



**MAHARASHTRA STATE BOARD OF TECHNICAL EDUCATION,
MUMBAI**

GOVERNMENT POLYTECHNIC, KARAD

ACADEMIC YEAR 2023-2024

SEMESTER – 5th OF COMPUTER ENGINEERING

FOR MICRO-PROJECT

“Environmental Impact of Renewable Energy Sources”

COURSE:

Environmental Studies (22447)

SUBMITTED BY-

Roll.No.	Name of the Team Members	Enrollment No.
2215	Shreya Dipak Patil	2100100013
2216	Shraddha Sanjay Talekar	2100100014
2220	Unnati Bharat Pawar	2100100018

Under the guidance of:

Prof. K. K. Gaikwad

Academic Year 2023-2024

DEPARTMENT OF COMPUTER ENGINEERING

CERTIFICATE

This is to certify roll no. 2215,2216 and 2220 of fifth semester of Diploma in computer engineering of institute Government Polytechnic, karad has successfully completed microproject under the subject of **Environmental Studies (22447)** for academic year 2022-23 as prescribed in the curriculum.

Enrollment No.	Name of student
2100100013	Shreya Dipak Patil
2100100014	Shraddha Sanjay Talekar
2100100018	Unnati Bharat Pawar

We have completed the project report titled as “**Environmental Impact of Renewable Energy Sources**”

Subject- Environmental Studies (22447)

Guide.

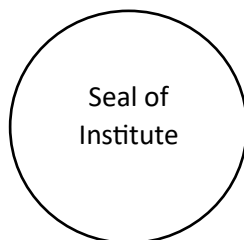
Prof. K. K. Gaikwad

Head of Department

Mrs. S. B. Patil

Head of Institute

Dr. R. K. Patil



Submitted it to Government Polytechnic Karad.

ACKNOWLEDGMENT

We take this opportunity to thank all those who have directly and indirectly inspired, directed and assisted us towards successful completion of this project report.

We express our sincere thanks to Prof. R. K. Patil principal of Government Polytechnic Karad and the Head of Department Prof. Patil S.B., for having us allowed to submit this report as a part of our academic learning. We express our sincere thanks to Prof. K. K. Gaikwad, Lecturer in Environmental Studies(22447)).Department of Computer Engineering, Govt. Polytechnic, Karad for encouragement throughout the project report and guideline in designing and working out this project. We are also grateful to team of **Environmental Studies(22447)**.

Place: Government Polytechnic, Karad.

Your sincerely,

2215 - Shreya Dipak Patil

2216 – Shraddha Sanjay Talekar

2220 – Unnati Bharat Pawar

❖ **RATIONALE:**

In environmental studies, the impact of renewable energy sources is driven by their environmentally friendly nature, reduced greenhouse gas emissions, and potential to mitigate climate change. They also offer energy security by diversifying the energy mix and reducing reliance on fossil fuels. Economically, renewables can create job and stimulate innovation, while socially, they can improve air quality and public health. However, their intermittent nature and initial high costs can present challenges. Overall, transitioning to renewable energy sources aligns with sustainable development goals and cleaner energy future.

❖ **AIM AND BENEFITS:**

- To Diversifying energy supply and reducing dependance on imported fuels.
- To reduces some types of air pollution.
- To enhancing energy security for region or country.
- To decreasing reliance on fossil fuels and fostering a cleaner and more sustainable energy future.
- To reducing greenhouse gas emissions, enhancing energy security, creating local job opportunities and promoting community resilience through decentralized power generation.

❖ **COURSE OUTCOMES:**

Co-a. Develop public awareness about environment.

Co-b. Select alternative energy resources for Engineering Practice.

❖ LITERATURE REVIEW:

Renewable energy sources, such as solar, wind, and hydropower, are often seen as more environmentally friendly than fossil fuels because they produce electricity with significantly lower or even zero greenhouse gas emissions. This reduction in carbon footprint is essential for mitigating climate change, as it helps decrease the overall concentration of greenhouse gases in the atmosphere. Numerous studies have assessed the life cycle emissions of renewable energy technologies, comparing them to conventional fossil fuel-based energy generation. These assessments contribute to our understanding of the theoretical advantages of renewables in reducing environmental harm.

However, it's also crucial to consider the various factors that can influence the environmental impact of renewable energy, including land use, resource extraction, and energy storage technologies. Therefore, a comprehensive literature review will delve into these theories and empirical findings to provide a nuanced perspective on the environmental implications of renewable energy sources.

IMPACT OF RENEWABLE ENERGY SOURCES

■ **What is renewable energy?**

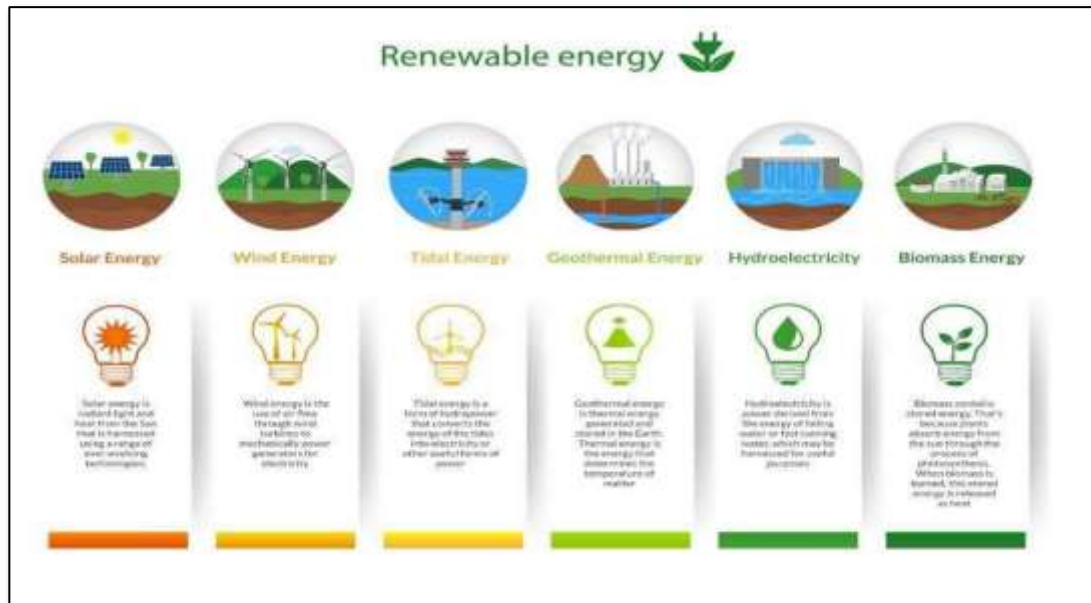
Renewable energy is energy derived from natural sources that are replenished at a higher rate than they are consumed. Sunlight, wind and water, for example, are such sources that are constantly being replenished. Renewable energy sources are plentiful and all around us.

Renewables are now cheaper in most countries, and generate three times more jobs than fossil.



■ **Types of renewable energy**

1. Solar energy
2. Wind energy
3. Hydro energy
4. Tidal energy
5. Geothermal energy
6. Biomass energy



■ Benefits of Renewable Energy

The advantages of renewable energy are numerous and affect the economy, environment, national security, and human health. Here are some of the benefits of using renewable energy in the United States:

1. Enhanced reliability, security, and resilience of the nation's power grid
2. Job creation throughout renewable energy industries
3. Reduced carbon emissions and air pollution from energy production
4. Increased U.S. energy independence
5. Increased affordability, as many types of renewable energy are cost-competitive with traditional energy sources
6. Expanded clean energy access for non-grid-connected or remote, coastal, or islanded communities.

A DIFFERENT RENEWABLE ENERGY RESOURCES

1.SOLAR ENERGY :

Solar energy is the most abundant of all energy resources and can even be harnessed in cloudy weather. The rate at which solar energy is intercepted by the Earth is about 10,000 times greater than the rate at which humankind consumes energy.

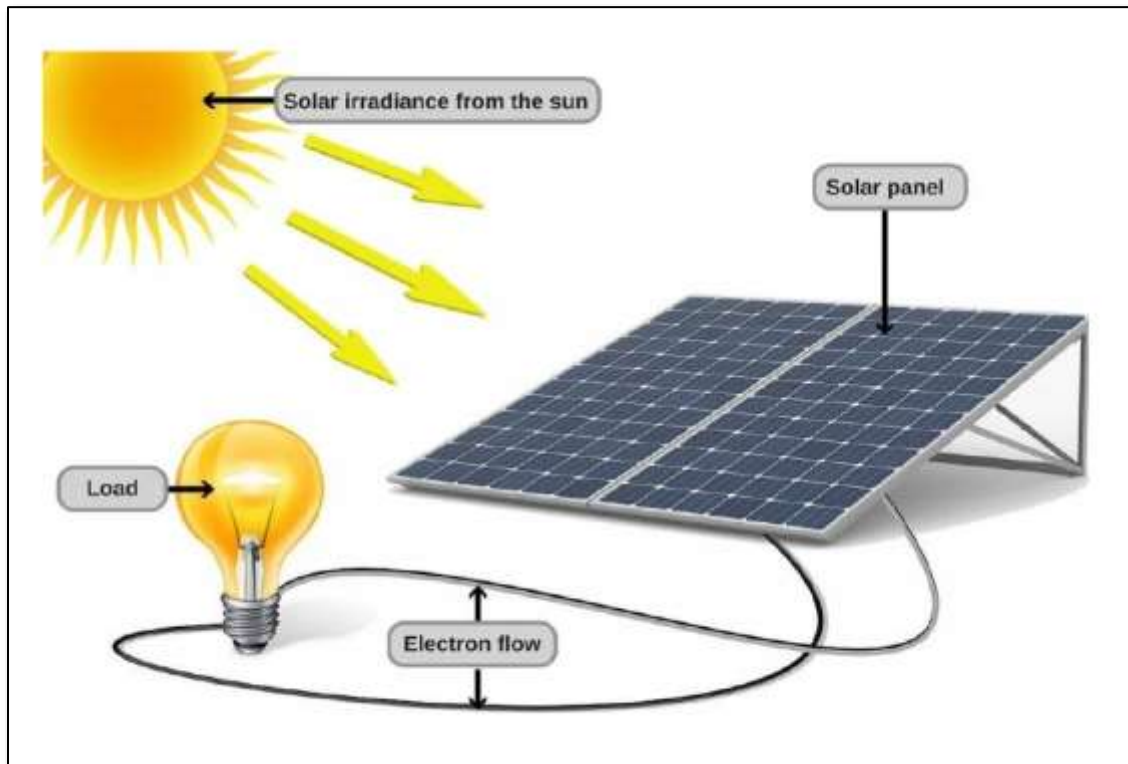
Solar technologies can deliver heat, cooling, natural lighting, electricity, and fuels for a host of applications. Solar technologies convert sunlight into electrical energy either through photovoltaic panels or through mirrors that concentrate solar radiation.

Although not all countries are equally endowed with solar energy, a significant contribution to the energy mix from direct solar energy is possible for every country.

The cost of manufacturing solar panels has plummeted dramatically in the last decade, making them not only affordable but often the cheapest form of electricity. Solar panels have a lifespan of roughly 30 years, and come in variety of shades depending on the type of material used in manufacturing.

• What is solar energy?

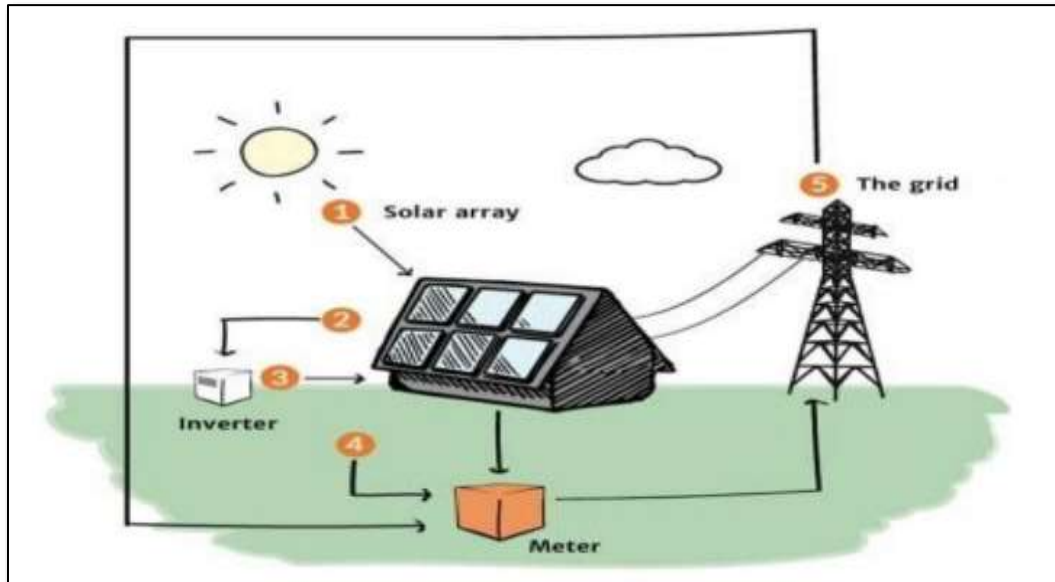
Solar energy is radiant light and heat from the Sun, and can be harnessed using a range of technologies such as solar heating, solar photovoltaic and solar thermal electricity. Solar energy is a renewable source of energy that is sustainable and totally inexhaustible, unlike fossil fuels that are finite.



SOLAR ENERGY

• How Does Solar Power Work?

1. The Sun's light is absorbed by the solar panels.
2. The silicon and conductors in the panel convert the light into Direct Current (DC) electricity, which then flows into the inverter.
3. The inverter converts the DC into Alternate Current (AC) electricity, which is used in your home.
4. Any additional electricity that's not used by your home goes via your home's meter into the mains power grid for others to use.
5. Electricity is drawn from the grid when you need more power than your solar energy system produces.



- **ADVANTAGES OF SOLAR ENERGY:**

1. Renewable Energy Source-

Among all the benefits of solar panels, the most important thing is that solar energy is a truly renewable energy source. It can be harnessed in all areas of the world and is available every day. We cannot run out of solar energy, unlike some of the other sources of energy

Solar energy will be accessible as long as we have the sun, therefore sunlight will be available to us for at least 5 billion years when according to scientists the sun is going to die.

2. Reduces Electricity Bills-

Since you will be meeting some of your energy needs with the electricity your solar system has generated, your energy bills will drop. How much you save on your bill will be dependent on the size of the solar system and your electricity or heat usage.

For example, if you are a business using commercial solar panels this switch can have huge benefits because the large system size can cover large chunks of your energy bills. Moreover, not only will you be saving on the electricity bill, but there is also a possibility to receive payments for the surplus energy that you export back to the grid through the Smart.

3. Diverse Applications-

Solar energy can be used for diverse purposes. You can generate electricity (photovoltaics) or heat (solar thermal). Solar energy can be used to produce electricity in areas without access to the energy grid, to distil water in regions with limited clean water supplies and to power satellites in space

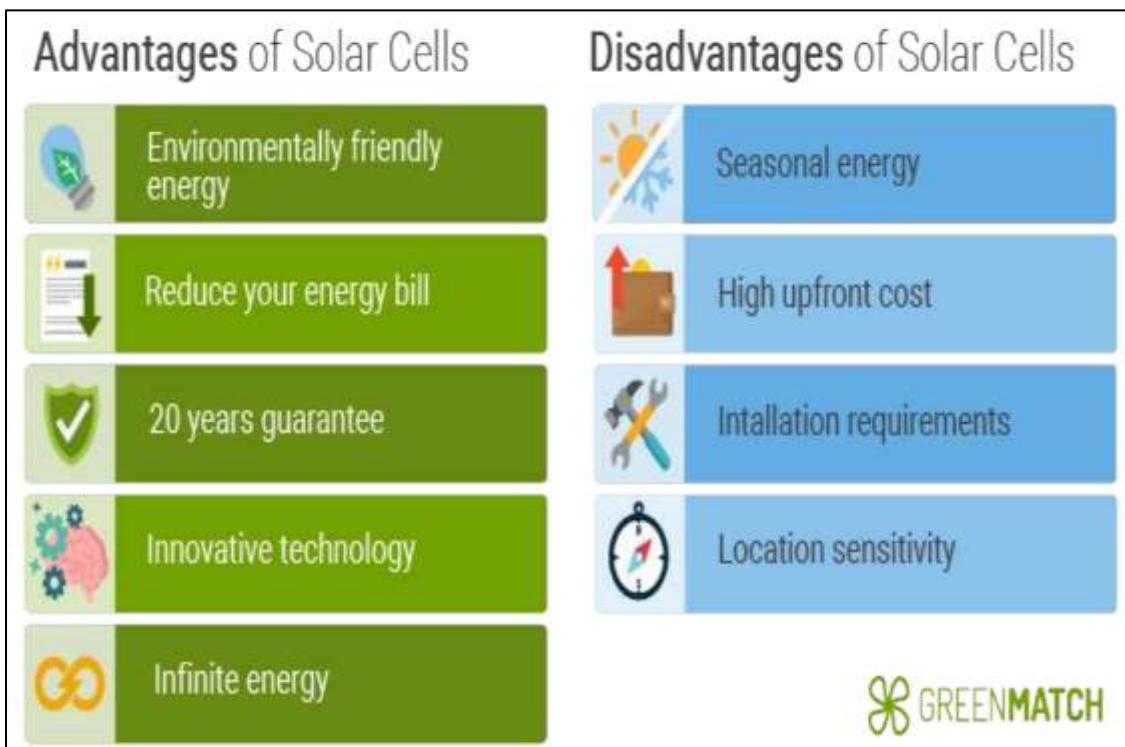
Solar energy can also be integrated into the materials used for buildings. Not long ago Sharp introduced transparent solar energy windows

4. Low Maintenance Costs-

Solar energy systems generally don't require a lot of maintenance. You only need to keep them relatively clean, so cleaning them a couple of times per year will do the job. If in doubt, you can always rely on specialised cleaning companies, which offer this service from around £25-£35.

5. Technology Development-

Technology in the solar power industry is constantly advancing and improvements will intensify in the future. Innovations in quantum physics and nanotechnology can potentially increase the effectiveness of solar panels and double, or even triple, the electrical input of the solar power systems.



2.WIND ENERGY:

Wind energy harnesses the kinetic energy of moving air by using large wind turbines located on land (onshore) or in sea- or freshwater (offshore). Wind energy has been used for millennia, but onshore and offshore wind energy technologies have evolved over the last few years to maximize the electricity produced-with taller turbines and larger rotor diameters.

Though average wind speeds vary considerably by location, the world's technical potential for wind energy exceeds global electricity production, and ample potential exists in most regions of the world to enable significant wind energy deployment.

Many parts of the world have strong wind speeds, but the best locations for generating wind power are sometimes remote ones. Offshore wind power offers tremendous potential.

- **ADVANTAGES OF WIND POWER:**

1. Wind power creates good-paying jobs. There are over 120,000 people working in the U.S. wind industry across all 50 states, and that number continues to grow. According to the U.S. Bureau of Labor Statistics, wind turbine service technicians are the second fastest growing U.S. job of the decade Offering career opportunities ranging from blade fabricator to asset manager, the wind industry has the potential to support hundreds of thousands of more jobs by 2050.

2. Wind power is a domestic resource that enables U.S. economic growth. In 2021, wind turbines operating in all 50 states generated more than 9% of the net total of the country's energy. That same year, investments in new wind projects added \$20 billion to the U.S. economy.

3. Wind power is a clean and renewable energy source. Wind turbines harness energy from the wind using mechanical power to spin a generator and create electricity. Not only is wind an abundant and inexhaustible resource, but it also provides electricity without burning any fuel or polluting the air. Wind continues to be the largest source of renewable power in the United States, which helps reduce our reliance on fossil fuels. Wind energy helps avoid 329 million metric tons of carbon dioxide emissions annually- equivalent to ft1 million cars worth

of emissions that along with other atmospheric emissions cause acid rain, smog, and greenhouse gases

4. Wind power benefits local communities. Wind projects deliver an estimated \$1.9 billion in state and local tax payments and land-lease payments each year. Communities that develop wind energy can use the extra revenue to put towards school budgets, reduce the tax burden on homeowners, and address local infrastructure projects.

5. Wind power is cost-effective Land-based, utility-scale wind turbines provide one of the lowest-priced energy sources available today. Furthermore, wind energy's cost competitiveness continues to improve with advances in the science and technology of wind energy.

6. Wind turbines work in different settings. Wind energy generation fits well in agricultural and multi-use working landscapes. Wind energy is easily integrated in rural or remote areas, such as farms and ranches or coastal and island communities, where high-quality wind resources are often found.

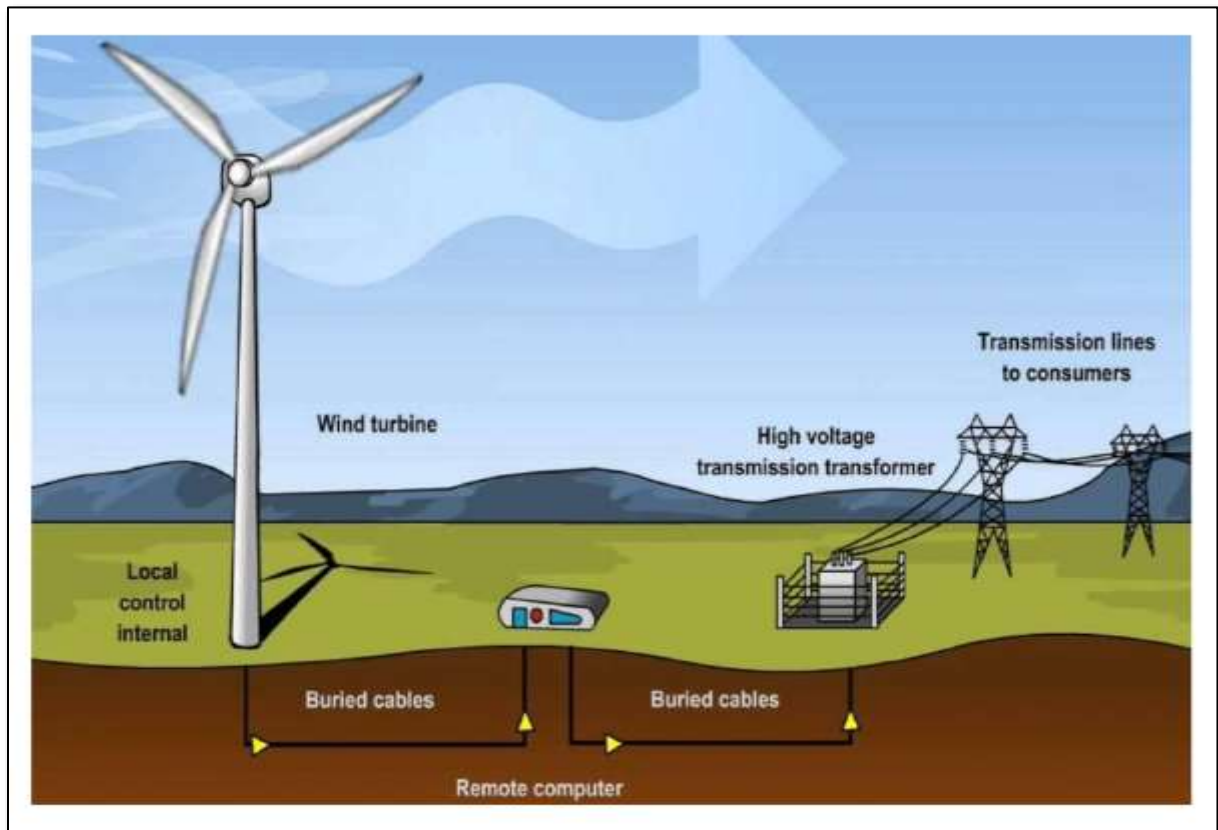
- **Challenges of Wind Power:**

1. Wind power must compete with other low-cost energy sources. When comparing the cost of energy associated with new power plants, wind and solar projects are now more economically competitive than gas, geothermal, coal, or nuclear facilities. However, wind projects may not be cost-competitive in some locations that are not windy enough. Next- generation technology, manufacturing improvements, and a better understanding of wind plant physics can help bring costs down even more.

2. Ideal wind sites are often in remote locations. Installation challenges must be overcome to bring electricity from wind farms to urban areas, where it is needed to meet demand. Upgrading the nation's transmission network to connect areas with abundant wind resources to population centers could significantly reduce the costs of expanding land- based wind energy. In addition, offshore wind energy transmission and grid interconnection capabilities are improving

3. Turbines produce noise and alter visual aesthetics. Wind farms have different impacts on the environment compared to conventional power plants, but similar concerns exist over both the noise produced by the turbine blades and the visual impacts on the landscape.

4. Wind plants can impact local wildlife. Although wind projects rank lower than other energy developments in terms of wildlife impacts, research is still needed to minimize wind-wildlife interactions. Advancements in technologies, properly siting wind plants, and ongoing environmental research are working to reduce the impact of wind turbines on wildlife.



3. HYDROPOWER:

Hydropower harnesses the energy of water moving from higher to lower elevations. It can be generated from reservoirs and rivers. Reservoir hydropower plants rely on stored water in a reservoir, while run-of-river hydropower plants harness energy from the available flow of the river.

Hydropower reservoirs often have multiple uses - providing drinking water, water for irrigation, flood and drought control, navigation services, as well as energy supply.

Hydropower currently is the largest source of renewable energy in the electricity sector. It relies on generally stable rainfall patterns, and can be negatively impacted by climate-induced droughts or changes to ecosystems which impact rainfall patterns.

The infrastructure needed to create hydropower can also impact on ecosystems in adverse ways. For this reason, many consider small-scale hydro a more environmentally-friendly option, and especially suitable for communities in remote locations.

• ADVANTAGES OF HYDROPOWER:

1. Hydropower is a renewable source of energy. The energy generated through hydropower relies on the water cycle, which is driven by the sun, making it renewable.
2. Hydropower is fueled by water, making it a clean source of energy.
3. Hydroelectric power is a domestic source of energy, allowing each state to produce its own energy without being reliant on international fuel sources.
4. Impoundment hydropower creates reservoirs that offer recreational opportunities such as fishing, swimming, and boating. Most hydropower installations are required to provide some public access to the reservoir to allow the public to take advantage of these opportunities.
5. Hydroelectric power is flexible. Some hydropower facilities can quickly go from zero power to maximum output. Because hydropower plants can generate power to the grid immediately, they provide essential backup power during major electricity outages or disruptions.

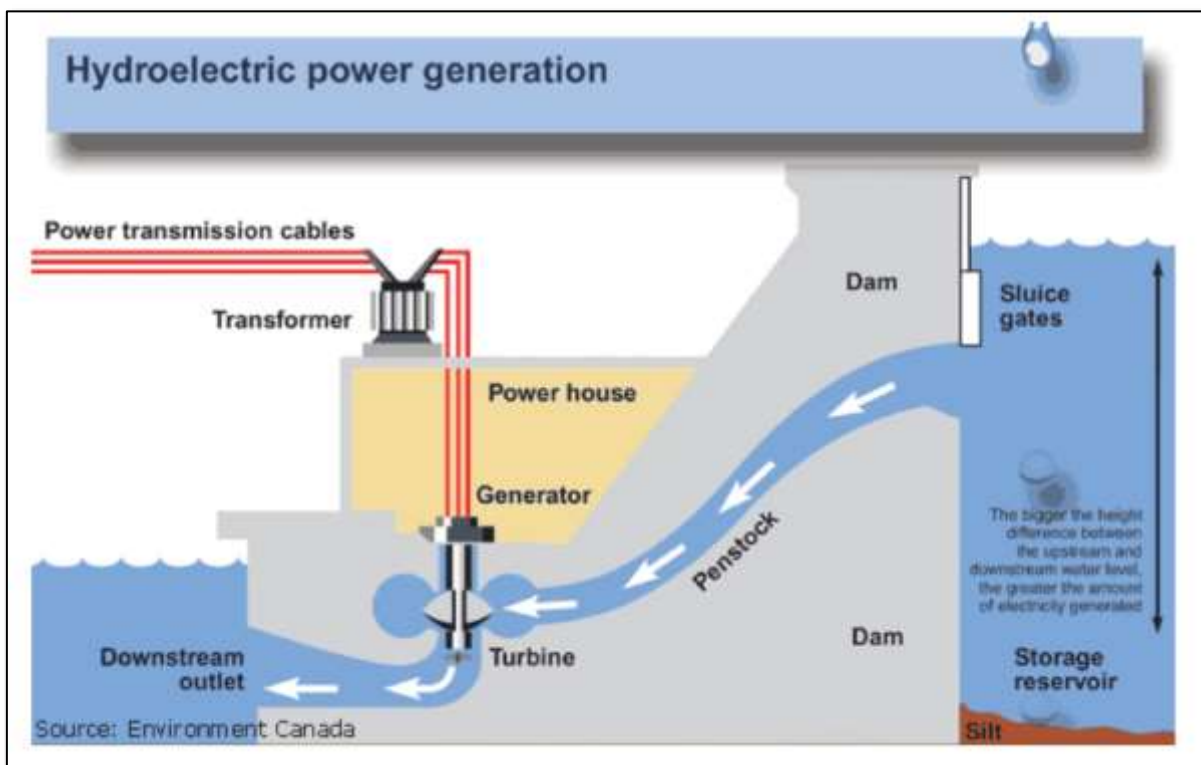
6. Hydropower provides benefits beyond electricity generation by providing flood control, irrigation support, and clean drinking water.

ft. Hydropower is affordable. Hydropower provides low-cost electricity and durability over time compared to other sources of energy. Construction costs can even be mitigated by using preexisting structures such as bridges, tunnels, and dams.

8. Hydropower complements other renewable energy sources. Technologies like pumped storage hydropower (PSH) store energy to use in tandem with renewables such as wind and solar power when demand is high.

9. Hydropower is an established industry in the United States, employing 66,500 people. And there are a growing number of jobs available in hydropower, including manufacturing, utilities, professional and business services, construction, trade and transportation, energy systems, water management, environmental science, welding, machinery, and other services.

10. Hydropower creates jobs in rural locations and boosts local economies.



- **DISADVANTAGES OF HYDROPOWER:**

1. It Has an Environmental Impact

Perhaps the largest disadvantage of hydroelectric energy is the impact it can have on the environment. Dams can damage or otherwise impact the environment both upstream and downstream through their construction process during the formation of the dam. To build a dam, new roads and power lines must be installed that disrupt the environment. Dams also often form reservoirs that flood large areas and displace natural habitats. When dams flood areas, it creates sections of still or stagnant water that kills vegetation which emits greenhouse gasses as it rots. This is especially true in humid and tropical environments.

locking the flow of water can also seriously impact fish migration, especially for species like salmon that rely on rivers to spawn. Dams can even impact biological triggers that tell fish where to go when it's time to migrate. Some dams have sought to solve this disadvantage of hydroelectric energy by creating fish ladders or fish elevators to help migratory fish make it to

2. It Displaces People

Reservoirs not only displace animals from their habitats, but they also displace people. This disadvantage of hydroelectric energy can have quite a large impact on communities. People

who have lived in an area their whole lives may be forced to move, and although they are typically compensated for moving, it can't make up for what they have lost. Cities, towns, and villages have been eliminated by dams, and local cultures displaced. If people refuse to move due to construction, they have sometimes been forced out of their homes with the threat of violence.

3. It's Expensive

Another disadvantage of hydroelectric energy is the expense required to build a dam in the first place. Although they don't cost much to operate, the time it takes for a dam to pay for itself can vary widely. Some dams take two to five years to construct, while others like the Itaipu Dam in Brazil and Paraguay can take significantly longer, leading to increased costs. Everything totaled, the Itaipu Dam took 18 years and \$18 billion to build

Since the 1950's, an estimated \$2,000 billion has been spent on dam construction around the world, with average construction delays of 44% and overestimates on cost reaching an average of 96%. Overspending and delays make it more difficult to get a return on the money invested in the construction of the dam.

4. There are Limited Reservoirs

Although water is an unlimited resource, the conditions necessary to build a dam are limited. This is a disadvantage of hydroelectric energy because it means you cannot simply build a dam anywhere you please. In fact, most locations that are suitable for building hydroelectric dams have already been used for this purpose. Another factor to consider is that even if a location could support a hydroelectric dam, it may not generate enough profit to make the project worthwhile

5. There are Droughts

When weighing the advantages and disadvantages of hydroelectric energy, it's important to take into consideration the fact that water can and does go through cycles of abundance and drought. Lower than normal water levels can heavily impact energy production and is a disadvantage of hydroelectric energy.

6. It's Not Always Safe

Despite a lack of combustible fuel, dams still offer dangers of their own. Construction accidents, as well as dam failure, can result in injury or loss of life. The Hoover Dam claimed as many as 112 deaths during its construction, and one of the worst catastrophes occurred when the Banqiao Reservoir Dam in China was destroyed by a typhoon in 19ft5.

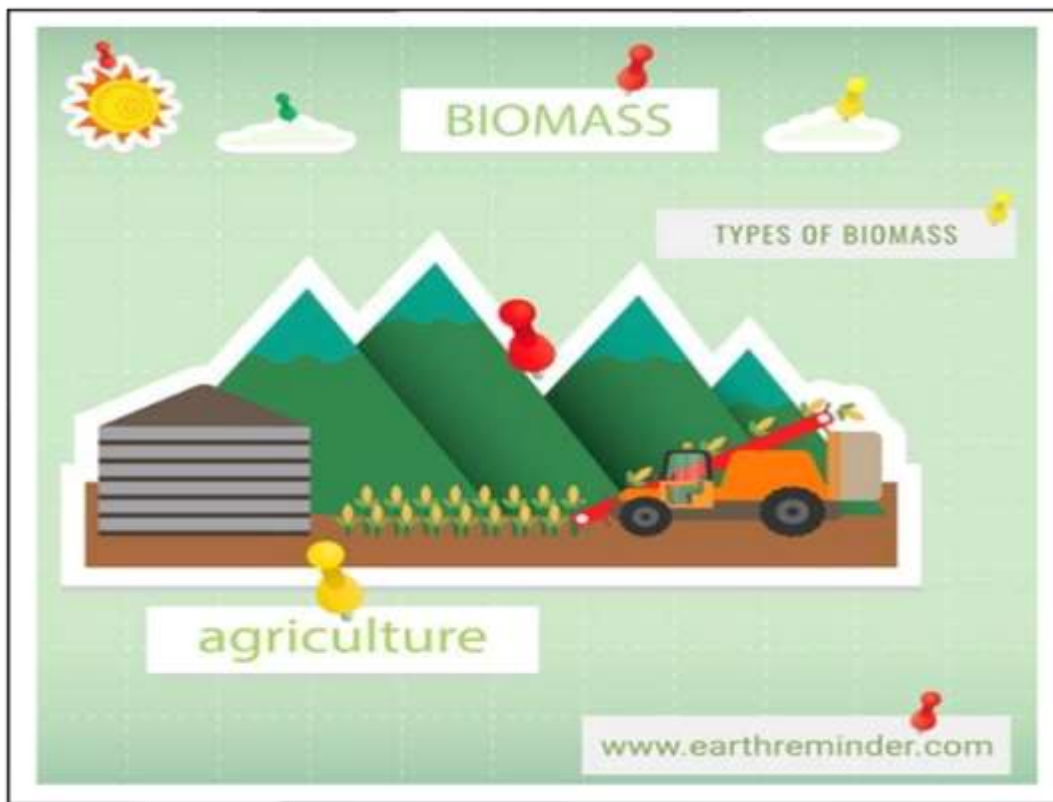
4.BIOMASS ENERGY:

Biomass energy, also known as bioenergy, becomes so popular nowadays, as it supplies the most valuable entity that we demand in our daily life. The energy produced from the Biomass is a renewable source, that means it can be generated in the future. Therefore, by analyzing the advantages and disadvantages of biomass energy, we can apply this to our future to produce lots of goods and also to save our mother nature from hazards

➤ TYPES OF BIOMASS-

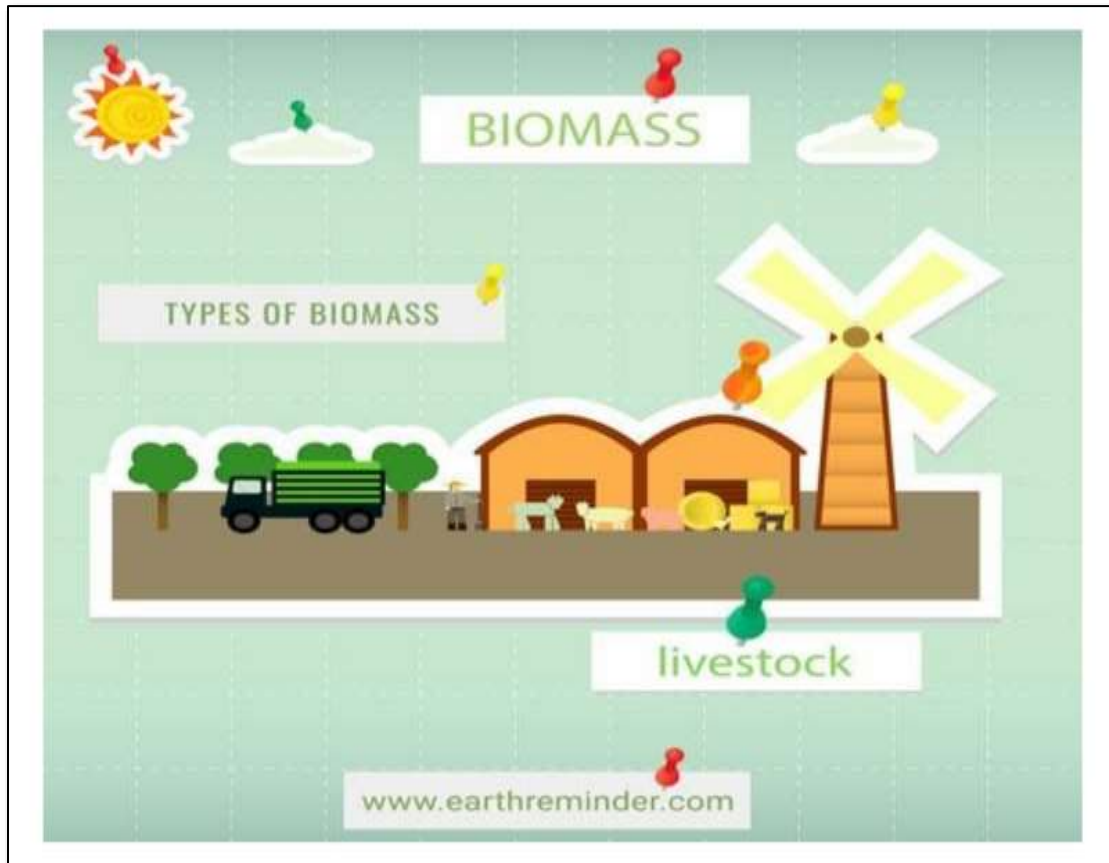
1. Agricultural and Forestry Crop Residues-

Agricultural and forestry crop residues are those we get from the farm field and forests. These are all plant residues like straw, residues from fruit processing like husk, stones, cane trash, Stover, forest residues like logging residues, imperfect commercial trees, dead wood, and other non-commercial plants that must be thinned from damaging overcrowded forests.



2. Animal Wastes-

Animal Wastes are the residues that come from animal farming like cattle farm, pig farm, poultry farm and even slaughterhouse and fishery. These wastes are such as, dung, chicken droppings, swine manure, and other organic debris from slaughterhouse and fisheries.



- **How Does Biomass Energy Work?**

Biomass energy is the energy stored in the Biomass, which by further processing can be utilized in various types of conversions like biochemical, electrochemical, or just thermal. Hence, differently, we can ask "how is biomass energy used for multiple purposes or what are the applications of it?" Therefore, here we are discussing the mechanisms of usage of Biomass for generating bioenergy.

For Generating Heat:

Generation of heat by using Biomass is quite similar to the production of heat through fossil fuels, but the only difference is the source. Fossil fuels are non-renewable resources we had been using from millions of years, and thus Biomass is the perfect alternative of it.

The process of heat generation is through the combustion of the Biomass or wastes, but still, there is a chance of environment pollution.

For Generating Electricity:

From Biomass, electricity can quickly produce and in various ways. We can directly burn those wastes for heating water to generate steam, and by this steam using a turbine, we can smoothly generate electricity

In other ways, we can use dry agricultural wastes in high temperature and anaerobic condition inside a gasifier. This can produce synthesis gases like carbon dioxide (CO_2) and hydrogen (H_2), The process is termed as pyrolysis. Also, by using wet organic excrement like manure or food garbage, we can generate methane (CH_4) (biogas) in a digestion tank.

For Generating Biofuel:

Biofuel is another sustainable energy source, produced industrially by biochemical conversion to reduce the use of natural fuels for energy demand in transport as well as other sectors.

The most well-known biofuels are ethanol and biodiesel Ethanol is produced by fermentation process in which Biomass such as sugarcane and molasses are converted into sugar through microbes like yeasts, and they are further transformed into a large amount of ethanol.

- **ADVANTAGES OF BIOMASS ENERGY:**

There are lots of advantages of biomass energy as our primary power source. Some of them are as follows:

1.It's a renewable source-

The first benefit of using Biomass is that we can renew it when needed in future and hence, can save our fossil fuels for future generations. These are all waste products which should not be deficient in anyways.

2.Carbon Neutral-

Biomasses are said to be carbon neutral as the carbon dioxide released by these are neutralized by the autotrophs in the process of photosynthesis. That means, these discharge the same amount of CO₂ as taken by the green plants for their metabolism.

3.Improves water quality-

As many industrial wastes will mix with our extensive water bodies, that much water quality suffers. This may result in aquatic ecosystem loss and various other effects. But for the production of biomass energy, we need those trashes, and therefore, oceans, rivers and other water reservoirs will remain cleaned.

4.A great alternative to fossil fuels-

The most significant advantage of biomass utilization is less dependency on non-renewable sources, ie, fossil fuels. Therefore, to fulfill our unavoidable power need like electricity, we can use biomass's rather than coals, petroleum or natural gases.

❖ ACTUAL METHODOLOGY FOLLOWED:

- After considering everyone's opinion, the team decided to work on the Environmental Impact of Renewable Energy Sources as a microproject.
- Conduct research to gather relevant information.
- Prepared and submitted a proposal outlining the project's scope, goals, timeline.
- The team collected the information of species diversity in different location
- Prepared a final report outlining the project's research, analysis, and conclusions, and present it to relevant faculty.

❖ RESOURCES USED:

Sr. No.	Name of Resources	Specifications	Quantity
1.	Computer Systems	Systems with various specification	1
2.	Software tools	Microsoft Office Software (Word)	1
3.	Website	https://www.ucsusa.org/resources/environmental-impacts-renewable-energy-technologies	1

❖ SKILL DEVELOPED OF THE MICROPROJECT:

- **Teamwork:** Collaboration with fellow researchers has improved our teamwork and collaborative skills.
- **Environmental Awareness:** Our project has cultivated a heightened environmental awareness, emphasizing the significance of biodiversity conservation.
- **Economical skill:** Renewable Energy projects required significant financial resources and generate various economics outcomes.
- **A Strong understanding of the technical aspects of renewable energy system.**

❖ APPLICATION OF THE MICRO-PROJECT:

- **Ecosystem Management:** Understanding species diversity helps in managing ecosystems for ecological balance, such as maintaining pollinators in agricultural areas.
- **Educational Purposes:** Providing valuable information for educational institutions and researchers to study biodiversity patterns and trends.
- **Renewable energy can be used for electricity generation ,space and water heating, cooling and transportation.**