

FUTURE POWER ENERGY

BIO ENERGY

POWERING THE FUTURE

A GREEN NOTE
A MESSAGE TO CHILDREN
BY DR R K PACHAURI, CHAIRMAN
INTERGOVERNMENTAL PANEL
ON CLIMATE CHANGE
JOINT WINNER OF THE
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The Energy and Resources Institute

A note from Dr R K Pachauri

Human society has reached a stage of prosperity, which was not expected several decades ago. Yet, a large number of people live in poverty and are barely able to keep alive. It appears that they have not been touched by human progress at all. At the same time, what we regard as progress has resulted in damage and destruction of our natural resources and caused serious problems such as human-induced climate change, which threaten all forms of life in different parts of the world in the form of sea-level rise, heatwaves, floods, droughts, and melting of glaciers.

All of this provides a strong reason for us to re-examine what we have mistakenly believed as human progress and change the way we have been pursuing human activities. For instance, we must now use renewable sources of energy and eco-friendly methods of production and consumption, make efficient use of water in every activity, and protect biodiversity.

It is in the hands of the children to try to change their own lives towards greater protection of the environment and all our natural resources. They can also take active part in changing the thinking of adults. Children can take the lead in organizing actions, which support conservation of resources, recycling of waste water, and greater use of renewable sources of energy, at the community level.

This series of children's books is aimed at providing children with knowledge on what needs to be done in all these areas. I hope those who read these books will not only enjoy them greatly but also feel inspired to implement actions that are described in these pages, so that we create a beautiful, peaceful, and healthy future for the human race.



R K Pachauri

Director-General, TERI

Chairman, Intergovernmental Panel on Climate Change

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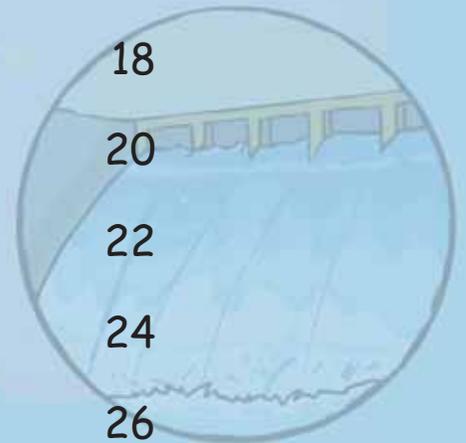
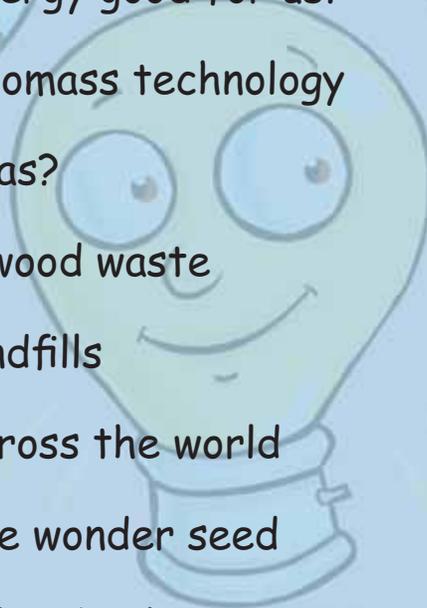
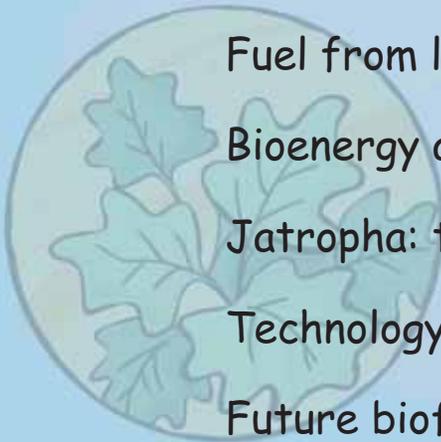
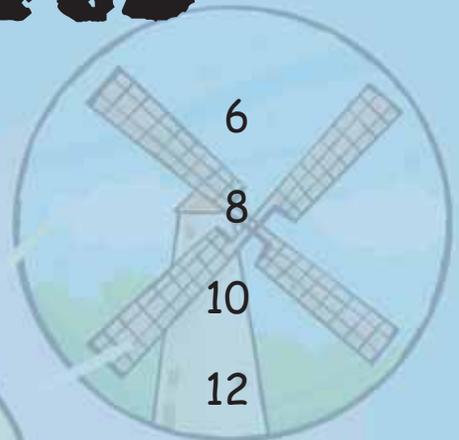
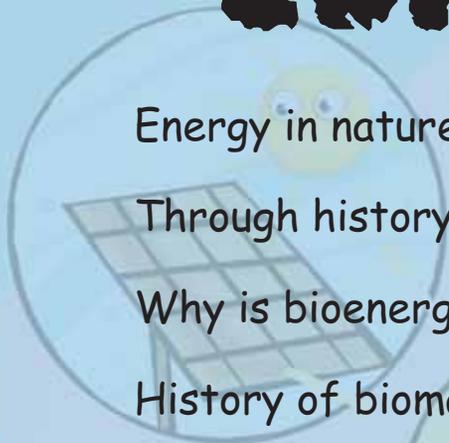
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Energy in nature

Did you know that nature can produce enough energy to supplement other forms of energy? Interesting!

What is bioenergy?

Bioenergy is a form of energy derived from nature. It is released when biomass is burnt, just like logs in a campfire. The word 'biomass' is derived from two words. 'Bio' means anything that is alive or has been alive. 'Mass' is the matter contained in a body. So, biomass means natural material or organic matter. It includes remains of plants and animals, animal waste, food waste, twigs, and leaves. Materials such as plastic, metal, and glass are not biomass. If biomass is the fuel, bioenergy is the energy produced by the fuel.



▲ Biomass includes wood, leaves, flowers, seeds, tree bark, and even algae.



Energy that's forever

Bioenergy is a renewable form of energy—it can be used again and again without getting depleted. Bioenergy is extracted from biomass. Biomass can be converted into different kinds of fuel—solid, liquid, and gas. The fuel that is extracted from biomass is called biofuel or agrofuel.

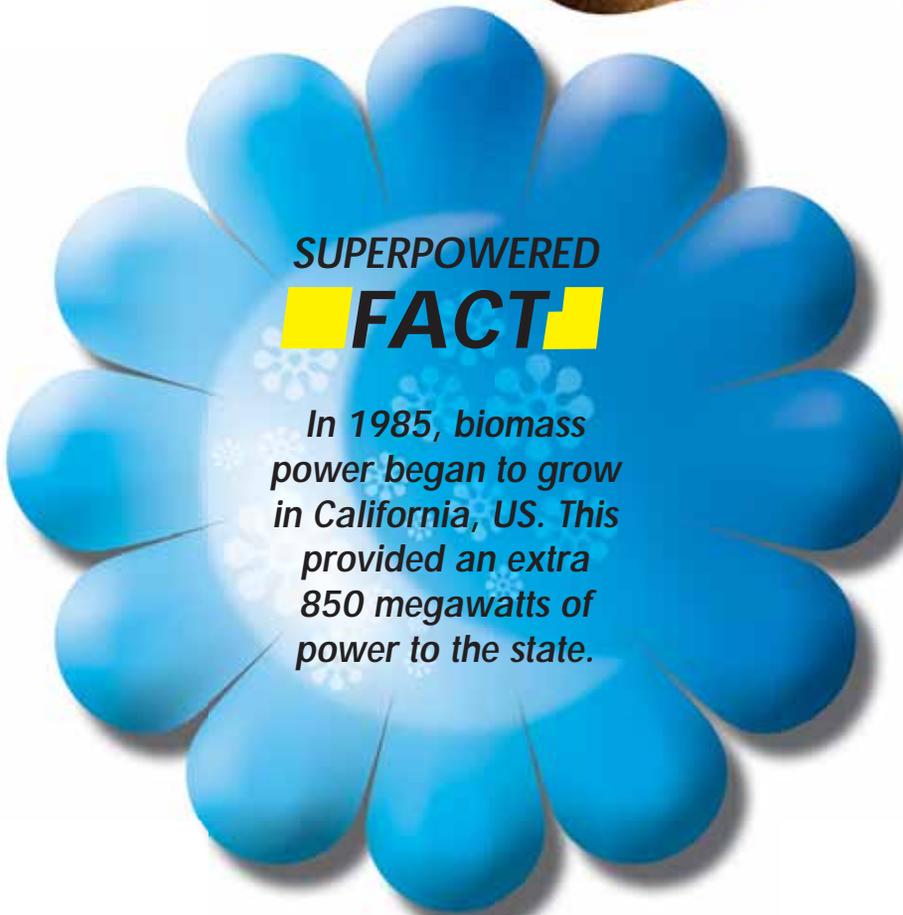
◀ *Even dung can be used to produce energy—it is commonly used for cooking in developing countries.*



▼ *New technologies enable the production of energy from kitchen waste and garbage.*

Fuel from waste

Biogas is a form of biofuel that is obtained from something that is or was once living. It can be produced from the waste and rubbish we throw out of our homes every day—leftover food, manure, sewage, and municipal waste. Specially grown crops are also a source of biogas.



Fuel from dung

Animal dung is also a source of bioenergy. Dung may be dried and burned to generate energy. This is a common fuel used for cooking in developing countries, especially in villages. Dung is also converted to liquid or gaseous fuels, such as methane, through chemical processes.

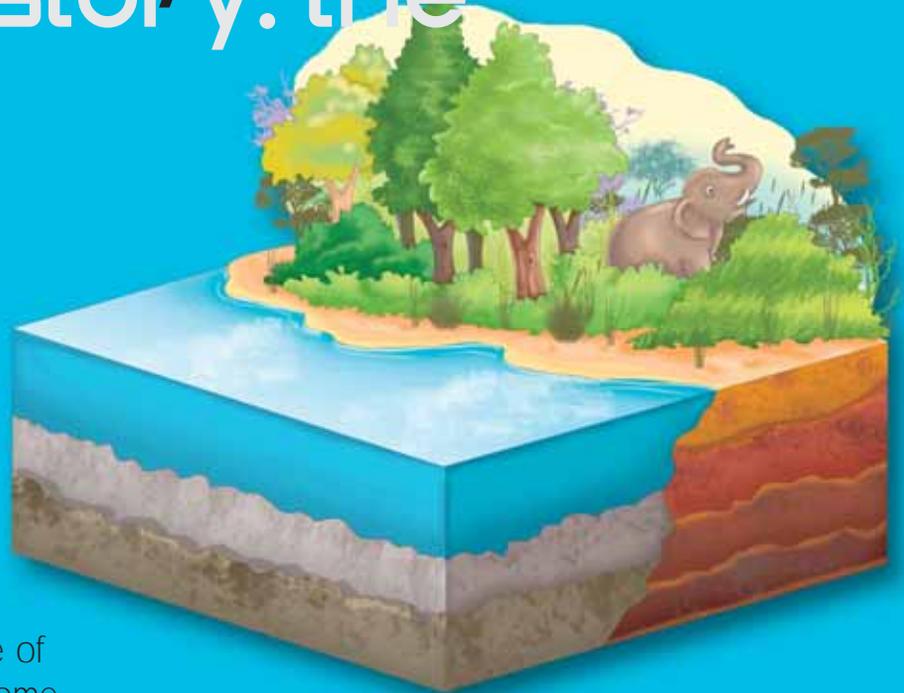
Forests are a rich source of bioenergy. For millions of years, forests have been providing us with fuel in the form of wood. But trees take a very long time to grow. And humans cut down trees for various purposes.

Through history: the early days

Modern human civilization depends on machines, which in turn, require energy to work. For a very long time, most of this energy has come from fossil fuels—coal, petroleum, and gas. The use of fossil fuels has increased over the years.

What are fossil fuels?

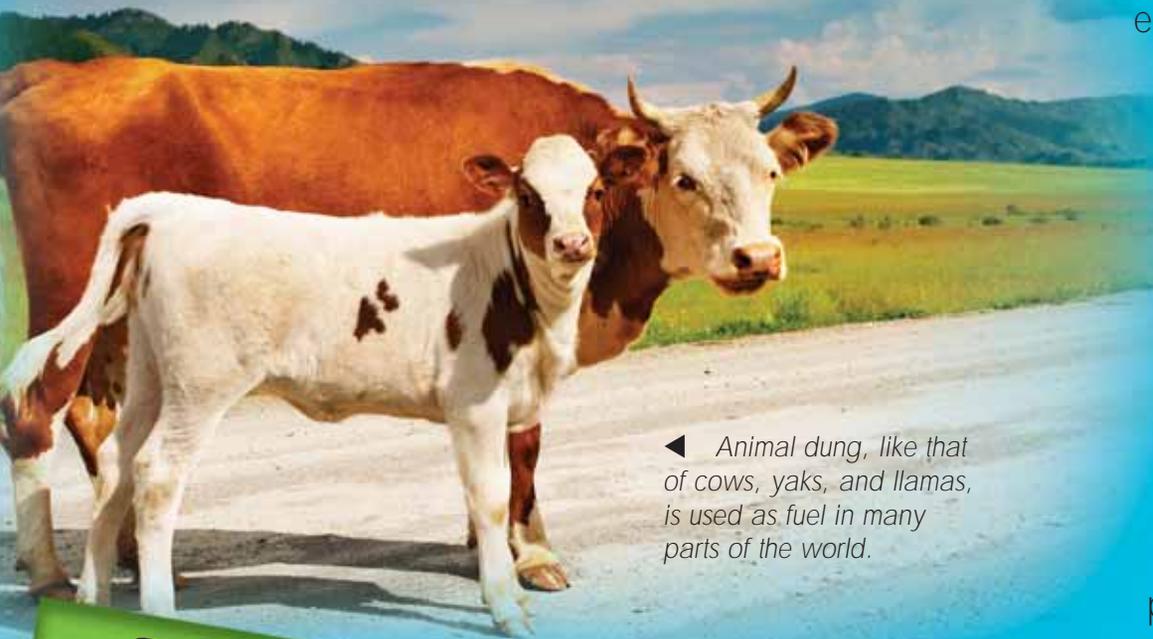
Fossil fuels were discovered by people of the Stone Age. They discovered that some black rocks could be lit to produce energy. These black rocks were nothing but coal. Coal and petroleum took millions of years to form. They were formed from the remains of plants, animals, and other organisms that were buried deep underneath the earth. That is why they are called fossil fuels.



Over millions of years, heat and pressure changed organic matter into rocks and oil.

Before fossil fuels

Much before fossil fuels were discovered, humans were burning natural items such as twigs, branches, and dry leaves to produce energy. Animal fat was also used to produce energy. Animal dung has been used as fuel for thousands of years. It is still used in many parts of the world. Yak dung is used to produce energy in certain regions like Tibet. In the Andes, llama dung is now being used to produce electricity.



◀ *Animal dung, like that of cows, yaks, and llamas, is used as fuel in many parts of the world.*





◀ Till recently, wood was the main fuel for heating and cooking.



SUPERPOWERED FACT

Estimates say that by 2050, the demand for energy will be double or triple of the present demand as the population of developing countries increases.



▲ Humans were burning twigs and branches to light fire since pre-historic times.

Biomass all the way

Before the Industrial Revolution, most of the world's energy demands were met by biomass. Up until the 1860s, the US used biomass, in the form of wood, for more than 90 per cent of all energy consumption. Wood was the main fuel for heating and cooking in homes and businesses. It was used for producing steam in industries, trains, and boats, before being replaced by coal. Only by the 1950s did electricity and natural gas replace wood as the heating fuel in most homes and commercial buildings. About 14 per cent of the world still utilizes biomass, though it has been replaced by fossil fuels in most parts.

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