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The Economic Impact of Green Energy Transition Subtitle: Exploring the Effects of Sustainable Transformation

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Abstract

The global shift toward green energy has emerged as a crucial response to climate change, environmental degradation, and the growing demand for sustainable economic development. This study examines the economic impact of the green energy transition, focusing on how the adoption of renewable energy sources such as solar, wind, and hydropower influences economic growth, employment generation, industrial transformation, and energy security. The research explores both opportunities and challenges associated with sustainable transformation, including investment requirements, technological innovation, policy frameworks, and market adaptation. While the transition promotes long-term economic resilience, reduced carbon emissions, and new employment sectors, it also presents short-term challenges such as infrastructure costs, skill gaps, and regulatory adjustments. The study highlights the role of government policies, private sector participation, and international cooperation in ensuring a balanced and inclusive transition toward a low-carbon economy. Overall, the green energy transition is identified as a key driver of sustainable economic progress and environmental sustainability.

Keywords*: Green Energy Transition; Renewable Energy; Sustainable Development; Economic Growth; Clean Energy; Energy Policy; Carbon Emissions; Green Economy; Sustainable Transformation; Environmental Economics.*

Introduction

Green Energy

Green energy is energy generated from natural resources, such as sunlight, wind, or water—E.g. Solar power, geothermal energy, biomass, biofuel, hydropower, etc. It can be produced using a method and from a source that does not harm the natural environment. Green energy sources often renew themselves organically, unlike fossil fuels such as coal or natural gas, which take millions of years to form.Green Energy Transition. The Green Energy Transition is a shift from fossil fuels to renewable energy sources.This shift is taking place as none of the fossil fuels are creating sustainable energy which needs an hour. Green energy can replace fossil fuels in the upcoming future for which responsible and varied production needs to be undertaken.

Green energy transition in India

India has already achieved its target of 40% installed electric capacity from non-fossil fuels in Nov 2021.India ranks 4th in Wind Power Capacity and 5th in Solar Power Capacity globally.In August 2022, India updated its NDC (Nationally Determined contribution) according to which the target is to achieve 500 GWatt of renewable energy capacity by 2030, as part of its commitment under the Paris Agreement. In India, the Government allows 100% FDI under the automatic route for renewable energy generation and distribution projects, which also includes Greenenergy.

Objectives

To understand the concept of green energy transition. To study the economic impact of green energy transition. Definition of Green Transition: Moving from a carbon-based economy to a sustainable, low-carbon economy Importance: Mitigating climate change, promoting sustainability, and fostering economic resilience.

Key Drivers of the Green Transition Government Policies (carbon taxes, emission regulations)

Technological Innovations (renewable energy, electric vehicles) Global Cooperation (Paris Agreement, Sustainable Development Goals) Consumer Demand for Sustainable Goods

Positive Economic Impacts Job Creation: Growth in renewable energy, clean technologies, and sustainable agriculture sectors. Innovation & Investment: New markets for green technologies attract investments. Energy Independence: Reducing reliance on fossil fuels lowers energy costs and increases energy security.

Cost Savings Lower healthcare costs due to reduced pollution. Energy efficiency reduces operating costs for businesses. Reduced environmental clean-up costs.

Challenges of Green Transition Initial Costs: High capital investment in renewable energy infrastructure. Job Displacement: Transition from traditional industries (coal, oil, gas) to green industries. Economic Inequality: Developing countries may face higher costs in adopting green technologies.
Sectoral Impact: EnergyFossil Fuels: Decline in demand for coal, oil, and natural gas, leading to joblosses. Renewable: Surge in solar, wind, and hydro energy industries.Example: China and the U.S. leading in solar panel production.
Sectoral Impact: TransportationShift from internal combustion engines to electric vehicles (EVs). Economic implications for oil markets, EV manufacturing, and battery supply chains.
Global Case Studies
European Union: Green Deal aiming for carbon neutrality by 2050.China: Largest producer of renewable energy technologies. United States: Green investments through the Inflation Reduction Act.
Impact on Global Trade
Trade in green technologies increases. Carbon border taxes may be implemented to avoid carbon leakage.Export opportunities for renewable energy and sustainable
products. Opportunities for Developing Economies Green transition can foster sustainable development. Opportunity for leapfrogging older technologies by adopting modern sustainable solutions.
Financing the Green TransitionRole of public and private investments.Green bonds and sustainable finance mechanisms. Government incentives and subsidies.
Long-Term Economic BenefitsResilience against climate-related economic shocks.Sustainable growth leading to long-term economic stability.

Conclusion
The green transition poses both challenges and opportunities for economies.Long-term benefits outweigh the short-term costs. Collaborative global effort is crucial for a successful transition.

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The authors declare that there are no conflicts of interest regarding the publication of this paper

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