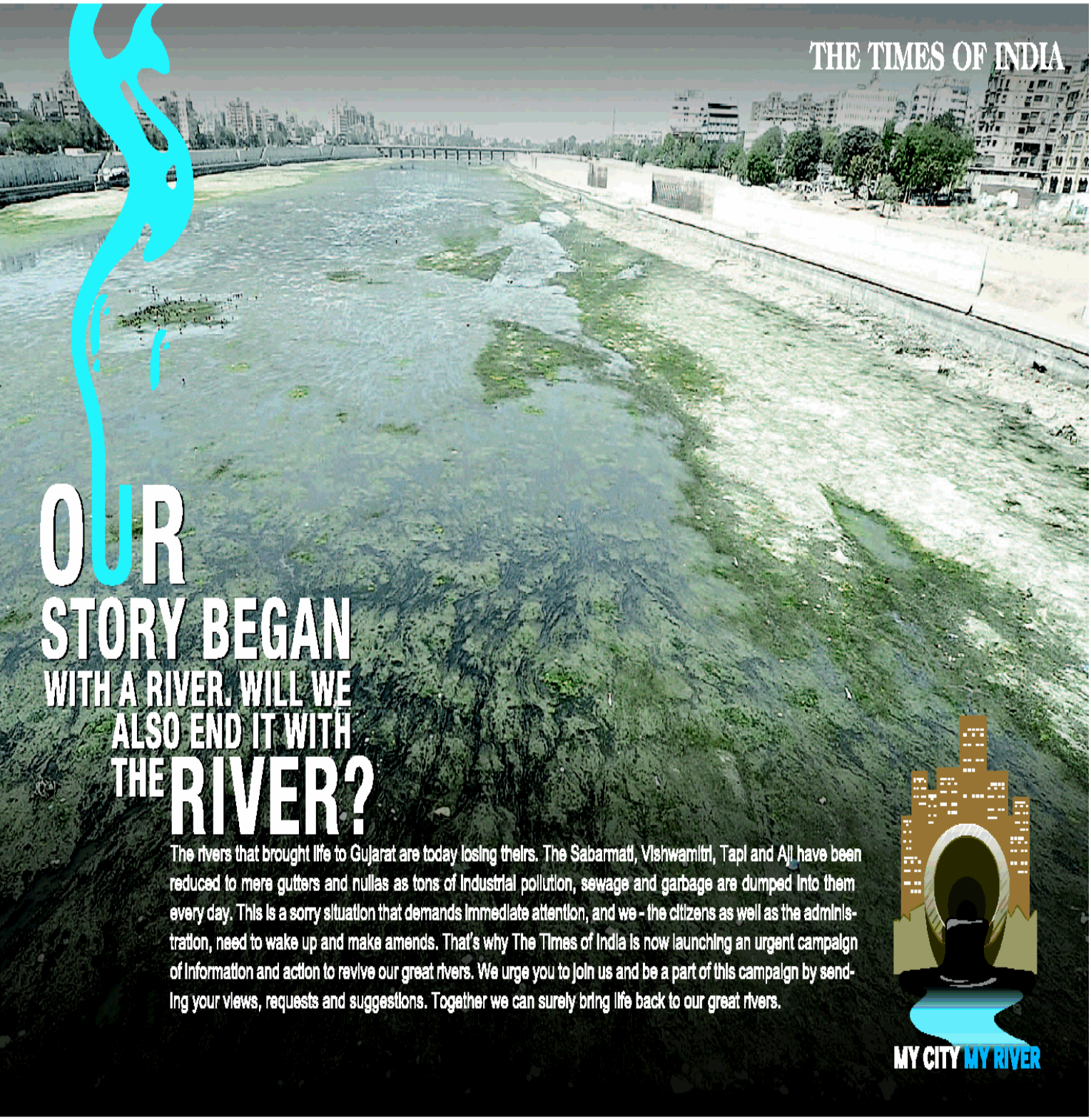
Relation of Panchmahabhutas and Cleaner Production

"Pancha" means five and "mahabhutas" means great elements. Panchamahabhutas is translated as the five great elements, they are the structural entities of the self. The living and the non living, plants and animals are constituted by these five elements. They are:

- Aakash (Ether) : It is the space where matter exists
- Vayu (Air) : It is the gaseous state of matter
- Agni (Fire) : It is the power of transformation of matter
- Jala (Water) : It is the liquid state of matter
- Prthvi (Earth) : It is the solid state of matter



The concept of Cleaner Production proactively tackles the problems by preventing air, water, land, earth pollution and fire at its source.



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"Cleaner Production in house will make your house clean, green and resource efficient"

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