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Revised and Updated

ICSE GEOGRAPHY

Based on the latest ICSE syllabus

R K JAIN

Includes latest toposheets G43S7 and G43S10 issued by the Survey of India

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ICSE GEOGRAPHY

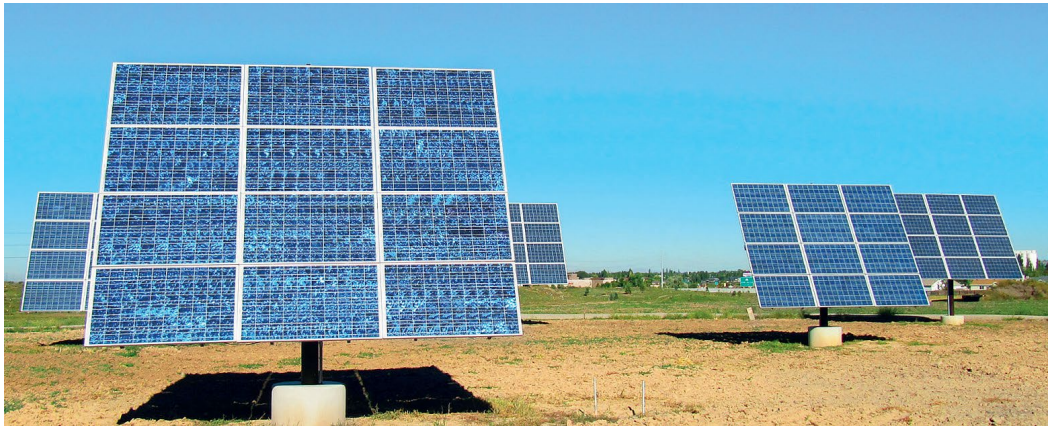
Class 10

Chapter 12: India-Energy Resources (Non-Conventional)

The world community is trying to find an efficient and sustainable source which should be environment-friendly. A viable solution can be to develop non-conventional sources of energy, such as **solar energy**, **wind energy**, **tidal energy**, **geothermal energy**, **nuclear energy**, **biogas**, etc. The non-conventional sources of energy are abundant, renewable, pollution-free and eco-friendly.

SOLAR ENERGY

The Sun is an inexhaustible source of energy. It is estimated that the solar energy falling on the Earth in one hour is equal to the total energy consumption of the world in one year. The Earth receives the solar energy in the form of heat and light throughout the year.



Solar energy panels

Solar Photovoltaic Cell

The **solar photovoltaic cell**, which can directly convert solar energy into electricity, is made up of semi-conducting material like **silicon**. A set of solar cells with rechargeable batteries is called a **solar panel** or solar electric power generator.

Solar Thermal Appliances

The solar energy falling on the Earth's surface is in a highly scattered form. Thus, we need devices that can collect the scattered solar energy and converge it into a small area. The **solar collectors** are used in solar cookers, which can cook rice, pulses and vegetables, but cannot be used for frying food.

Solar Power Plants

If large concave reflectors are used, then a large quantity of sunlight is concentrated at a point called **focus**. The focus can attain a very high temperature. Large concave reflectors are used in solar furnaces and solar power plants. The intense heat at focus can produce steam, which can drive a turbo-generator to generate electricity.

ADVANTAGES OF SOLAR ENERGY

The solar energy is cleanest, pollution-free and inexhaustible source of energy. The solar energy harnessing devices can be easily installed in remote rural, hilly or desert areas.

SOLAR ENERGY IN INDIA

Being a tropical country, India receives abundant sunshine for about 250 to 300 days in a year. India has developed several devices, such as solar cookers, solar lanterns, solar heaters, solar photovoltaic cells, power generators, solar pump sets and desalination plants. India has the largest solar cooker programme.

WIND ENERGY

In ancient times, wind energy was used by ships and boats for sailing. Today, we can convert the wind power into mechanical and electrical energy on a large scale. The velocity of the wind is generally high in the coastal areas and also on hills. **Windmills** are used to harness wind power.

Wind energy farm

ADVANTAGES OF WIND ENERGY

The wind energy does not need any raw material and does not produce any waste. It is renewable and pollution-free. The wind energy farms or windmill farms need less maintenance than a conventional energy station.

WIND ENERGY IN INDIA

India started the utilisation of wind energy during the Seventh Five Year Plan and made significant progress, especially in the coastal areas. High velocity of wind has been recorded in Gujarat, Maharashtra, Karnataka, Tamil Nadu, Andhra Pradesh and Odisha. The first wind power farm was set up at **Mandvi** in Gujarat.

TIDAL ENERGY

Those who are living in the coastal areas must have observed that the level of sea water rises and falls twice in 24 hours. These are called **tides**. Efforts have been made to utilise the energy associated with rise and fall of sea level for power generation.

Tidal energy plant

ADVANTAGES OF TIDAL ENERGY

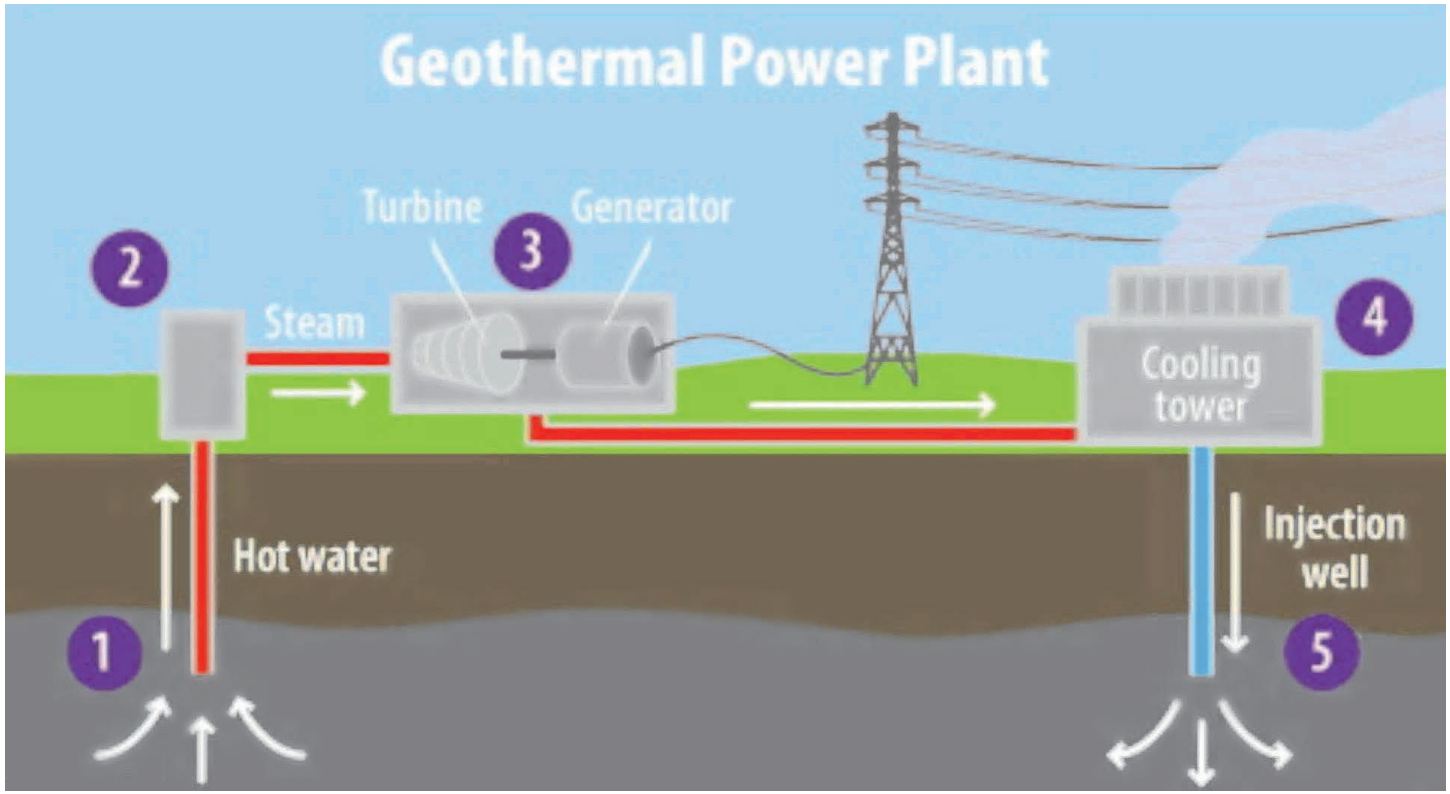
The tidal energy is renewable, pollution-free and it is also a continuous source. Though the initial investment is high, but it is cost-effective in the long run. The project can be developed even in remote coastal areas or on a remote island.

TIDAL ENERGY IN INDIA

The Gulf of Khambhat and the Gulf of Kachchh are best suited for the utilisation of tidal energy in India. The estimated potential is about 9000 MW. At present, tidal power plants are in operation in Russia, France and few more countries. In India, a 900 MW tidal power plant is proposed to be set up in the Gulf of Kachchh.

GEOTHERMAL ENERGY

The interior of the Earth maintains a very high temperature. The heat inside the Earth is called **geothermal energy**, which has a great potential for the production of non-conventional energy. At some places on the Earth, the hot magma is very close to the surface of the Earth.



Geothermal power plant

ADVANTAGES OF GEOTHERMAL ENERGY

This pollution-free, non-conventional source of energy does not require any raw material. It is a reliable source of energy as weather or seasonal changes do not affect it.

GEOTHERMAL ENERGY IN INDIA

In India, about 300 hot water springs have already been located. In some of them, the temperature is close to boiling point of water. The potential of geothermal energy is mostly in Ladkah, Jammu and Kashmir, Himachal Pradesh, Uttarakhand, Jharkhand and Chhattisgarh

NUCLEAR ENERGY

Some heavy elements like **uranium** and **thorium** emit radioactive rays, such as alpha, beta and gamma rays. This phenomenon is called **radioactivity**. The process of **nuclear fission** can generate nuclear energy.

A nuclear power plant is set up to produce power, i.e., electricity, from the energy of the nuclear fission.

Nuclear power plant

The plant has nuclear reactors or atomic reactors. In the reactors, energy is released in the form of heat, which is used to convert water into steam that runs the turbines to produce electricity.

ADVANTAGES OF NUCLEAR ENERGY

The available resources of nuclear energy are almost inexhaustible. It is clean and creates no pollution of air, water or soil. Though initial cost is very high, but the operating cost is very low.

NUCLEAR ENERGY IN INDIA

India has rich deposits of radioactive elements, such as uranium and thorium in the **monazite sands of Kerala** shores. The use of thorium for producing nuclear energy has made India self-reliant in nuclear fuels. India has also developed technique for reprocessing of spent fuels. The nuclear fuel resources of India are equivalent to about 700 billion tonnes of coal.

The nuclear programme in India started with the setting up of Atomic Energy Establishment in 1950. The Indian Nuclear Power Programme began with the commissioning of two nuclear reactors at **Tarapur** (near Mumbai) Atomic Power Station in October 1969.

India – Nuclear power plants

Today we have other nuclear power stations at **Rawatbhata** (Rajasthan), **Kalpakkam** (Tamil Nadu), **Narora** (Uttar Pradesh), **Kakrapar** (Gujarat), **Kaiga** (Karnataka), **Jaitapur** (Maharashtra), **Kundankulam** (Tamil Nadu), etc.

BIOGAS

The animal or plant material that can be converted into energy is called **biomass**. The biomass can be converted into **biogas**, which is a mixture of gases produced when microorganisms decompose biomass in the presence of water but in the absence of air.

Biogas plant

Biogas is a mixture of **methane** (56 per cent), **carbon dioxide** (40 per cent) and small amount of other gases.

Biogas is a good fuel for cooking and can also be used for lighting homes and streets, pumping water for irrigation, running flour mills and other rural industries. Biogas can replace diesel for generation of motive power and electricity. The leftover slurry is used as manure.

The methods of biogas generation is almost same in all types of biogas plants.

- The organic waste is mixed with water and is led to the **digester tank**.
- The organic waste is broken down by micro-organisms to produce biogas.
- If cow dung is the organic waste, then the biogas produced is popularly called **gobar gas**.
- The biogas is taken out through a tube and is connected to the kitchen stove.
- The biogas can be utilised for lighting and also to run small machines.
- The semi-solid residue from the digester tank is a good quality of manure.

ADVANTAGES OF BIOGAS

The decomposition of biomass in a biogas digester produces 3 to 5 times more energy than that by direct burning. Biogas is a cheap and a renewable source. It is a clean fuel as it does not produce smoke or ash. It can dispose of large amount of rural waste and, thus, is environment-friendly.

BIOGAS ENERGY IN INDIA

The rural areas in India produce a large amount of plant and animal wastes, which can possibly solve the energy problem of India.

- The Department of Non-conventional Energy Sources launched a programme in 1981–82, in which biogas plants are installed all over the country.
- Most of the biogas plants are being installed in individual houses and farms.
- The capacity of 3–6 cubic metres of biogas can meet the energy needs of a family of 6–8 persons.
- Currently, about 2.5 million plants are successfully working in the country.
- Coimbatore, Udaipur and Samastipur have training centres for biogas production.

THANK YOU