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AN AUTONOMOUS INSTITUTION



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23MCT003 – ENVIRONMENTAL SCIENCE & SUSTAINABILITY

## 3-RENEWABLE ENERGY SOURCES

### 3.2– NEED FOR NEW ENERGY SOURCES

The need for new energy resources arises from environmental, economic, and geopolitical challenges associated with traditional fossil fuels (like coal, oil, and natural gas). Fossil fuels are finite, polluting, and vulnerable to supply disruptions, and transitioning to new, renewable energy resources is crucial for sustainable development, energy security, and environmental health. Here are the main reasons for the need for new energy resources, with examples to illustrate each point:

#### 1. Environmental Impact of Fossil Fuels

Fossil fuels are the primary contributors to air pollution and climate change, as burning them releases large amounts of carbon dioxide (CO<sub>2</sub>) and other greenhouse gases. These emissions contribute to global warming, extreme weather events, and adverse effects on biodiversity and ecosystems.

*Example:* The transportation sector relies heavily on oil-based fuels, and according to the EPA, it accounts for about 29% of U.S. greenhouse gas emissions. Shifting to electric vehicles (EVs) powered by renewable energy sources, like solar or wind, can significantly reduce emissions and improve air quality.

#### 2. Finite Nature of Fossil Fuels

Fossil fuel reserves are limited, and as they deplete, they become more expensive and challenging to extract. This dependency creates a vulnerable and unsustainable energy system. Relying solely on non-renewable resources could lead to an energy crisis as demand grows and supplies diminish.

*Example:* The North Sea oil fields, once a major source of oil for Europe, have been declining in output since their peak in the 1990s. The UK and other European countries are turning to wind farms, especially offshore, to replace the energy lost from declining oil production. Offshore wind is expected to provide 40% of the UK's electricity by 2030, showcasing the potential of renewable energy to fill the gap left by declining fossil fuels.

### **3. Energy Security and Geopolitical Stability**

Many countries rely on imported fossil fuels, which can create dependency on politically volatile regions. This dependency can lead to price volatility and risks to energy security. Diversifying energy sources with local renewable energy can reduce this reliance and improve energy security.

*Example:* The European Union (EU) has been investing in solar, wind, and hydropower to reduce dependence on imported natural gas, especially from Russia. The Russia-Ukraine conflict highlighted the vulnerability of European countries relying on foreign energy sources, accelerating their shift to renewable energy projects to secure stable, domestically produced energy.

### **4. Economic Stability and Growth**

Renewable energy technologies are becoming increasingly cost-effective due to advances in technology and economies of scale. In many cases, renewables are now cheaper than fossil fuels, especially when considering the long-term costs associated with pollution and climate-related disasters.

*Example:* Solar energy costs have dropped by nearly 90% over the last decade, making it one of the cheapest sources of electricity in many parts of the world. Countries like India have invested heavily in solar farms; the Bhadla Solar Park in Rajasthan, for example, is one of the world's largest and provides affordable electricity to millions of people. This transition reduces costs and creates jobs in new sectors, supporting economic growth and stability.

### **5. Health Benefits**

The burning of fossil fuels releases pollutants like sulfur dioxide (SO<sub>2</sub>), nitrogen oxides (NO<sub>x</sub>), and particulate matter, which have harmful effects on human health. Switching to cleaner energy sources can drastically improve air quality and reduce respiratory and cardiovascular diseases associated with air pollution.

*Example:* According to studies, air pollution from coal-fired power plants in China has contributed to premature deaths and health complications. In response, China is now the world's largest producer of solar panels and has heavily invested in renewable energy projects, like the Tengger Desert Solar Park, to reduce its reliance on coal and improve public health.

### **6. Climate Change Mitigation**

The Intergovernmental Panel on Climate Change (IPCC) emphasizes that a drastic reduction in greenhouse gas emissions is necessary to limit global warming to manageable levels. The

most effective way to achieve this is by replacing fossil fuels with low- or zero-emission renewable energy sources.

*Example:* Costa Rica has emerged as a global leader in clean energy by generating over 99% of its electricity from renewable sources, primarily hydropower, wind, and solar. This has helped the country maintain low emissions levels and work toward its goal of becoming carbon-neutral.

## **7. Incentivizing Technological Innovation**

The transition to renewable energy is spurring innovation, leading to advances in energy storage, grid management, and energy efficiency. These innovations not only make renewables more viable but also open up new markets and business opportunities.

*Example:* Tesla's advancements in lithium-ion battery storage systems have paved the way for large-scale energy storage solutions, like Tesla's Powerwall, which stores solar energy for use during periods when the sun isn't shining. This technology has been deployed in regions with high renewable energy use, like California, to stabilize the grid and ensure a consistent energy supply.

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## **New Energy Resources: A Path Forward**

Examples of new energy resources include:

- **Solar Energy:** Vastly abundant and scalable, solar power is increasingly used in homes, businesses, and utility-scale solar farms.
- **Wind Energy:** Wind farms, especially offshore, are becoming a major source of renewable energy, notably in the UK, Denmark, and parts of the U.S.
- **Hydrogen:** As a clean fuel, green hydrogen (produced using renewable energy) is gaining traction for use in industries and transportation.
- **Ocean Energy:** Tidal and wave energy projects are beginning to harness the oceans' vast potential for sustainable power.

By adopting these new energy resources, we can create a more resilient, clean, and sustainable energy system, ensuring a healthier planet and a more stable future for generations to come.