INDIA’S PROJECTION IN GREEN TECHNOLOGY

INTRODUCTION

Green technology has gained increasing importance due to growing concerns about climate change, resource depletion, and environmental degradation. It plays a critical role in addressing a range of pressing global challenges and offers numerous benefits to society, the environment, and the economy.

Governments, businesses, and individuals are increasingly adopting green technologies to reduce their carbon footprint and transition toward a more sustainable and environmentally responsible future. This transition not only benefits the environment but also has the potential to drive economic growth and create new job opportunities in the green technology sector. Its adoption is essential for building a more sustainable, resilient, and prosperous future for both current and future generations.

Innovations in Green Technology

Green technology innovation is essential for addressing the urgent environmental and sustainability challenges facing the planet. It promotes not only job development and economic progress but also a more resilient and sustainable future for all communities and ecosystems worldwide.

India's green technology ecosystem has accelerated in recent years, leading to the development of numerous creative solutions in a variety of industries, including waste management, electric vehicle production, biofuel production, and wind and solar energy generating.

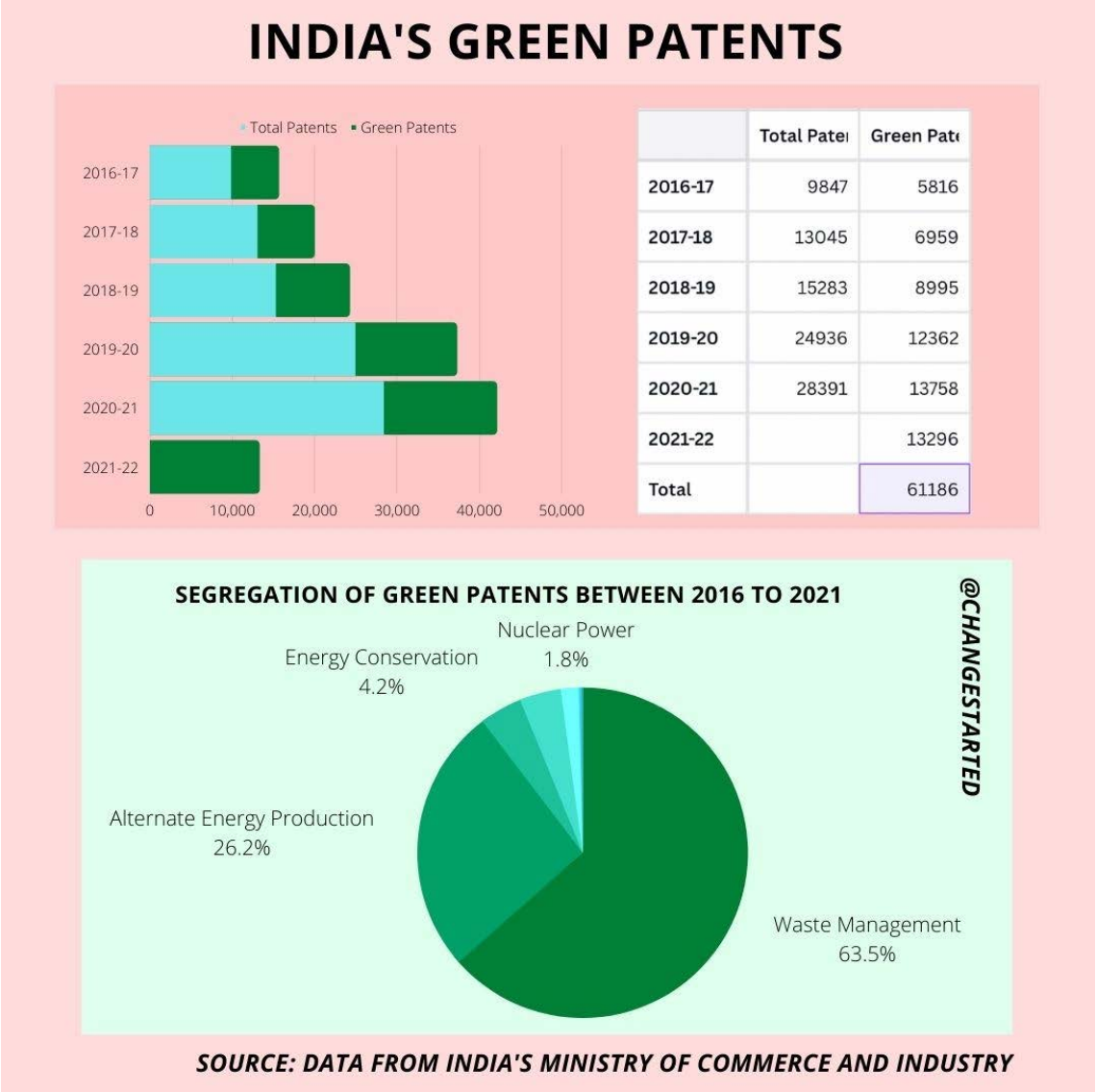
As a result of green innovation, India's economy is growing, which is also driving customers to buy green technology products. India's standing on the Global Innovation Index has been emphasized by the advancements in green technology, where India moved

up in the rankings from 81st in 2015–16 to 40th in 2022. A significant part of this is concerned with the quantity of green patents India has recently filed.

According to data from India's Ministry of Commerce and Industry, more than 91,500 patents, (the majority of which are green patents) were granted between 2016–17 and 2020–21. According to additional data released by the government, 61,186 patents for green technologies were awarded between 2016–17 and 2021–22.

A closer examination of the data reveals that waste management and alternative energy production account for 90% of the 61,186 patents linked to green technology. Of these, 38,837 (or 63 percent) are connected to waste management, and more than 16,000 (or 26 percent) are for alternative energy production.

Energy conservation (2,555), transportation (2,481), nuclear power generation (1,079), agricultural and forestry (161), and other (69) technologies make up the remaining green technology patents.



Courtesy: https://changestarted.com/green-innovation-and-green-patents-in-india/

Finance minister of India outlined four key sectors when she delivered the country's budget in February 2022, with the intention of guiding the Indian economy over the next 25 years. The following were a few of them: "Productivity Enhancement & Investment, Sunrise Opportunities, Energy Transition, and Climate Action."

The investment of Rs 24,000 crore (US$ 3.2 billion) in incentives to support India's solar energy needs is one of the key announcements in the Budget 2022.

The world is now starting to recognize India as a desirable location for investments in renewable energy.

Green technology through the years

Green technology has been evolving in India over the years in response to environmental concerns, energy security, and the need for sustainable development. Here's an overview of the progression of green technology in India:

- Early Initiatives (1970s-1990s)

  During the 1970s and 1980s, India initiated efforts to address environmental issues, such as the establishment of the Department of Environment and Forests. In the 1990s, the Indian government began promoting renewable energy sources like wind and solar power, and energy-efficient technologies.

- National Action Plan on Climate Change (2008)

  India unveiled its National Action Plan on Climate Change (NAPCC) in 2008, which includes eight national missions, such as the National Solar Mission and the National Mission on Enhanced Energy Efficiency.

- Solar Power Revolution

  India has seen significant growth in solar power installations. The National Solar Mission was launched in 2010 and aimed to achieve 20 GW of solar capacity by 2022, but India exceeded this target. Solar power tariffs dropped to record lows, making solar energy more competitive.

- Wind Energy

  Development of wind power in India began in the 1986 with first wind farms being set up in coastal areas of Maharashtra, Gujarat and Tamil Nadu with 55kW Vestas wind turbines. India has been a global leader in wind energy capacity, with a focus on onshore and offshore wind projects. Various incentives, tax benefits, and policy support have boosted wind power generation.

- Green Transportation

  India has been promoting electric vehicles (EVs) and developing charging infrastructure. Initiatives like the Faster Adoption and Manufacturing of Hybrid and Electric Vehicles (FAME) scheme launched by the Indian Government in 2015 support EV adoption. Metro systems and public transportation networks in major cities have expanded, reducing reliance on fossil fuels.

- Energy Efficiency

  Energy efficiency measures have been introduced in industries and buildings. The Perform, Achieve, and Trade (PAT) scheme targets energy efficiency in industries. The Bureau of Energy Efficiency (BEE) plays a pivotal role in promoting energy-efficient technologies and practices.

- Waste Management

  India has been focusing on waste management and recycling technologies for several years to reduce environmental pollution and conserve resources. Initiatives like the Swachh Bharat Abhiyan launched in 2014 aim to promote cleanliness and sustainable waste management practices.

- Green Building Standards

  The Energy and Resources Institute (TERI) introduced the concept of "Green Buildings" in India in 2001. TERI played a significant role in raising awareness about sustainable building practices in the country. Green building practices and certifications like LEED (Leadership in Energy and Environmental Design) and GRIHA (Green Rating for Integrated Habitat Assessment) have gained popularity in India.

- Afforestation and Conservation

  Initiatives like the Green India Mission focus on afforestation and biodiversity conservation. India has also pledged to restore 26 million hectares of degraded land by 2030 as part of the Bonn Challenge.

- International Cooperation

  India has engaged in international efforts to combat climate change, such as the Paris Agreement, and has made commitments to reduce its carbon emissions.

In order to achieve its goal of green energy and the United Nations Sustainable Development Goal-7 (UN SDG-7), India has taken numerous concrete initiatives in recent years, including investments, technological adoptions, policy changes, and many more. India wants to fulfill its commitment to combating climate change by meeting 50% of its electricity needs with green energy by 2030 and achieving net zero emissions by 2070.

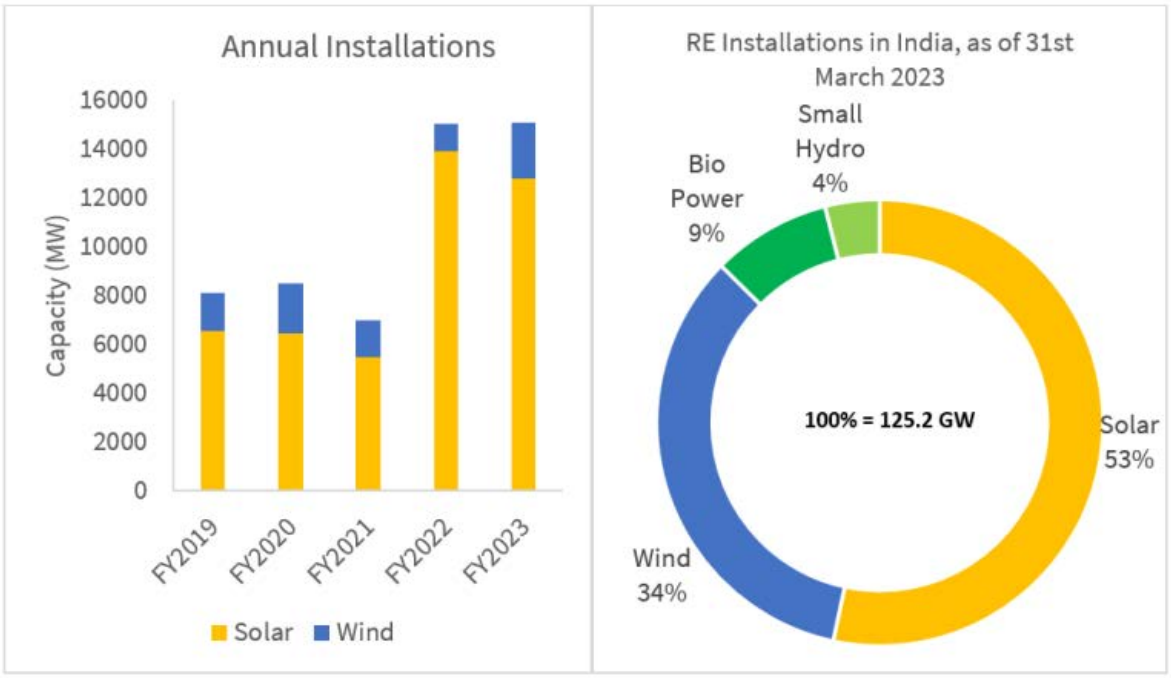
Existing Green Technologies in India

The green energy market in India is dominated by solar energy, followed by wind, biomass, and small hydroelectric power.

Due to several initiatives to promote solar parks, solar cities, and solar pumps as well as the National Solar Mission, India's solar capacity has significantly expanded.

Between April 2022 and March 2023, or the Financial Year 2023 (FY), India added about 12,784 MW of solar capacity and 2,276 MW of wind capacity. Compared to FY2022, the number of solar installations fell by 8% while the number of wind installations rose sharply by 105%.

India's renewable energy installation capacity has reached 125.2 GW in terms of total installations, according to information provided by the Ministry of New and Renewable Energy (MNRE) until March 2023. In the overall renewable energy segment, solar energy makes up around 53% of the market share, followed by wind energy (34%), bio power (9%), and small hydro (4%).



Source: MNRE, JMK Research

Courtesy: [India added 12.8 GW solar capacity in FY2023 (jmkresearch.com)]

India installed 67.07 GW and 42.8 GW worth of solar and wind energy capacity as of July 2023, respectively. Tamil Nadu, Rajasthan, and Maharashtra are the states with the highest wind energy projects in India. (www.investindia.gov.in)

Green Technology Market in India

Green energy plays major role in the green technology market in India. Electric vehicles (EV) and water and wastewater treatment are further important market segments. According to data from Netscribes, India installed 111.39 GW of green energy capacity in FY 2022. In the same year India's EV market sold 429,710 units in order to meet its goal of 287.34 GW by FY 2027. The largest market sector for EVs in India in FY 2022 was electric two-wheelers, which accounted for 61.56 percent of all sales. Between FY 2023 and FY 2027, it is anticipated to increase at a phenomenal compound annual growth rate (CAGR) of 66.73%.

Indian market for water and wastewater treatment is expected to produce INR 251.93 Bn in revenue by 2027, expanding at a CAGR of 8.41% from 2022 to 2027.

Invest India reports that within the next five years, green technology in India is predicted to reach a market size of $45–55 billion with a projected annual growth rate of 25–30%.

Green Technology Goals

Expanding economic potential is provided by the development of green technologies, which are used to produce goods and services with lower carbon footprints. A technological revolution centered around green technologies is only getting started. This next wave of advancement in technology is expected to have a significant impact on the world economy.

In developing countries, where vulnerable populations frequently lack the resources to adapt efficiently and face the danger of missing out on these possibilities, the effects of climate change are expected to be the most severe. To promote economic growth, it is essential for developing nations to take a greater proportion of the value created by this technological revolution.

According to reports by Invest India, India has set goals to reach net-zero carbon emissions by 2070, achieve cumulative renewable energy installations of 50% by 2030, and lower the carbon intensity of the country's economy by less than 45% by the end of the decade. The country aims to achieve 500 GW of green energy capacity by 2030. A total of 125 GW of renewable energy capacity will underpin this objective.

In India, 57 solar parks with a combined capacity of 39.28 GW have been approved. The target for offshore wind energy is 30 GW by 2030, and viable sites have been identified.

India’s Green Start-ups

Green startups in India are gaining momentum as the country grapples with environmental challenges and seeks sustainable solutions. These startups focus on

various sectors, including renewable energy, waste management, sustainable agriculture, clean transportation, and more. Here are some notable green startups in India:

ZunRoof

ZunRoof is a solar energy startup that provides solar panel installation and maintenance services for homes and businesses. They help consumers adopt solar energy and reduce their carbon footprint.

Nasaka

Nasaka specializes in water purification solutions, offering a range of products from water purifiers to softeners and conditioners. They focus on clean and sustainable water solutions.

Ecolibrium Energy

Ecolibrium Energy develops energy management software and solutions that help industries and businesses optimize energy consumption and reduce their carbon emissions.

Ather Energy

Ather Energy designs and manufactures electric scooters. Their scooters are known for their performance and innovation in the electric vehicle (EV) sector.

Greenway Grameen Infra

This startup offers clean cooking solutions to rural households. They manufacture and distribute biomass stoves that are more energy-efficient and reduce indoor air pollution.

Rapido

Rapido is a bike taxi platform that promotes shared mobility and reduces traffic congestion and air pollution in cities. They offer eco-friendly transportation alternatives.

Kheyti

Kheyti focuses on sustainable agriculture by providing small farmers with greenhouse technology and training to increase crop yields and income while reducing environmental impact.

Nikola Labs

Nikola Labs is involved in waste management and recycling. They use technology to track and optimize waste collection, reducing the environmental impact of waste disposal.

Blume Ventures

Although not a startup itself, Blume Ventures is a venture capital firm in India that actively invests in green and sustainable startups. They support and nurture environmentally focused entrepreneurs.

Sustainability Initiatives

This organization works on sustainability consulting and education. They help businesses and individuals understand and adopt sustainable practices.

Ibex Expeditions

Ibex Expeditions promotes responsible and eco-friendly tourism by organizing adventure and wildlife tours in India while focusing on conservation and community engagement.

Log9 Materials

Log9 Materials focuses on clean energy and energy storage solutions. They have developed graphene-based supercapacitors that have applications in various industries, including EVs.

Ecozen Solutions

Ecozen Solutions provides post-harvest technology solutions to farmers, enabling them to reduce food wastage and improve the efficiency of their cold storage and solar solutions.

These green startups in India are making significant contributions to environmental sustainability and addressing critical challenges such as climate change, pollution, and resource depletion. They also align with the Indian government's initiatives to promote renewable energy, clean transportation, and sustainable agriculture.

Key developments in India's green technology and EV sectors

FAME Scheme

The Faster Adoption and Manufacturing of Hybrid and Electric Vehicles (FAME) scheme was launched by the Indian government to incentivize the production and adoption of EVs and hybrid vehicles. FAME II, the updated version of the scheme, focuses on supporting the deployment of electric buses, two-wheelers, and three-wheelers, along with charging infrastructure.

Electric Two-Wheelers

India's electric two-wheeler market has seen substantial growth, with several startups and established automotive companies offering electric scooters and motorcycles. Companies like Ola Electric, Ather Energy, Bajaj Auto, and TVS Motors have introduced electric models to cater to the growing demand.

Electric Three-Wheelers

Electric rickshaws and three-wheelers, also known as e-rickshaws, are gaining popularity in Indian cities due to their affordability and low operational costs. They provide a sustainable and cleaner alternative to traditional auto-rickshaws.

Electric Four-Wheelers

Major automobile manufacturers like Tata Motors, Mahindra & Mahindra, and Hyundai are producing electric cars for the Indian market. The Tata Nexon EV and the Mahindra eKUV100 are some examples of electric SUVs available in India.

Charging Infrastructure

The development of EV charging infrastructure is crucial for the widespread adoption of electric vehicles. Several private and public initiatives have been launched to set up charging stations across the country. Companies like Tata Power, Reliance, and government agencies are investing in expanding the charging network.

Battery Manufacturing

India is also focusing on developing a robust battery manufacturing ecosystem. Companies like Exide Industries, Amara Raja Batteries, and TATA Chemicals are investing in battery production facilities to reduce dependency on imports.

Government Incentives

The Indian government offers various incentives and subsidies to promote the adoption of electric vehicles. These incentives include tax benefits, reduced GST rates, and subsidies for electric two-wheelers and three-wheelers.

Taiwan-India Cooperation

Taiwan and India have been actively involved in the development and promotion of green technology, recognizing the importance of sustainable practices and environmental conservation.

Taiwan has emerged as a global leader in green technology, particularly in areas such as renewable energy, energy efficiency, and environmental protection. The Taiwanese government has introduced policies and incentives to support the development of clean energy, including solar power, wind energy, and hydroelectric power. Taiwan is also known for its expertise in green building technologies and has implemented energy-saving measures in the construction industry.

In recent years, Taiwan has focused on promoting electric vehicles (EVs) and related infrastructure. Taiwan also plays a vital role in the global supply chain for green technology products, manufacturing components for solar panels, wind turbines, and energy-efficient appliances.

- Three agreements were reportedly signed at the 2022 India-Taiwan Industrial Collaboration Summit, which was hosted by the Federation of Indian Chambers of Commerce and Industry in India and Taiwan's Chinese National Federation of Industries (CNFI) in November 2022. They include:

(1) An MOU was signed by Taiwanese memory chipmaker Adata Technology and the Electronic Industries Association of India (ELCINA).

(2) An agreement between Taiwanese precious metal recycling specialist UWin Nanotech. Co. and India's Srikaarya Industries.

(3) The International Centre for Clean Water in India, the Taiwan Environmental Manufacturers Association, the China Productivity Centre, the Industrial Technology Research Institute, the Water Affairs Organisation, and Steady-taps Consulting all signed the agreement.

- According to a report published in Business Standard (2022), in response to the mounting challenges posed by climate change, the local chapter of the Indian Chamber of Commerce and Industry (ICCI) had partnered with Taiwan's National Productivity Council and the National Productivity Council to provide industries innovative green solutions to reduce carbon footprints. Technology such as cloud-connected e-mobility, power-generating elevators, electrodialysis for industrial waste water treatment, IoT-based grain processing and storage were the focus areas.

- In a recent report published in Economic Times, Kartikeya Singh, Director of the Global Energy Futures Initiative stated that India and Taiwan can work together on offshore wind, solar energy, and electric transportation. According to him, Taiwan is the world's largest supplier of solar wafers, which may help India's battery and renewable energy programs. He also stated that the two parties could collaborate on offshore wind and electric transportation.

CONCLUSION

Taiwan and India have the potential to form a significant partnership in the green energy sector. Both countries are rapidly growing economies with a growing need for clean and sustainable energy sources to address environmental concerns and energy security. Collaborating on research, development, and investment in green energy initiatives could not only benefit both nations but also contribute to global efforts to combat climate change while boosting their respective energy sectors and economies.