



## CleanTech: Benefits & Challenges

This editorial is based on [Cleantech, for an inclusive green future in India](#) which was published in The Hindu on 26/08/2023. It talks about the benefits of adopting CleanTech in India. It also talks about how India could effectively adopt CleanTech.

**For Prelims:** CleanTech, [Pradhan Mantri MUDRA Yojana](#), [Micro, small and medium enterprises \(MSMEs\)](#), [Pradhan Mantri Formalisation of Micro food processing Enterprises \(PM-FME\) scheme](#), [Paris Agreement](#), [Agriculture Infrastructure Fund](#), [Pradhan Mantri Matsya Sampada Yojana](#), [Hydrogen fuel cells](#)

**For Mains:** CleanTech: Significance, challenges and Way Forward

India's experience has shown that climate action is only effective and embraced at scale if it aligns with the development aspirations of millions and contributes to economic growth.

The [green economy](#) paradigm provides an optimistic pathway to align development and environmental outcomes. For instance, building a solar park or an electric vehicle charging station helps expand the much-needed infrastructure in a developing economy while furthering climate action. Similarly, reviving millets helps improve farm incomes in rain-fed areas while making our agriculture climate resilient.

### What do We Understand about CleanTech?

CleanTech, short for "clean technology," refers to innovative technologies, products, and processes that **aim to reduce or minimize the negative environmental impact associated with various industries and activities.**

CleanTech encompasses a wide range of sectors, including energy, transportation, agriculture, waste management, water treatment, and more. The **primary goal of CleanTech is to promote sustainability, resource efficiency, and environmental protection** while maintaining economic growth and human well-being.

#### Some examples of CleanTech are:

- Solar panels that convert sunlight into electricity
- Wind turbines that generate power from the wind
- [Biofuels](#) that are made from plants or waste materials
- [Electric vehicles](#) that run on batteries or [hydrogen fuel cells](#)
- [Smart grids](#) that optimize the distribution and consumption of electricity
- LED lights that use less energy and last longer than traditional bulbs

### What is the Significance of CleanTech in India?

- **Reducing Dependence on Fossil Fuels:** India's heavy reliance on fossil fuels, coupled with their volatility in pricing and susceptibility to geopolitical disruptions. By embracing CleanTech, India can tap into its abundant renewable energy resources like solar, wind, biomass, and hydro power to diversify its energy mix.
  - **Oorjan**, a roof-top solar platform system that offers solutions to set up and maintain solar panels for households and businesses.
- **Mitigating Climate Change and Emissions:** It can help India achieve its [renewable energy targets](#) and reduce its dependence on fossil fuels. India has set a goal of installing 450 GW of renewable energy capacity by 2030. **CleanTech adoption can help India meet its emission reduction targets, align with international agreements like the [Paris Agreement](#)**, and contribute to global efforts to limit global temperature rise.
  - **Log 9 Materials**, a [nanotechnology](#) company that has developed an innovative zero emission and low-cost aluminum-air fuel cell.
  - **Ecowrap** is a [biotechnology](#) company that produces biodegradable and compostable packaging materials from agricultural waste.
- **Enhancing Energy Security and Resilience:** CleanTech allows India to harness its domestic renewable resources, thereby decreasing its dependence on energy imports.
  - **Urjas**, a startup that converts agricultural waste into [biofuel](#) pellets.
    - The pellets can be used as a substitute for coal, diesel, or wood in various applications such as cooking, heating and power generation.
- **Improving Quality of Life:** CleanTech has the **potential to transform living conditions for millions of Indians by providing access to clean and affordable energy, safe water, reliable sanitation, and efficient transportation.** This is particularly beneficial for rural areas and slums where such services are lacking, leading to improved health, education, and overall well-being.
  - **OxyGarden**, a startup that has launched a product called Forest, which is an indoor natural air purifier.
  - **Karma Healthcare** is a healthcare company that uses solar-powered e-clinics to provide affordable and accessible healthcare services in rural areas.
- **Stimulating Economic Growth:** India's pursuit of CleanTech solutions presents opportunities for innovation and entrepreneurship, stimulating the growth of startups and SMEs. Furthermore, **CleanTech can generate income for rural communities engaged in the CleanTech value chain.**
  - **S4S Technologies** has developed solar-powered food dehydrators that can preserve fruits, vegetables, and grains without using any chemicals or additives.
    - It can help farmers reduce post-harvest losses, increase shelf life, and add value to their produce.
- **Encouraging Innovation:** The adoption of CleanTech requires innovative solutions across multiple sectors. This **can spur research and development activities, leading to technological breakthroughs** that benefit not only India but also have global implications.
  - **Carbon Masters**, a startup that has developed a technology to convert organic waste into carbon-neutral [biogas](#). The biogas can be used for cooking, heating, or power generation.
    - It also produces bottled biogas under the brand name **Carbonlites, which can be used as an alternative to LPG cylinders.**
- **Women Empowerment:** CleanTech innovation opens avenues for women entrepreneurs and leaders. Women-led startups and businesses can focus on developing and implementing sustainable solutions, thereby breaking traditional gender norms and fostering a culture of women leadership in a male-dominated field.
  - A recent **Council on Energy, Environment and Water (CEEW)** study has shown that **out of the 13,000 early adopters of clean tech livelihood appliances, more than 80% are women.**
  - By 2030, **India is expected to see 30 million women-owned [micro, small and medium enterprises \(MSMEs\)](#)** employing around 150 million people.
- **Rural Empowerment :** India's rural economy that comprises 120 million farmers and 34 million microenterprises often struggles with unreliable electricity access and a dependence on expensive and imported diesel.
  - These renewable energy based CleanTech solutions can help India reduce its diesel imports, avoid the loss of perishable food and **enhance rural livelihood opportunities while posing an investment opportunity worth USD 50 billion for investors and**

**financiers.**

- According to the CEEW, **just 12 CleanTech solutions have the potential to impact at least 16% of our rural population.**

## What are the Challenges in Adopting CleanTech?

- **Low Product Awareness:** Many potential customers are **not aware of the benefits and features of CleanTech products and services**, or they have misconceptions about their performance and reliability.
- **High Customer Acquisition Cost:** CleanTech solutions often **require a high upfront investment and a long payback period**, which deter many customers from adopting them.
  - Moreover, customers need to touch and feel these products before adoption, which increases the marketing and distribution costs for CleanTech providers.
- **Low Density of Customers:** The **demand for CleanTech solutions is dispersed across rural and remote areas, where the infrastructure and logistics are poor and the access to finance is limited.** This makes it difficult for CleanTech providers to reach and serve these customers efficiently and profitably.
- **Limited After-Sales Service and Market Linkage:** Customers who adopt CleanTech solutions often face challenges in maintaining and repairing them, as there is a lack of skilled technicians and spare parts in the local markets.
  - Additionally, customers who use CleanTech solutions for livelihood enhancement, such as solar dryers or biomass cold storages, **may not have adequate market linkages to sell their processed products at competitive prices.**

## What should be the Way Forward?

- **Leverage Existing Government Programmes:** Utilizing existing government programs like:
  - The [Pradhan Mantri MUDRA Yojana](#) that extends collateral-free loans for microenterprises **can be used to enable the adoption of CleanTech solutions.**
  - The [Pradhan Mantri Formalisation of Micro food processing Enterprises \(PM-FME\) scheme](#) that supports the adoption of technology among micro food enterprises **can be used to unlock support for solutions such as a solar dryer, an energy-efficient multipurpose food processor or a solar grain mill.**
  - The [Pradhan Mantri Matsya Sampada Yojana](#) can be leveraged towards **adopting solar refrigerators and dryers for fishing communities.**
  - The [Agriculture Infrastructure Fund](#), which has only seen a 15% fund utilization against a target of Rs 1,00,000 crore, **can support the adoption of biomass-powered cold storage and beyond.**
- **Enable Large-Scale Financing of CleanTech Solutions:** It requires enhancing bankers' capacity on understanding of CleanTech solutions through training and capacity building to enable informed credit assessment.
  - It also **requires Mitigating risks for financiers in the initial stages by providing partial guarantees.**
  - Moreover, **Collaborating with financiers to design loan products aligned with the unique cash flow scenarios of users**, thereby encouraging investment in CleanTech solutions.
  - Adopting some of these principles '**Powering Livelihoods**' (a CEEW initiative) was able to secure over 300 loans for CleanTech solutions in rural areas for women, [SHGs](#), [FPOs](#), and microentrepreneurs.
- **Enable Multi-Actor Partnerships:** Establishing partnerships between various stakeholders, such as technology innovators, manufacturers, distributors and service providers, financiers, and market-linkage players to enable an overall ecosystem.
  - **Addressing challenges faced by CleanTech manufacturers**, such as limited product awareness, high customer acquisition costs, and sparse customer density.
  - **Ensuring a holistic ecosystem where distributors collaborate with manufacturers** to make technology accessible at the grassroots level.
  - **Incorporating service providers to ensure reliable after-sales services** and market-linkage players to facilitate access to markets.
    - For instance, there are solar dryer companies that are not only deploying dryers but

are also enabling financing for users to adopt the dryers and buying back the final produce from them to ensure market linkages.

**Drishti Mains Question:**

CleanTech is often considered a crucial enabler for sustainable development and addressing environmental challenges. Discuss the benefits and challenges in adapting CleanTech and suggest suitable measures to overcome the challenges.

**UPSC Civil Services Examination Previous Year Question (PYQ)**

**Mains:**

**Q.** Describe the benefits of deriving electric energy from sunlight in contrast to conventional energy generation. What are the initiatives offered by our government for this purpose? **(2020)**

**Q.** India has immense potential of solar energy though there are regional variations in its developments. Elaborate. **(2020)**

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