

S&I Article

Climate Action Technologies

Innovating today for a sustainable tomorrow.



CLEAN ENERGY



ENERGY STORAGE



CARBON SOLUTIONS



WATER SOLUTIONS

Across India, from scorching summers in cities like Delhi to unpredictable rainfall in the villages of Maharashtra, climate change is becoming a visible reality. Rising temperatures and water scarcity are no longer distant problems; they are part of our everyday lives. To tackle these challenges, scientists are developing **Climate Action Technologies** solutions designed to protect our environment and ensure a sustainable future.

For students, this topic is about applying physics, chemistry, and biology to solve real - world problems.

What are Climate Action Technologies?

These are scientific tools developed to reduce environmental damage. Their primary goals are to lower greenhouse gas emissions, conserve natural resources, and promote sustainable living.

In simple terms, these technologies help us live better while harming the planet less. They include things like:

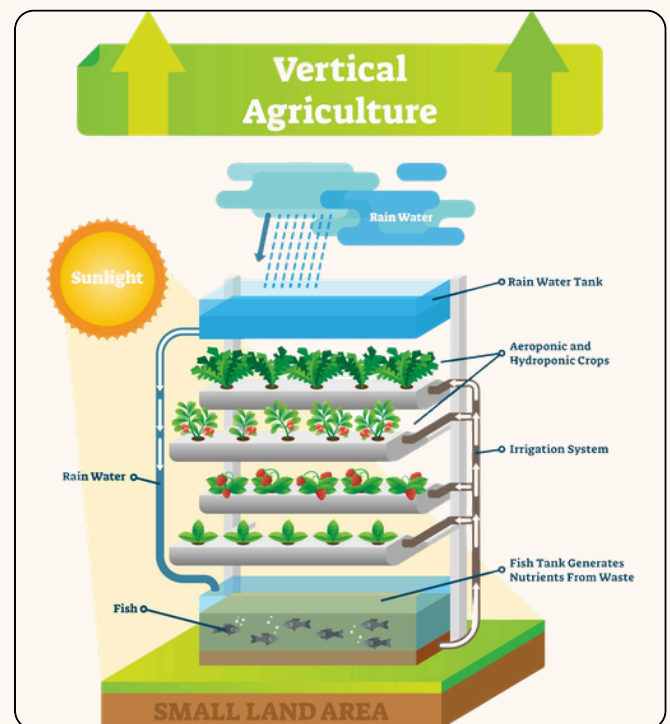
- **Renewable Energy:** Harnessing power from the sun or wind.
- **Green Transport:** Vehicles that run on electricity instead of petrol.
- **Resource Management:** Systems that save water or turn kitchen waste into "black gold" (compost).

Why are they Important?

India is particularly vulnerable to climate change due to its diverse geography. Rising heat affects our crops, while irregular monsoons lead to both floods and droughts.



These technologies provide a "shield." For example, using **Green Hydrogen** in factories can reduce industrial smoke, and **Vertical Farming** in crowded cities can provide fresh food using 90% less water than traditional farming.



Where are they Used?

You can see these technologies in action everywhere:

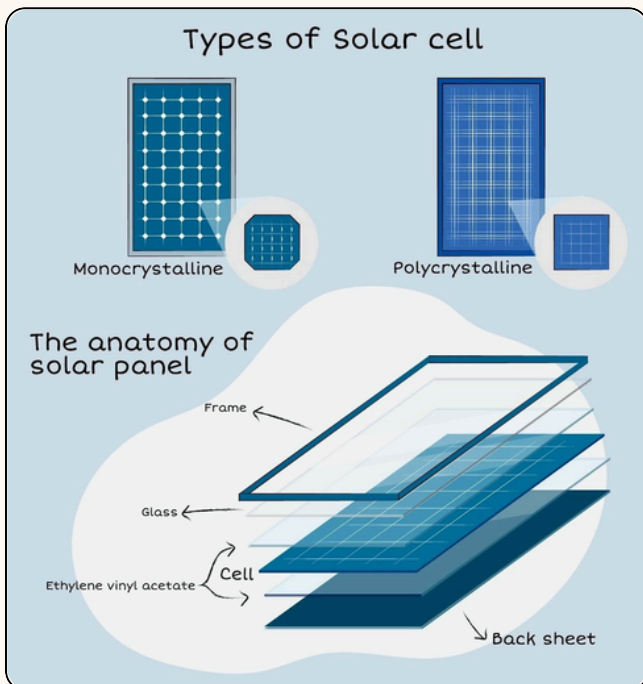
- **In Cities:** Metro trains use **Regenerative Braking** to save power every time they stop.
- **In Rural Areas:** Farmers use **Solar Water Pumps** instead of diesel engines, which is cheaper and cleaner.

- **At Home:** LED bulbs use much less electricity than old glass bulbs to give the same amount of light.

How do they work? (The Concept of Efficiency)

Climate action tech works by being more efficient. Efficiency is the ratio of useful output to the total input.

For instance, old coal power plants are only about 33% efficient, meaning a lot of energy is wasted as heat and pollution. Modern Monocrystalline Solar Panels are reaching higher efficiency levels, converting more sunlight into electricity in a smaller space. By increasing efficiency, we use fewer resources to get the same result.



Who is Involved?

Climate action is a collective effort involving many groups. Governments create policies and support programs, scientists and engineers develop technologies, industries manufacture products, and communities adopt sustainable practices.

Students also play an important role. Through school projects, innovation challenges, and awareness campaigns, they contribute ideas and solutions. Teachers guide and inspire students to think scientifically and creatively.

This collaboration makes climate action technologies a shared responsibility and opportunity.

Jargon Buster

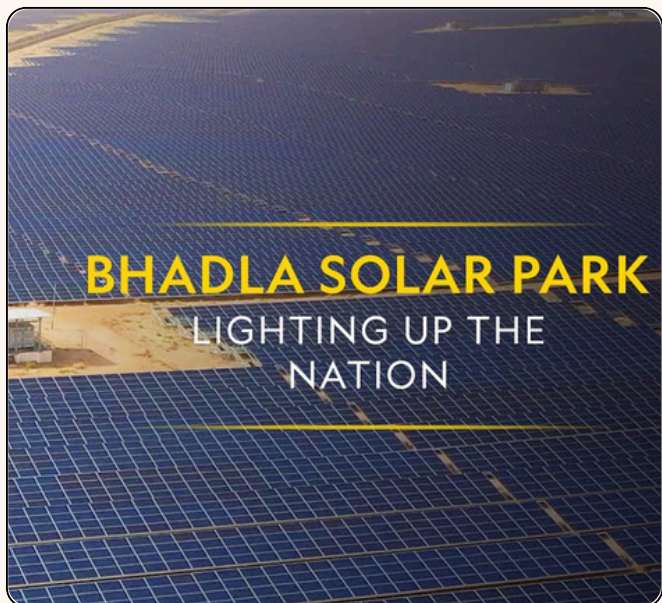
Think of this as your "Green Dictionary" to help you understand the common terms used in climate science today.

- **Carbon Footprint:** The total amount of greenhouse gases produced by our individual actions (like travelling or using AC).
- **Net Zero:** A state where the amount of greenhouse gas we add to the atmosphere is no more than the amount we take away.
- **Circular Economy:** A system where we stop "using and throwing" and start "repairing and recycling" everything.

Success Stories in India

India is a global leader in this field.

- The **Bhadla Solar Park** in Rajasthan is one of the largest in the world. In Gujarat, solar panels have been placed over water canals, which generate electricity while simultaneously preventing water from evaporating in the heat!
- **Biogas from Temple Waste:** Major temples across India, like the Siddhivinayak Temple in Mumbai, have installed **Biogas Plants**. Instead of throwing away tons of flower offerings and food waste, they convert it into clean cooking gas used in the temple kitchens, proving that "waste" is just a resource in the wrong place.



- **Electric Rickshaws (The Silent Revolution):** India is home to one of the world’s largest fleets of electric vehicles, the E-Rickshaw. These simple vehicles have replaced thousands of petrol-run autos in cities, significantly reducing noise and air pollution while providing affordable transport for millions.



Career Corner: Your Green Future

If you want to work in climate tech, here are some practical paths:

1. **Solar Technician/Engineer:** Installing and maintaining the millions of solar panels India is deploying.

2. **Electric Vehicle (EV) Designer:** Working on battery technology or the software that runs electric scooters and buses.
3. **Waste - to - Value Expert:** Finding chemical ways to turn plastic waste or crop stubble into useful fuel or construction materials.
4. **Green Architect:** Designing houses that stay naturally cool during Indian summers without needing heavy air conditioning.

Conclusion

Climate action technologies demonstrate how science can be used to address global challenges. They show that innovation is not limited to laboratories; it can begin in classrooms and communities.

For students, this is an opportunity to become problem-solvers and innovators. By understanding and applying these technologies, they can help build a sustainable future for India and the world.

Innovation Challenge: The "Cool Roof" Experiment

The Problem: Concrete roofs in India absorb massive amounts of heat, making rooms unbearable.

The Challenge: Can you find a low - cost way to reduce your room’s temperature?

- **Try This:** Paint a section of a dark surface with "cool roof" white paint and leave another section as is. Use a thermometer to measure the temperature difference after two hours in the sun.
- **Think Further:** Could recycled glass or mud pots be used on a rooftop to create an insulating layer?