E-ISSN:2583-1747

Research Article

Climate Change

Management Journal for Advanced Research

2025 Volume 5 Number 6 December

Publisher

Singh Publication

www.singhpublication.com

Green Technology: A Study on its Applicability

Chowdhary T[1], Dhar A[2], Elakodical MP[3*]

DOI:1054741/MJAR/5.6.2025.268

[1] Taniya Chowdhary, BBA Student, 5th Semester, THK Jain College, Kolkata, West Bengal, India.

[2] Arko Dhar, BBA Student, 5th Semester, THK Jain College, Kolkata, West Bengal, India.

[3*] Manoj Peter Elakodical, Assistant Professor, Department of Business Administration, THK Jain College, Kolkata, West Bengal, India.

In the present time, use of technology has been an important part of life. The rapid advancement in technology has made human life easier. But with the expanding use of different technology and machines there arises consequences, i.e. depletion of natural resources, change in global climate, increase of carbon emission. Green Technology is the solution to these concerns because it helps to address issues that affect the environment with the aim of fostering in the field of technology with innovation and practices. It focuses on developing sustainable solutions to reduce environmental degradation and promote optimum use of resources. In spite having it's benefits, green technology faces challenges such as high initial costs, limited infrastructure, and obstacles from traditional industries. This research explores the advancements in green technology, renewable energy system, how carbon emission is being reduced and enhancing environmental sustainability. This research concludes that implementing green technology into global industry and economy is essential for long term environmental sustainability.

Keywords: sustainability, climate change, carbon emissions, depletion in natural resources, optimum use of resources

Corresponding Author

Manoj Peter Elakodical, Assistant Professor, Department of Business Administration, THK Jain College, Kolkata, West Bengal, India.

Email: manoj.peter2@gmail.com

How to Cite this Article

Chowdhary T, Dhar A, Elakodical MP, Green Technology: A Study on its Applicability. Manag J Adv Res. 2025;5(6):34-43.

Available From https://mjar.singhpublication.com/index.php/ojs/article/view/268

To Browse

Manuscript Received	Review Round 1	Review Round 2	Review Round 3	Accepted
2025-11-13	2025-11-30			2025-12-19

Conflict of Interest	Funding	Ethical Approval	Plagiarism X-checker	Note
None	Nil	Yes	5.84	

1. Introduction

Technology generally refers to the use of various techniques, skills, methods, and processes to solve problems or achieve specific goals, such as in scientific research. When technology is designed to be environmentally friendly in its production, distribution, or use, it is known as Green Technology, or Green Tech, or environmental technology or clean technology. Green Tech is a broad term that includes the development of products, systems, or equipment that place less strain on the environment and natural resources, its main aim is to reduce negative impacts on the planet by conserving resources, minimizing pollution, and promoting sustainability. Its goal is to reduce or minimize the harmful impact of human activities. Our planet has a limited supply of natural resources, many of which are non-renewable—meaning they cannot be replaced once they are used up. Human actions have already led to the loss of several of these resources. According to the Global Footprint Network's 2018 report, humans are using natural resources 1.7 times faster than the Earth can regenerate them. This movement encourages the use of renewable energy, green technology, and eco-conscious lifestyles to create a more balanced relationship between humans and nature. It is a key step toward building a healthier, cleaner, and more sustainable future for the planet. It encompasses various areas, including renewable energy, waste management, and water conservation.

2. Literature Review

Historical Evolution of Green Technology

The concept of green technology has evolved in parallel with global awareness of environmental degradation. Early notions of sustainability and ecological design appeared in the 1960s during the rise of environmental movements, notably catalysed by Rachel Carson's *Silent Spring* (1962), which exposed the hazards of pesticide use. The 1972 report *The Limits to Growth* by the Club of Rome further emphasized the need for technological innovation to mitigate environmental collapse.

The institutionalization of sustainable development came with the 1987 Brundtland Report (*Our Common Future*), which defined sustainable development and indirectly laid the groundwork for what is now considered green technology. Technological innovation was identified as a central pillar in decoupling economic growth from environmental harm.

By the 1990s and 2000s, green technology had become a recognized field in policy and academia, with landmark events like:

- **The Kyoto Protocol (1997)** – which introduced market-based mechanisms for emission reductions.
- **The Paris Agreement (2015)** – which set a global framework for limiting global warming to below 2°C.

These agreements incentivized nations and corporations to adopt and invest in clean technologies, especially in energy and transportation.

Recent Developments and Trends

Recent studies (e.g., OECD 2022, IEA 2023) show accelerated investments in green technologies due to climate policies, green stimulus packages, and ESG (Environmental, Social, and Governance) frameworks. Some notable trends include:

- **Digitalization of Green Tech**: Integration of AI, IoT, and blockchain to optimize resource use and trace sustainability in supply chains.
- **Green Hydrogen**: Seen as a potential game-changer in decarbonizing hard-to-abate sectors such as steel and aviation.
- **Carbon Capture, Utilization, and Storage (CCUS)**: Gaining traction as a necessary tool for reaching net-zero emissions.

Applications of Green Technology Across Key Sectors

Green technology has evolved as a multidisciplinary field encompassing renewable energy, sustainable agriculture, green building design, and environmental remediation.

a) Energy Sector:
Currently, the global energy demand is predominantly met through the combustion of fossil fuels. However, this method contributes significantly to environmental degradation due to the release of harmful by-products. Green technology offers sustainable alternatives such as solar, wind, and hydroelectric power.

These renewable energy sources are not only cleaner but also help reduce dependence on fossil fuels, thus mitigating environmental harm.

b) Transportation Sector:
Conventional vehicles that operate on petrol and diesel are among the leading sources of greenhouse gas (GHG) emissions. To address this, the transportation industry is increasingly adopting green technologies. Innovations such as electric vehicles (EVs) and compressed natural gas (CNG) buses are being integrated into modern transport systems, reducing emissions and promoting cleaner mobility.

c) Waste Management Sector:
Green technology plays a vital role in improving waste management processes. It is being applied to the transportation, storage, and recycling of waste materials in an efficient and environmentally responsible manner. These advancements help minimize the environmental impact of waste while promoting sustainable practices.

d) Air Purification:
Industrial activities are major contributors to air pollution through the emission of carbon dioxide and other harmful gases. Green technology is being utilized to reduce these emissions, thereby improving air quality. Innovations in this area aim to create cleaner, healthier environments by filtering pollutants and minimizing industrial carbon footprints.

e) Agriculture Sector:
Green technology is revolutionizing the agricultural sector by promoting sustainable farming practices. Techniques such as precision farming, vertical farming, and the use of solar-powered irrigation systems are enhancing crop yield while conserving natural resources. Additionally, organic farming and biodegradable pesticides help reduce soil and water contamination, contributing to long-term agricultural sustainability.

3. Research Methodology

This study adopts a mixed-methods approach combining secondary data analysis with a primary survey conducted among some participants. The survey aimed to assess public awareness, attitudes, and adoption of green technologies.

Research Design:

Mixed method is being used that is with Qualitative & Quantitative.
Sources of Data: Done with both primary Data & Secondary Data.
Sampling: Random Sampling has been used and Population contains students and family.
Data Analysis: Bar Diagrams to represent data visually
Data Collection Tools: Survey / Questionnaire and Through articles.

4. Data Analysis

During our survey we have asked certain questions to which we have got certain answers which we have summarised and bought all answers together.

Q. Have you ever heard about green technology? If yes, explain in brief.
(65 responses)

A. Many respondents described green technology as the use of science and technology to create eco-friendly solutions that reduce environmental impact. Also known as clean or sustainable tech, it includes renewable energy sources like solar and wind, energy-efficient systems such as smart grids and LED lighting, and sustainable transport like electric vehicles. Other areas include waste and water management and carbon capture. Examples mentioned were solar panels, Tesla EVs, and ocean cleanup systems. While some showed interest in EVs, a few respondents said they had no idea about green tech.

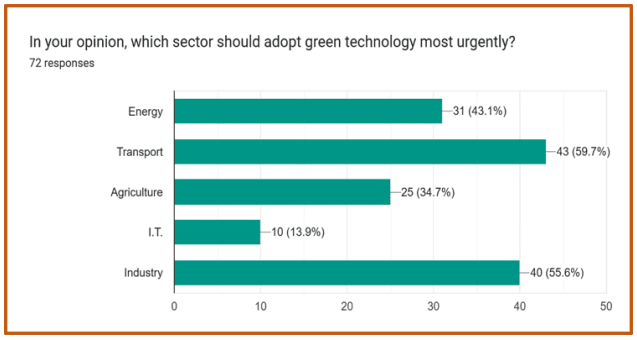
Q. According to you how can Green Technology minimize the negative impact of human activities on the environment?
(46 responses)

A. Many respondents said green technology helps reduce the negative impact of human activities by promoting sustainability, reducing pollution, and conserving natural resources. It includes using renewable energy, improving energy efficiency, managing waste effectively, and lowering greenhouse gas emissions. Green tech also supports cleaner air, eco-friendly transport, and climate change control. While most highlighted its environmental benefits, a few were unsure or lacked knowledge about its impact.

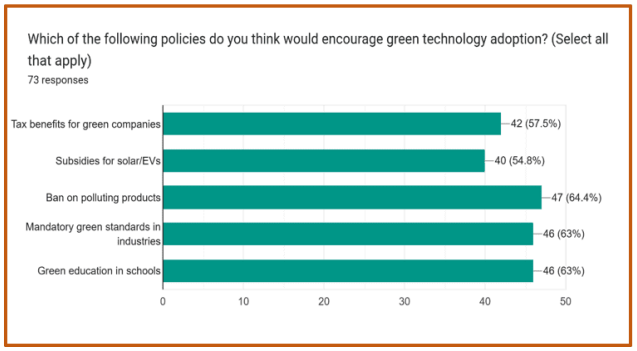
Q. Are you interested in taking part in any green technology initiatives? If so, why? (70 responses)

A. The responses show strong interest in green technology initiatives, driven by environmental concern, personal values, and a desire to make a positive impact. Many feel a sense of urgency about the climate crisis and want to be part of the solution through innovation. Others are motivated by career or educational goals, seeing green tech as a meaningful and exciting field. Overall, there is a clear passion for using technology to build a more sustainable future.

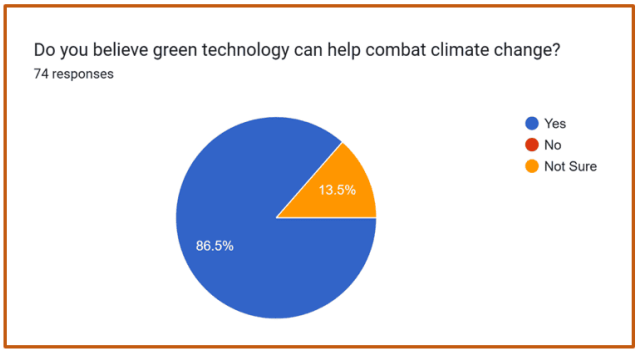
We have also raised certain polls to which people respond are given below:



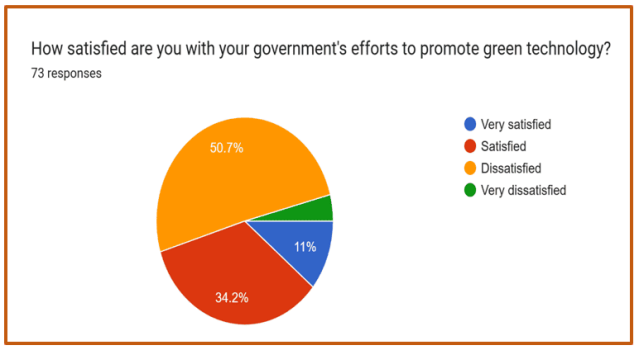
In this poll, they can select more than one sector they think green technology should be adapting urgently. We can see people opinion that most of them wanted to see the adaptation of green technology urgently in transport followed by industry sector.



In this poll people were asked which of the mentioned initiatives will help adopt green technology more effectively. As the graphs suggest, people are addressing all mentioned initiatives a way to adopt this noble cause.

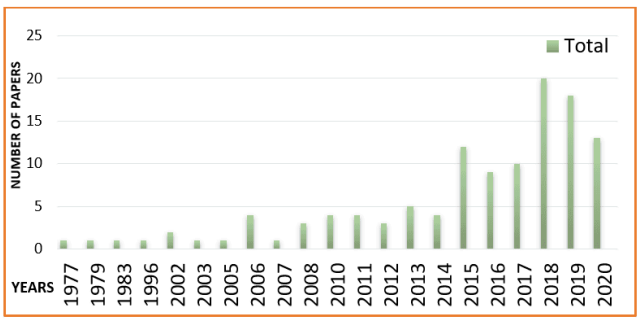


This pie chart shows how many people out of the population of 75 persons, believes that green technology can combat the effects of climate change.

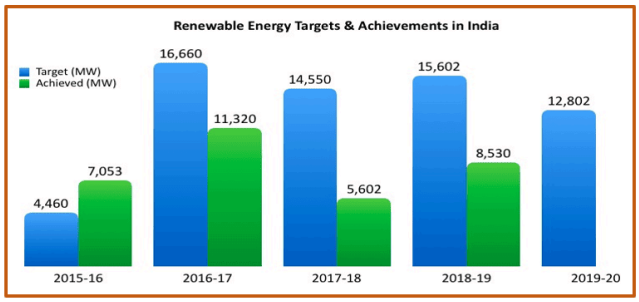


In this chart, it is shown what percentage of the population are satisfied or dissatisfied regarding the efforts taken by government towards green revolution.

Year base Publication of Green Technology



Based on the graph above, it showed the year-based publication on green technology acceptance fields. We can see that as early as 1977, researchers already start to do research on green technology which is around 43 years ago. The total number of the publication were gained from the Scopus database. As stated in year of 1977, 1979, 1983, 1996, 2003, 2005 and 2007 are having one publication respectively. The highest number of publications is in year of 2018, which is around 20 research papers are published on Green Technology topic.



This chart shows how much renewable energy India planned to add (targets) versus how much it added (achievements) each year from 2015–16 to 2019-20. India aimed high for renewable energy each year, and while it made good progress in some years, it often fell short of its ambitious goals.

Why We Need Green Technology?

We need green technology for many important reasons, especially because of the environmental problems we face today.

1. To Fight Climate Change

One of the biggest problems in the world is climate change. It happens because we burn too much fossil fuel (like coal, oil, and gas) which releases carbon dioxide (CO_2) and other harmful gases into the air. These gases trap heat and make the earth warmer, causing problems like:

- Melting glaciers and rising sea levels
- Stronger storms, floods, and droughts
- Extreme heat that harms people, animals, and crops

Green technology helps reduce pollution and carbon emissions by using clean energy sources like the sun, wind, and water. These do not pollute the air and help keep the planet cool and safe.

2. To Save Natural Resources

The Earth gives us many valuable resources like water, forests, and minerals. But we are using them too fast and wasting a lot. If we don't change the way we live, these resources might run out.

Green technology helps by:

- Using renewable energy (energy that comes from sources that don't run out)
- Creating energy-efficient machines that use less electricity
- Encouraging recycling and reuse instead of throwing things away

This helps save resources for the future and protects wildlife and nature.

3. To Keep Air and Water Clean

Pollution from factories, vehicles, and waste harms the air we breathe and the water we drink. This can cause health problems like asthma, cancer, and other diseases.

Green technologies like electric cars, clean energy plants, and water purifiers help to:

- **Reduce smoke and chemicals** from factories and vehicles
- **Clean dirty water** and make it safe to drink
- **Reduce plastic and waste** in rivers and oceans

Cleaner air and water mean healthier lives for people, animals, and plants

4. To Create Green Jobs and Support the Economy

Green technology is not only good for the environment—it also helps the economy. It creates green jobs in areas like:

- Solar panel installation
- Wind turbine manufacturing
- Recycling and waste management
- Eco-friendly construction

These jobs are growing fast and give people a chance to work in careers that help the planet.

5. To Build a Better Future

Using green technology means thinking ahead. It helps us:

- Build smart cities that use less energy and are more comfortable to live in
- Grow food using less water and fewer chemicals
- Create safe transportation systems like electric buses and trains
- Live in eco-friendly homes that stay cool in summer and warm in winter without using too much energy

This kind of future is healthier, cleaner, and more peaceful for everyone.

6. To Protect Life on Earth

When we harm the environment, we also harm animals, plants, and natural systems that support life. Many species are disappearing because of pollution, deforestation, and climate change.

Green technology helps us live in balance with nature by:

- Reducing the need to cut down forests
- Preventing harmful chemicals from entering the soil and water
- Protecting ecosystems like oceans, rivers, and rainforests

5. Challenges Faced by Adopting Green Technology

Green technology is very important for protecting the environment and fighting climate change. However, using green technology in daily life, industries, and cities is not always easy. There are many challenges that people, governments, and businesses face when trying to adopt it.

1. High Initial Cost

One of the biggest challenges is that green technology often costs more at the beginning.

- Solar panels, electric vehicles, and energy-efficient machines are expensive to buy and install.
- Many people or small businesses cannot afford these high costs.
- Even though green technology saves money in the long run, the starting cost can stop people from using it.

2. Lack of Awareness and Education

Many people still do not know much about green technology.

- Some people do not understand how it works or why it is important.
- There are also many myths or wrong beliefs about it (for example, that solar panels do not work on cloudy days).
- Without proper education and awareness, people may not trust or want to use green solutions.

3. Limited Availability

Green technology is not available everywhere, especially in poor or remote areas.

- In villages or small towns, there may not be shops or companies that sell and install green products.
- Some countries don’t have the materials or skilled workers needed to use these technologies.
- This creates inequality—rich areas go green while others are left behind.

4. Resistance to Change

People often feel more comfortable using old, familiar methods.

- Factories and companies don’t want to change their machines or ways of working.
- Some workers fear they might lose jobs if factories switch to automation or green practices.
- Changing habits takes time, effort, and training.

5. Technical Challenges

Some green technologies are still new or not fully developed.

- For example, batteries for storing solar or wind energy are still improving.
- Electric vehicles need better charging systems and longer-lasting batteries.
- Some green machines need regular care or parts that are hard to find.

6. Weather and Location Issues

Some green technologies depend on natural conditions.

- Solar power needs enough sunlight, so it may not work well in very cloudy or rainy places.
- Wind turbines need strong winds, which are not available everywhere.
- This means different places need different green solutions, which can be hard to plan.

7. Competition from Traditional Energy Sources

Fossil fuels like coal, oil, and gas are still cheaper and easier to get in many places.

- Big oil and gas companies often fight against green technology to protect their business.
- If traditional energy is cheap and easy to use, some people and businesses will not switch.

6. National Policies for Green Technology in India

National Green Hydrogen Mission (2021)

The National Green Hydrogen Mission (NGHM), launched by the Government of India in 2021 and formally approved in January 2023, is a strategic initiative aimed at positioning India as a global hub for the production, utilization, and export of green hydrogen and its derivatives. This mission is integral to India's broader objectives of achieving energy independence by 2047 and attaining net-zero carbon emissions by 2070. The National Green Hydrogen Mission represents a significant step towards a sustainable and self-reliant energy future for India, with the potential to transform the country's energy landscape and contribute meaningfully to global decarbonization efforts.

Key Components

1. Strategic Interventions for Green Hydrogen Transition (SIGHT):

Financial Incentives: Allocation of ₹17,490 crore up to 2029-30 to support:
Manufacturing of electrolysers.
Production of green hydrogen.

Quality Assurance: Projects must utilize equipment approved by the Government of India, adhering to specified quality and performance criteria.

2. Demand Creation:

Domestic Consumption: Mandating a minimum share of green hydrogen or its derivatives (like green ammonia, green methanol) consumption by designated consumers.
Competitive Bidding: Aggregating demand and procuring green hydrogen and green ammonia through competitive bidding.
Certification Framework: Developing a regulatory framework for certifying green hydrogen and its derivatives produced from renewable energy sources.

3. Infrastructure Development:

Green Hydrogen Hubs: Establishing integrated green hydrogen and ammonia manufacturing hubs to streamline production and distribution logistics.
Transmission Charges Waiver: Waiving inter-state transmission system (ISTS) charges for renewable energy used in green hydrogen production for 25 years from the commissioning date of the project, applicable to projects commissioned on or before December 31, 2030.

National Solar Mission (2010)

The National Solar Mission (NSM), also known as the Jawaharlal Nehru National Solar Mission (JNNSM), waslaunched in January 2010 by the Government of India to promote solar power and establish India as a global leader in solar energy.The mission aims to create a policy environment that encourages rapid investment in solar energy and drives down costs through technological innovation. NSM is a major initiative by the Government of India with active participation from State Governments.

Key Components of the Mission

1. Grid-connected Solar Power Projects
Central government auctions and incentives for solar developers.
Solar parks with shared infrastructure.

2. Off-grid Solar Applications
Solar lanterns, home lighting systems, street lights, and solar pumps.

3. Rooftop Solar Systems
Financial incentives and subsidies for residential, commercial, and institutional rooftops.

4. Solar R&D and Manufacturing
Support for domestic solar panel manufacturing.
Investments in solar cell and module production.

National Electric Mobility Mission Plan 2020 (2013)

The National Electric Mobility Mission Plan 2020 (NEMMP 2020) was a plan launched by the Indian government in 2013 to promote the adoption of hybrid and electric vehicles in India, aiming to enhance fuel security and reduce environmental impact.The plan aimed to achieve a market penetration of 6-7 million hybrid and electric vehicles by 2020 and further increase to 15-16 million cumulatively.

To achieve this, the plan included measures like demand-side incentives for consumers, support for research and development, and promotion of charging infrastructure.

7. Key Components

- **Demand-side incentives:** Providing financial incentives to consumers to encourage the purchase of hybrid and electric vehicles.
- **Research and Development:** Supporting R&D activities in areas like battery technology, power electronics, and charging infrastructure development.
- **Charging infrastructure development:** Promoting the establishment of charging infrastructure to facilitate the adoption of electric vehicles.
- **FAME India Scheme:** The Faster Adoption and Manufacturing of (Hybrid &) Electric Vehicles in India (FAME India) scheme was implemented as part of NEMMP 2020 to promote the adoption of electric and hybrid vehicles.

8. Findings

- **Increased Adoption of Green Technologies:** India has shown a significant rise in the adoption of green technologies.
- **Government Support is Crucial:** Fiscal incentives, subsidies, and regulatory support are found to be essential enablers.
- **Public Awareness is Growing but Uneven:** General awareness about green technologies (solar panels, EVs, etc.) is growing, understanding of advanced green innovations remains limited among the public.
- **Educational Gaps Identified:** Schools and colleges are not yet fully integrating green technology education into their curriculum.
- **Implementation Challenges Exist:** High initial cost, Technological limitations, Lack of Skilled Labour, Resistance to change, Insufficient infrastructure in certain regions
- **Green Tech is Seen as the Future:** Survey participants largely agree that green technology is essential for sustainable development and combating climate change.

Economic and Environmental Benefits

- Jobs in the renewable sector have outpaced those in fossil fuels.
- Green buildings consume 30-50% less energy and water than traditional buildings.
- Countries investing in green tech report better air quality, lower healthcare costs, and increased innovation.

Barriers

- **Economic:** High initial costs deter small businesses and low-income regions.
- **Political:** Policy inconsistencies and lack of enforcement weaken long-term planning.
- **Social:** Resistance to change and limited public awareness slow adoption.

9. Conclusion

Green technology is very important for our world today. It helps us take care of the environment while still allowing us to grow and develop. Instead of harming nature like many old technologies do, green technology gives us new ways to use energy, build things, travel, and manage waste without polluting the earth. This technology includes things like solar panels, wind turbines, electric vehicles, recycling systems, and smart buildings. These helps reduce air and water pollution, save energy, and protect our natural resources. Green technology also creates new jobs and helps people live healthier lives.

However, there are still some challenges. Green technology can be expensive to set up, and not all countries have equal access to it. Many people are not fully aware of how it works or why it is important. Also, some governments do not have strong rules to support it yet.

To solve these problems, we need everyone to work together—governments, scientists, companies, and even students. Governments should support green projects with rules and money. Companies should invest in clean technologies. Teachers and schools should help students learn how to protect the planet. And each person should try to live a greener life by saving energy, reducing waste, and using eco-friendly products. In the future, green technology can help us build a cleaner, safer, and fairer world for everyone. But it will not happen on its own.

We need to choose green solutions now, so that our planet stays healthy for future generations. Green technology is not just a good idea—it is something we all need.

Recommendations

1. Enhance Public Awareness and Education

Public awareness is the foundation of any successful environmental strategy. Organizing Green Tech Awareness Days, workshops, and exhibitions can inform individuals and communities about the importance of sustainable practices. Educational initiatives should focus on:

- The science and benefits of green technologies.
- How individuals and businesses can incorporate eco-friendly practices.
- Government policies and subsidies available for green initiatives.
  These programs should be inclusive, targeting schools, colleges, workplaces, and local communities. Collaborating with NGOs, environmental experts, and influencers can increase reach and engagement.

2. Promote Renewable Energy

Encouraging the use of renewable energy sources—especially solar power—can significantly reduce dependence on fossil fuels. Key strategies include:

- Installing solar panels on rooftops of schools, homes, and industrial buildings.
- Offering government subsidies or tax rebates for solar energy users.
- Conducting demonstrations on solar-powered devices and appliances.
- Launching pilot projects in public schools to showcase benefits and savings.
  This not only reduces greenhouse gas emissions but also makes energy more affordable in the long term.

3. Eco-Friendly Transportation

Transportation is a major contributor to carbon emissions. Promoting eco-friendly alternatives can help mitigate this impact:

- **Electric vehicles (EVs)**: Encourage adoption through subsidies, infrastructure (like charging stations), and public EV fleets.
- **Public transport**: Improve efficiency, comfort, and accessibility of buses, metros, and trains to make them attractive alternatives to private cars.
- **Non-motorized transport**: Develop safe cycling lanes and pedestrian paths to promote walking and biking.
  Awareness campaigns and policy changes (e.g., congestion charges) can further encourage sustainable travel choices.

4. Support Eco-Friendly Startups

Green startups drive innovation in sustainability. To foster their growth:

- Offer financial incentives, such as low-interest loans, seed funding, and tax benefits.
- Create green business incubators to provide mentorship, networking, and workspace.
- Launch public-private partnerships for collaborative product development.
  Startups in renewable energy, eco-friendly packaging, organic farming, and sustainable fashion should be prioritized, as they contribute significantly to the circular economy.

5. Waste Reduction and Recycling

Managing waste sustainably is crucial to environmental protection. Recommendations include:

- **Composting organic waste** at household and community levels to reduce landfill pressure and produce natural fertilizer.
- Installing compost bins in residential complexes, schools, and public parks.
- Launching awareness drives on waste segregation at source.
- Setting up **recycling centres** and incentivizing return of recyclable materials.
  By reducing landfill usage, these efforts help decrease methane emissions and promote soil health.

6. Support the Use of Reusable Containers and Bottles

Single-use plastics are a major environmental threat. A shift to reusable items can:

- Significantly reduce plastic waste and ocean pollution.

- Promote sustainable consumption habits.
- Encouraging schools and offices to adopt plastic-free policies.
- Distributing reusable containers and water bottles as part of corporate or school initiatives.
- Running media campaigns and challenges (e.g., "No Plastic Month") to encourage behavioural change.
- Retailers and food vendors should also be incentivized to offer discounts for customers using their own containers.

7. Energy Conservation Initiatives

Reducing energy use is both eco-friendly and cost-effective. Specific measures include:

- Promoting the use of LED lighting, which consumes up to 80% less energy than traditional bulbs.
- Encouraging the purchase of energy-efficient appliances (with star ratings).
- Implementing smart building technologies such as motion sensors and automated climate control systems.
- Running community-level initiatives like "Energy Saving Weeks" to engage citizens.
  Schools and government offices can serve as role models by adopting green building practices and publishing their energy savings.

References

1. Chandra Asri. (n.d.). *Green technology*.

2. Science Direct. (2024). *Green technology innovations: A pathway toward sustainable development*.

3. Netguru. (n.d.). *What is green tech? Definition, benefits, and examples*.

4. MKCE. (n.d.). *The power of green technology and its role in sustainable development*.