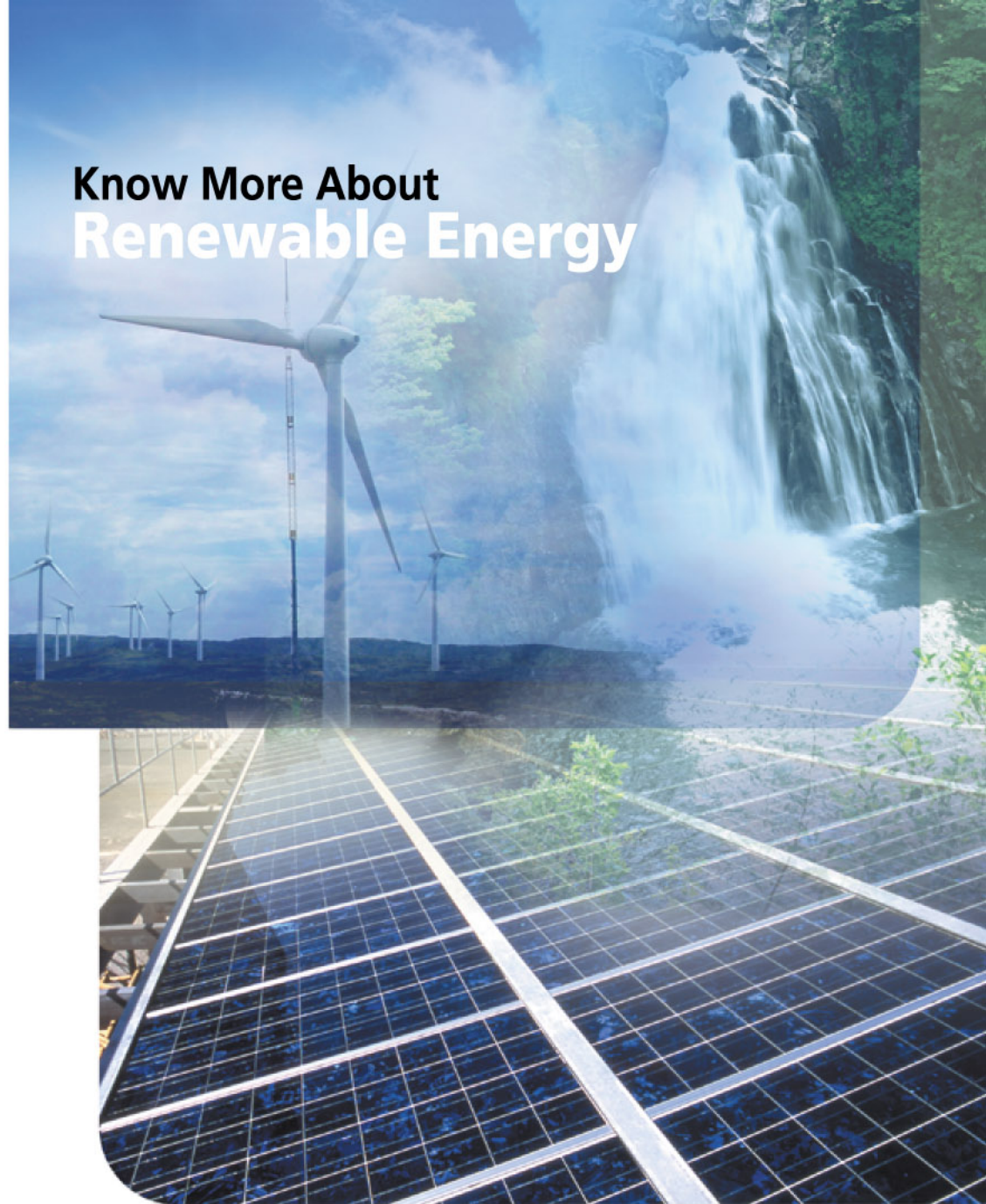


Know More About Renewable Energy



Energy Efficiency  **EMSD**

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EMSD 

Information on Renewable Energy?

Content

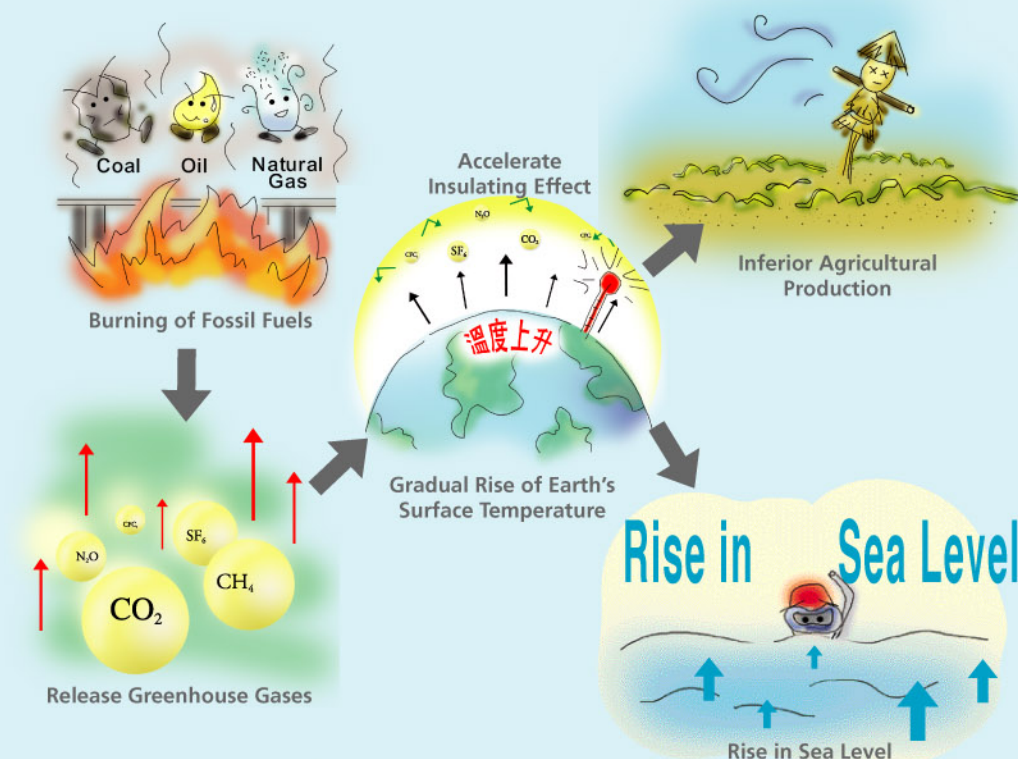
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How is Our Present Energy Use Making Unfriendly Impacts on the Environment?

The burning of fossil fuels, such as coal, oil and natural gas, for generating electricity will release greenhouse gases and other pollutants into the atmosphere and will impose the following impacts to the Earth and Mankind:

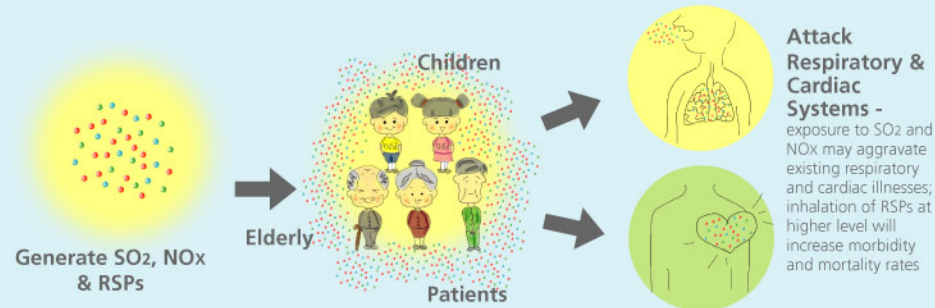
Global Warming

The greenhouse gases will accelerate the insulating effect in upper atmosphere, prevent heat dissipation at the usual rate and will result in global warming. The consequence of global warming has far-reaching impacts on our ecosystems, affecting the agricultural production, and causing rise in sea level.



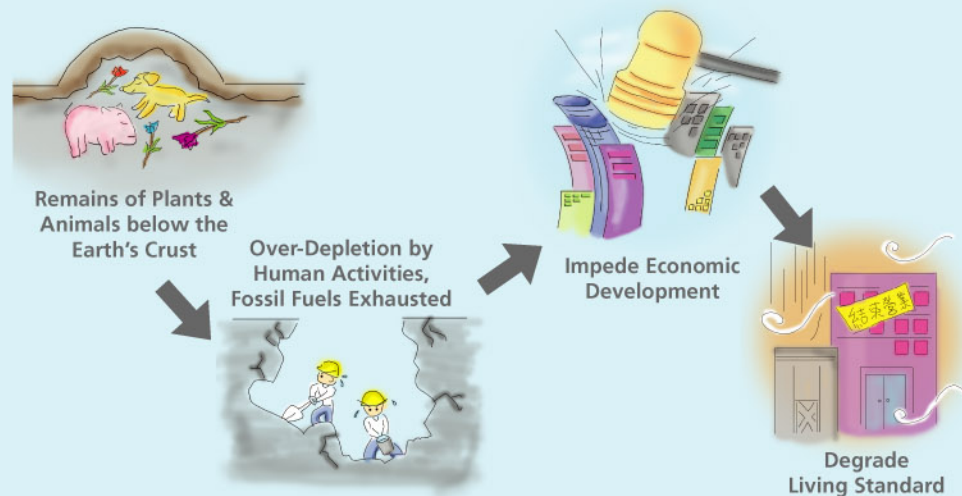
Atmospheric Pollutants Production

Atmospheric pollutants, such as sulphur dioxide (SO₂), nitrogen oxides (NO_x), respiratory suspended particulates (RSPs), etc. will affect human health, with particular adverse effects on the young children and the aged, as well as people with chronic health problems.



Economic Development Hindrance

Fossil fuel reserves have their limits. Over the past decades, we have rapidly depleted these limited natural resources. The shortage of fossil fuels in the not too distant future could affect the activities of all walks of life and impede economic development. This could result in the global degradation of people's living standard.

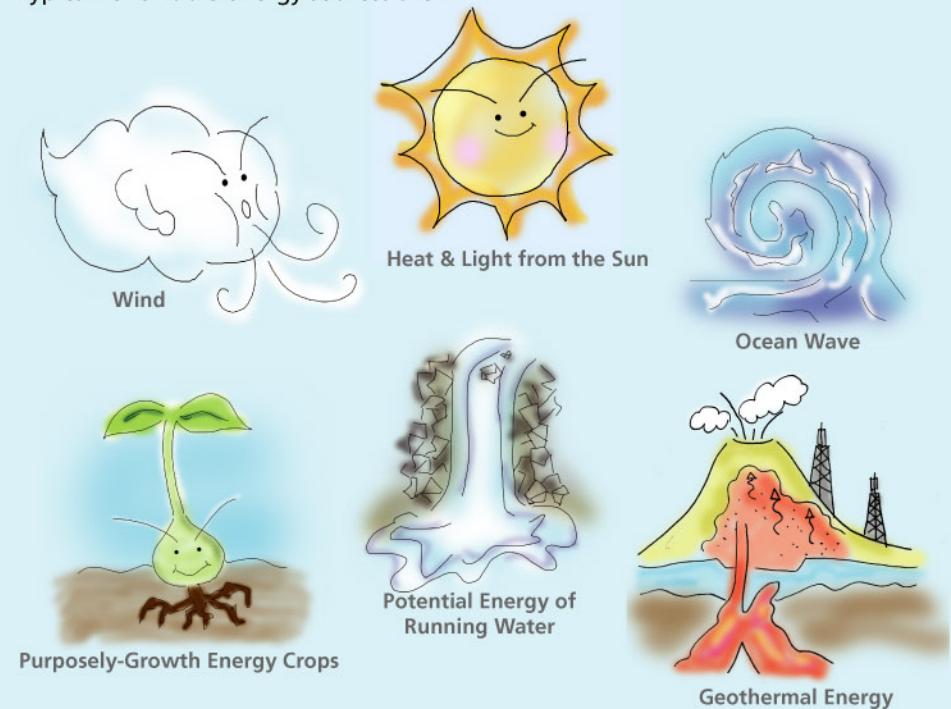


What is Renewable Energy?

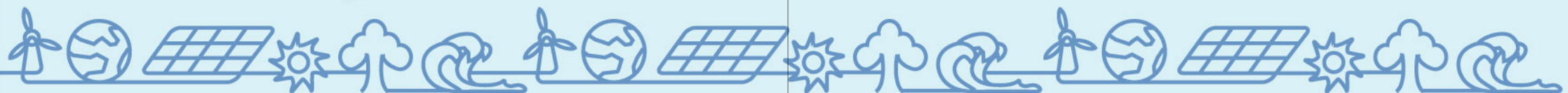
In contrast to the fossil fuels, renewable energy, as the name suggests, exists perpetually and in abundant quantity in the environment. Renewable energy is ready to be harnessed, inexhaustible, and more importantly, it is a clean alternative to fossil fuels.

The term "renewable energy" has no official or commonly accepted definition. As an example, the Renewable Energy Working Party of the International Energy Agency defines renewable energy as "energy that is derived from natural processes that are replenished constantly".

Typical renewable energy sources are:

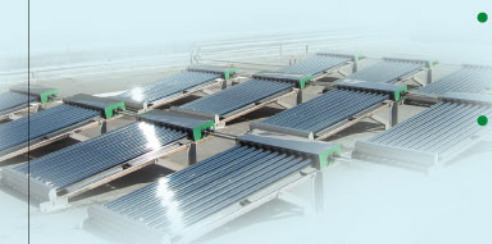
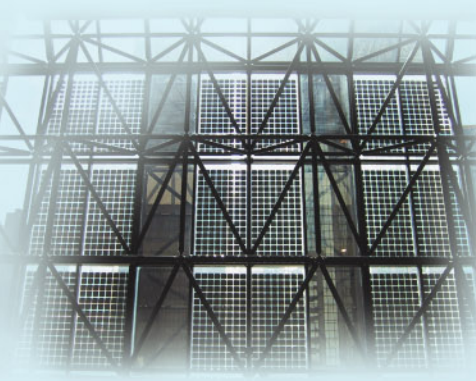


Energy generated from waste is termed as one kind of renewable energy sources in some countries. Others regard it as a waste disposal process rather than a renewable source, since there are pollutants generated as by-products, although modern technology has significantly reduced the pollutant emission to a very low level.



Solar Energy

- Adopt modern technologies in capturing energy from the sun (solar energy) to produce hot water, steam or electricity.
- Photovoltaic cells, made from semiconductor materials, such as silicon, can convert sunlight directly into electricity. The simplest and most common type of photovoltaic cells provide power to watches and calculators, while the more sophisticated "state-of-the-art" photovoltaic system can generate electricity to supplement local consumption in a building or a designated system, and the excess power can even be fed to the city electrical grid.



- Solar hot water heaters can be installed on the roof to absorb solar energy and produce hot water.
- Appropriate features can be incorporated into the design of buildings in cold countries so as to make the best use of solar energy. Materials that absorb and store the Sun's heat can be built into the walls. The walls will then be heated up during the day and release heat at night.

Wind Power

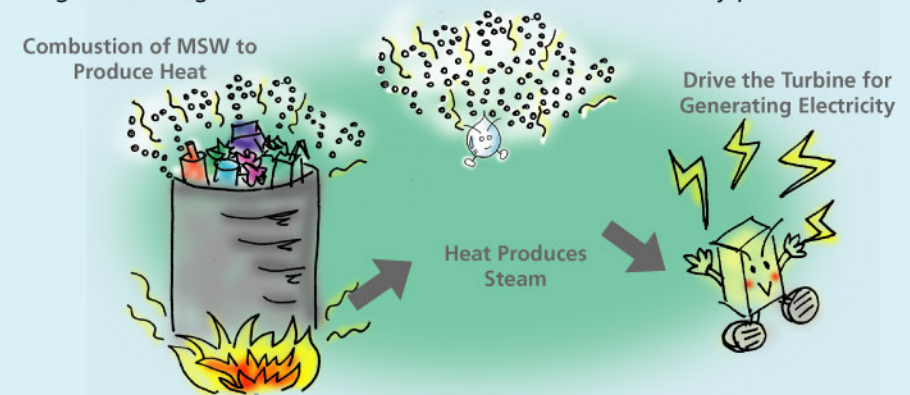
- Wind energy has been used for thousands of years for milling grain, pumping water and driving other mechanical devices.
- Nowadays wind farm commonly employs groups of wind turbines, located either on land, near-shore and offshore, to harness wind energy for mass production of electricity.



- A wind turbine is a device fitted with blades which converts kinetic energy of the wind into rotational motion to turn an electrical generator and produce electricity.
- Wind power is commonly used in many countries including Germany, Denmark, Spain and United States. For example, over 15% of Denmark's electricity demand is met by wind power.

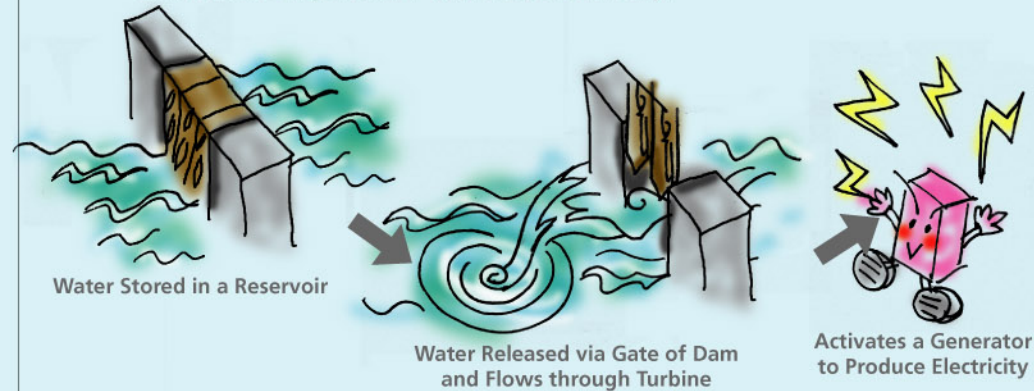
Energy From Waste

- Household and commercial waste, commonly termed as municipal solid waste (MSW), can be used to produce heat for generating electricity and for district heating in cold countries.
- In general, there are three basic processes to convert MSW to useful heat and electricity, namely the thermal process, biological process and landfill gas utilization.
- Thermal process is the combustion of MSW to produce heat. Heat can then be used to produce steam to drive the turbine for production of electricity.
- Biological process means decomposing the organic fraction of MSW through bacterial action in the absence of oxygen, to form a biogas rich in methane which can be used as fuel for power generation. This process takes place under a controlled environment in a specially designed facility to allow biogas to be produced in a more rapid manner.
- After MSW have been deposited in a landfill for a period of time, a methane-rich-gas will be produced. This gas is known as the landfill gas (LFG), which can be used as fuel for power generation.
- Without undergoing any of these three processes, the organic materials will be decomposed naturally into methane or carbon dioxide which are greenhouse gases and thus are considered as undesirable by-products.



Other Forms of Renewable Energy Technology

- Other forms of renewable energy technology, such as hydroelectric power, wave power, geothermal energy and energy from vegetation, are also used in power generation worldwide.
- Hydroelectric power plant uses a dam built across a river to store water in a reservoir. Water released from the reservoir flows through turbine, which in turn activates a generator to produce electricity.

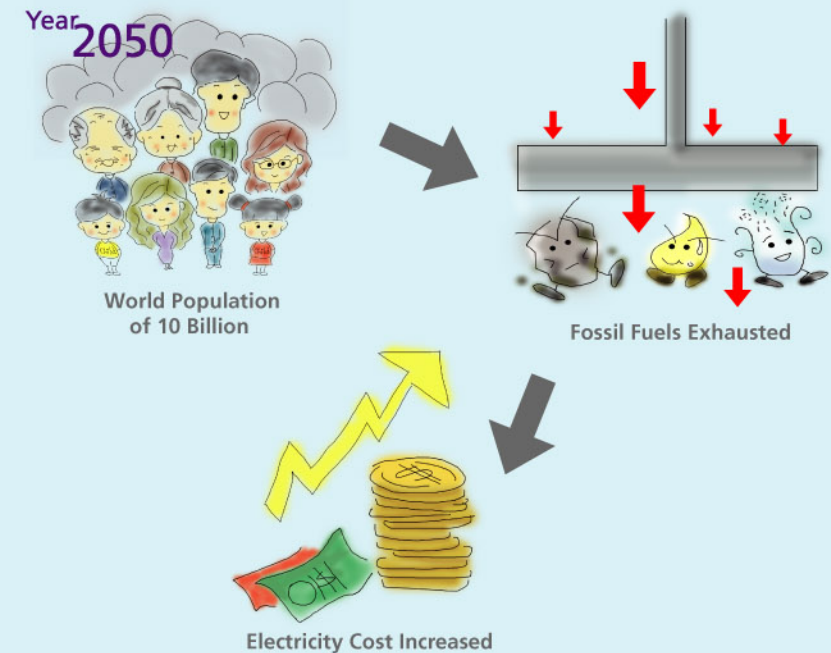


- Wave power system generates electricity from the wave-driven rise and fall of water in a cylindrical shaft or caisson. The rising and falling water column drives air into and out of the top of the shaft and in turn power an air-driven turbine, which can drive a generator to produce electricity.
- Geothermal energy is the natural heat extracted from the Earth's crust. Geothermal power plant uses steam produced from reservoirs of hot water found below the Earth's surface to drive electric generators.
- Since the exploitation of these forms of renewable energy is very often dictated by geographical conditions, and thus the extent of their application usually has a wide variation among different countries.

Why Use Renewable Energy?

Many countries are already switching to renewable energy. Apart from looking for clean energy sources from the environmental point of view, the search for new energy sources as substitutes for fossil fuels is another reason providing such drive.

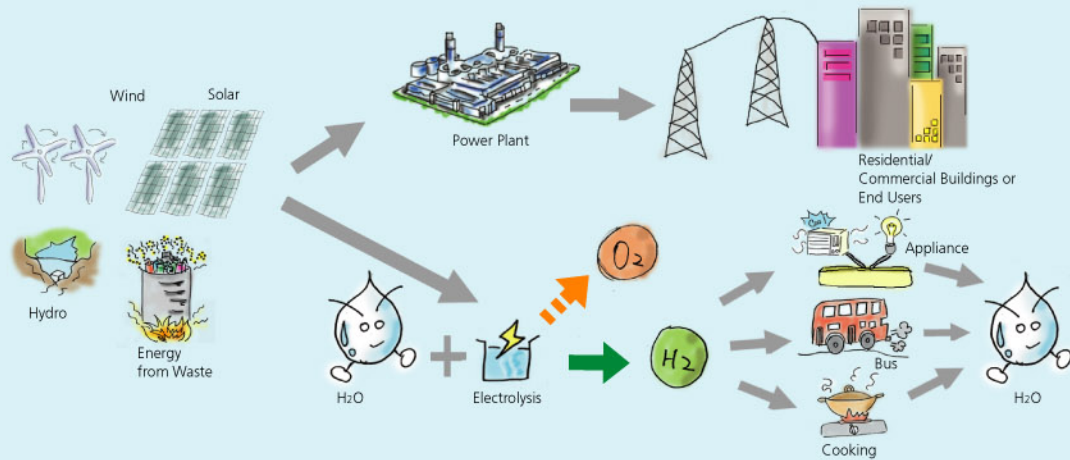
With a projected world population of 10 billion by the year 2050, the increasing global energy demand will propel a more rapid depletion of the world's fossil fuel reserves. Such possible tightening of energy supplies in the future will inevitably result in an upsurge of fuel and electricity prices.



Renewable energy can reduce the reliance on exhaustible sources of fossil fuels. Developed countries are now making more and more investments on the development of renewable energy technologies. We would envisage that when those equipment and systems are mature enough to be produced on a large scale, the unit price of electricity so generated could be comparable to that of the conventional fossil fuel burning process.



Utilising renewable energy to generate hydrogen as the energy carrier is probably the way out to a future world with perfectly clean energy supply and with water vapour as the only emission during the whole process.



Which Renewable Energy Technologies are Suitable for Local Applications?

The Electrical and Mechanical Services Department commissioned a two-stage consultancy study in late 2000 to investigate the feasibility of wider application of renewable energy technologies in Hong Kong. Findings from the Stage 1 Study suggest that the renewable energy technologies considered potentially feasible for wide-scale application in Hong Kong are:



Are We Using Renewable Energy in Hong Kong?

Solar Power

Hong Kong has been using solar energy for over 20 years, albeit in a very small scale and mainly for water heating applications:

- The first solar hot water heating installation was installed in 1980 for a bathhouse in Stanley.
- There are a number of solar water heating installations for low-rise houses in some suburban areas while some are for swimming pools.
- The largest system installed so far in the territory is at the Sheung Shui Slaughter House where the system is used to pre-heat the incoming water for the slaughtering process.



Solar energy was also harnessed locally by photovoltaic systems to generate electricity:

- Since the 1980s, solar cells have been employed to power small automatic weather monitoring points in various locations in Hong Kong.
- A number of Building Integrated Photovoltaic System in both government and private projects have emerged recently and are showcases for the integration of the photovoltaic system with the electrical systems of the buildings.
- These projects include Wanchai Tower, EMSD Headquarters at Kowloon Bay, Science Park and the "Green School" at Ma Wan, etc.





Wind Power

So far Hong Kong only has a few small wind turbines installed. The Hong Kong Observatory has successfully made use of small wind turbines coupled with photovoltaic panels to form hybrid systems in supplying electricity to some of their weather monitoring stations in remote sites.



Energy from Waste

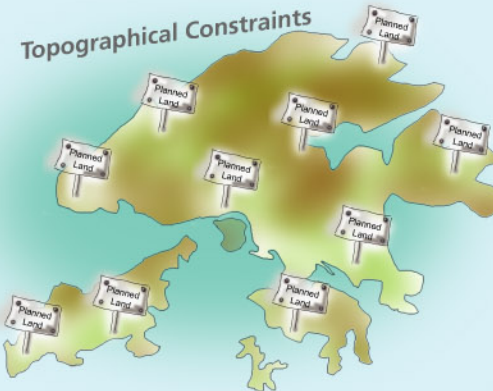
The utilisation of landfill gas (mainly methane) as an energy source has not been extensive in Hong Kong. At present, its application includes:

- As a heating fuel in the landfill's leachate treatment plant in most landfill sites.
- As a primary fuel to power generation plants in producing electricity for on-site consumption.
- In one of the landfill sites, as the process fuel to feed a nearby town gas production plant to crack naphtha during the production of town gas.

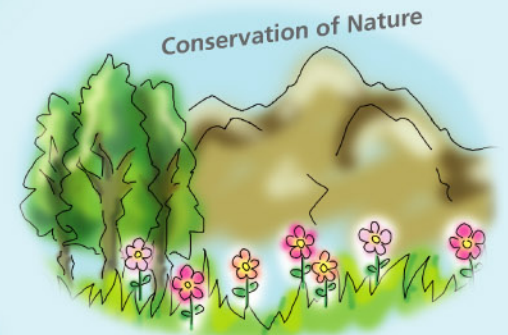
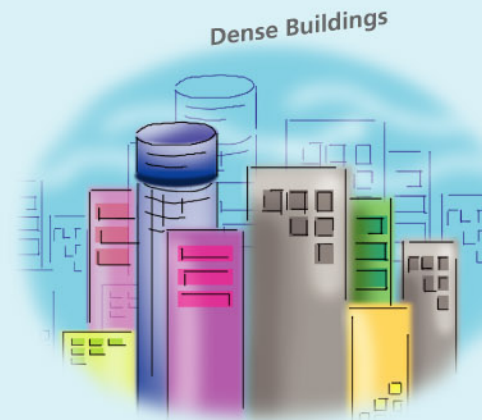


Are there any **Social or Economic Factors** that may need to Consider when Using Renewable Energy in Hong Kong?

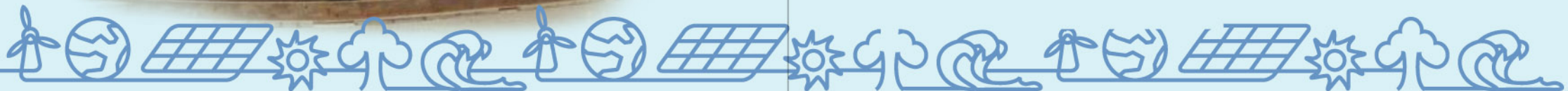
The implementation of renewable energy in Hong Kong may encounter a certain degree of difficulties due to public concern on the effect of large-scale renewable energy schemes on our surroundings:



Given Hong Kong's topographical constraints, it is clear that land suitable for development is extremely limited. Therefore, lands taken up by large renewable energy systems may put constraint on future "urban" and "new town" developments.



Most potential renewable energy sites are either located in areas targeted for various urban development or in our country park areas where natural and wildlife conservation measures are in place.



The visual and noise impacts of renewable energy installations, although subjective to some extent, can be a major factor that may need to consider.



Furthermore, the development cost of renewable energy at present is still high. Based on the "user-pay" principle, consumers using renewable energy will be required to pay a higher energy price.



Where Can I Get **More Information?**

For further information, please contact Energy Efficiency Office, Electrical and Mechanical Services Department. Contact details are:

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