Challenges and Opportunities Associated with Green Technology

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ABSTRACT: ***Green technology is an emerging technology in order to protect planet and their ecosystem. Apart from various opportunities, there are some challenges are also associated with the green technology. Green technology utilizes the renewable energy resources in order to produce ecofriendly products that help in conservation of environment as well as ecosystem. Green technology helps in reducing the waste and carbon dioxide (CO_2) as well as various harmful gases. Green technology can be implemented in various fields such as agricultural sector, automobile, construction, education, healthcare and sustainable energy etc. Like other new technologies, green technology also facing some challenges including high R&D cost, technical issues, less knowledge among general public and high implementation cost. This review paper discussed about the challenges and opportunities associated with the green technology. In the near future, through proper R&D, green technology can provides benefits to the society, economy as well as ecosystem.***

KEYWORDS: ***Energy, Green Technology, Harmful Gases, Resources, Renewable Energy Resources.***

INTRODUCTION

Rapid growth in the industrialization and population, threaten to the nature. Exponentially growing population increase the food demand as well as land for the survival. The increase food demand gives birth to the commercial farming. The main objective of the commercial farming is to produce food at large scale in order to fulfill the demand of food by the society. Commercial farming required large farm land for cultivation that leads to the deforestation and for increasing the yield of the crops in the commercial farming, it mainly utilizes chemical fertilizers as well as plant growth regulators that has adverse effect on the health of human as well as animals. On the other hand, industries produces large amount of carbon dioxide (CO_2) to the environment resulting in climate change and global warming. The overall effect of these negative factors associated with the damaging of ecosystem as well as negative impact on health. In order to overcome such issues, there is a need technology that can help to minimize these effects[1], [2].

In contrast, Green technology offers various benefits that will help to secure and conserve our ecosystem and environment. Green technology providing the solution to produce non-toxic green/clean products. Green technology can help to improve the product quality with least negative impact on the environment. It can utilize in various fields such as in food technology for improving the quality of food, in soil management, in automobile industry for producing natural energy resources based motor vehicles that will help in minimizing the emission of CO_2 in the atmosphere and sustainable energy etc. Green technology helps these fields in different ways in order to fulfill the objective of securing the earth and its ecosystem. Any new technology facing various challenges in the beginning, like that green technology also encounter to the various challenges including high cost Research and development (R&D), less employment, implementation issues and lack of knowledge etc. In order to make green technology to be mature, it must be ensure that proper implementation has been done without need of sophisticated implementation framework. This review paper provides an overview of green technology and opportunities and challenges associated with them. In order to take green technology to the next level, there are various factors need to take care of because without tackling those issues, the implementation of the green technology will be difficult.

GREEN TECHNOLOGY AND RENEWABLE ENERGY RESOURCES

Green technology provides a solution to create non-toxic clean products by utilizing green materials and process. Renewable energy resources are plays a major role in the green technology. Renewable energy resources are known as natural energy resources that present in the nature in unlimited quantity. The main

advantage of renewable energy resources is that it doesn't produce must waste. There are mainly four types of the renewable energy resources utilize in green technology as listen in Table 1.

Table 1: List of Renewable Energy Resources that Utilizes in Green Technology for Producing Non-Toxic Products

Renewable Energy Resource	Explanation
Wind energy	There are various countries across the world now producing electricity from the wind power. It produces electricity based on the wind crossing through the large wind turbines that has multiple blades. These blades designed in a way to increase the area of receiving the wind. The placement of the wind turbines plays a crucial role because its operation mainly depends on the wind that is why it must be ensure that it must be place in open area such as near the oceans and open lands. It produces carbon dioxide (CO_2) and other harmful gases in negligible amount.
Solar energy	Solar energy nowadays utilizing for various purposes including generation of electricity, water heater and solar cooker etc. It creates heat or electricity after the process. The electricity production by utilizing the solar energy helps in conservation of ecosystem because the process of generation of electricity through solar energy doesn't produce waste or emit the harmful gases[3].
Wave energy	When wind crosses over the surface of the ocean, there will be a periodic wave formation that is caller ocean waves. The periodic motion of these waves in up and down movement and this movement are used to create various non-toxic products such as electricity generation[4]. The main disadvantages of wave energy are that the performance is poor in bad weather conditions.
Biofuel	Biofuel is the mixture of gases produces by decomposition of organic waste. Organic waste are collected in large quantity from agricultural sector, food waste and manure etc.

OBJECTIVES OF GREEN TECHNOLOGY

In the era of technological innovations, green technology can help in solving problems linked with the society as well as nature. The primary objectives of green technology have been emerged to tackle issues related to various basic and advanced fields of the society (discussed in the Table 2).

Table 2: List of Objectives Associated with Green Technology in Different Fields of Society.

Area	Green technology objectives
Automobiles	To enhance the production of motor vehicles based on renewable energy resources
Agriculture	Produce crops without harming the environment
Aircraft and Space	Utilize green energy resources as well materials in aircraft and space shuttle as well as in space travelling

Construction	To construct smart building in order to provide energy efficient and environmental friendly conditions in indoor and outdoor
Consumer products	To produce next generation consumer products without damaging the environment during the production as well as actual use of products by the users
Education	Utilize green technology in order to provide education and its services
Food Technology	In order to eliminate the toxic chemicals or substances during food process for conserving the ecosystem from damages
Healthcare	Utilize green technology as well as green processes in all healthcare facilities and services
Information technology (IT)	To develop recyclable electronic components based IT systems in order to reduce carbon footprint and enhance the efficiency of the IT systems
Sustainable energy	To generate energy as per requirement by utilizing the natural renewable energy resources

OPPRTUNITIES ASSOCIATED WITH GREEN TECHNOLOGY

Green technology has wide spectrum of opportunities. It can deploy in various fields (as shown in Figure 1) in order to produce non-toxic products. Based on the application field by fulfilling the need of that field it secure and conserve the environment and ecosystem. The details of various opportunities in different fields have been discussed below:

1. *Green technology for Agricultural Sector:*

Agricultural sector is the major field which provides food to the society. Rapid growth of the population revolutionizes the agricultural sector. Large population increases the demand of the food. Earlier, small land farming was popular in order to feed the families. The main issue associated with farming system is that it cannot produce food at large scale because small scale farming done on the small land farm. In order to fulfill the demand of the food, industrial or commercial farming comes into the picture. The main objective of the commercial farming is to produce food at large scale and create revenue. Because commercial farming is capital intensive that is why this farming system utilizes chemical fertilizers, plant growth regulators and heavy machine for the production of food in order to increase the yield rate. Chemical fertilizer has huge negative impact on the soil as well as food quality and heavy machinery system increase the level of carbon dioxide (CO_2) in the atmosphere due to which ecosystem and environment comes in the danger zone. Green technology based sensor and machines can help in managing the soil quality and food quality and can significantly reduce the emission of CO_2 and other harmful gases[5], [6].

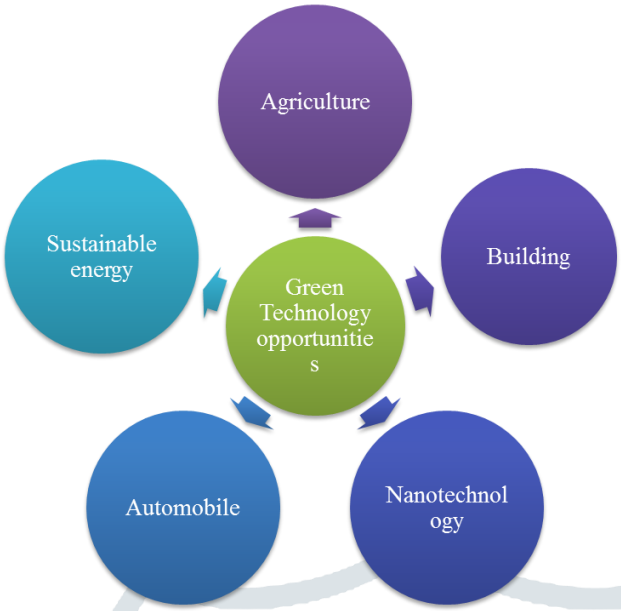

Figure 1: Schematic Representation of the Opportunities Associated with Green Technology in Various Fields

2. *Green Technology for Nanotechnology:*

Nowadays, nanotechnology has been expanding its area of applications in various fields including healthcare, medical and electronics sector. Nanotechnology enhances the existing commercial process as well as applications and materials by reducing the size to the Nano level for utilizing the potential of the matter to the maximum level. Green technology based nanotechnology can improve the quality of the basic needs of the humans including water, shelter, energy, healthcare and food etc. The effect of the matter at nanoscale increase the activity due to which more precise and clean non-toxic product can produce.

3. *Green Technology for Automobile Sector:*

The motor vehicles based on the petrol and diesel produce lots of carbon dioxide (CO_2) and other harmful gases that leads to the climate change and global warming. Renewable energy resources based motor vehicles reduce the emission of harmful gases significantly that leads to the conservation of the ecosystem. Biofuel and solar energy based motor vehicles has huge potential to overcome the issue of CO_2 level in atmosphere.

4. *Green Technology for Sustainable Energy:*

Electricity is the basic need of the human beings. It makes life easier to live. There is various equipment such as consumer households, mobile phones, industries' heavy machines runs on the electricity. But the most of the electricity generated by utilizing the non-renewable energy resources such as coal and fossil fuels. The main drawback associated with these resources is that it produces harmful gases as well as wastes at large scale. Renewable energy resources based electricity generation improves the health of the environment by reducing the emission of harmful gases. The main source of electricity generation based on green technologies is solar energy, wind power, tidal energy and biofuel.

5. *Green Technology for Building:*

Buildings are the part of the infrastructure development. Buildings have many objectives in order to fulfill the societal needs such as is serves as a shelter from weather, space for living and to comfortably survive and work. Increasing population demands more buildings for sheltering resulting in deforestation that has adverse effect on the ecosystem. Green technology based construction, maintenance and demolition of buildings can minimize the impact of ecological damage. During the construction of the buildings, different machinery

systems are utilized nowadays. These machines increase the level of air population as well as noise pollution. Renewable energy resource based machines and equipment can overcome these problems significantly.

CHALLENEGES FACING BY GREEN TECHNOLOGY

Every new technology suffering in the beginning in terms of financial investment and knowledge. Green technology also facing the same challenges while implementing. It takes lots of time to mature any technology. By giving an importance to the growth of the green technology for societal benefits, some of the challenges that are associated with green technology are listed in Table 3.

Table 3: List of Challenges Associated with the Green Technology and Their Explanations

Challenge	Explanation
Lack of awareness	Due to lack of knowledge about importance of healthy ecosystem and environment, people don't know what is the use of green technology for conservation of the ecosystem. Without knowledge it will be difficult to convince the people to use green products. In order to overcome such issue, proper awareness must be spread over the society.
High capital investment	In the beginning, every new technology requires lots of financial investment for the establishment of the technology. Heavy financial investment in the major challenge associated with the green technology that has to be addressed.
Reduction in employment	When existing commercial technologies move from one technology to other technology, most of the workers lost their jobs due to the lack of skills and knowledge about the new technology. It is important for organizations and government to provide the training to the people about latest technologies.
Lack of government policies and initiatives	Proper structured framework is required for the deployment of the green technology. Government policies and initiative can help to the companies to stable their business in proper manner.
Less investment in R&D	In the beginning every new technology needs lots of R&D in order to take the technology to the next level. The new technology cannot be used at commercial level until proper R&D has been done. It must be ensure that high capital investment in the R&D so that proper progress can be done for the implementation.

MERITS AND DEMERITS OF GREEN TECHNOLOGY

Like other technologies, green technology also has some disadvantages apart from various benefits. Green technology offers various advantages and few disadvantages by utilizing the various natural energy resources. The merits associated with the green technology have been listed in the Table 4.

Table 4: List of Merits Offering by Green Technology and Their Explanations

Merits	Explanations
Energy savings	Green technology has capability to save energy at large scale. By producing green technology based energy efficient products can help to reduce heavy energy usage in our daily life
Air pollution reduction	Motor vehicles and industries emit the carbon dioxide (CO_2) as well as other harmful gases at large scale resulting in damaging of environment and increase air pollution. The adaptation of green technology is a better alternative to reduce the air pollution by utilizing the renewable energy resources
Reduction of waste	Green technology uses renewable energy resources that make itself less waste production technology. Biodegradable materials end up with less waste.
Effective recycling	Recycling is the advantage offering by the green technology. Recycling reduces the consumption of fresh raw materials and provide more efficient and effective waste separation process
Less water pollution	Usage of chemicals and fertilizers in the agriculture sector and in the industries enhance the possibility to wash out some chemical substances in to the groundwater. Since life depends of the water that is why it is important to secure the groundwater. By using the green technologies, the water pollution can be minimizing upto some extent.
Sustainable energy production	Green technology offers to produce energy by utilizing natural renewable energy resources. It also helps in slowing down the climate change as well as global warming by reducing the emission of carbon dioxide (CO_2) as well as other harmful gases
Less soil pollution	High demand of food fulfill by the industrial farming and this sector heavily utilizes the chemical fertilizers and plant growth regulators in order to increase yield rate but this causes the adverse effect on human health as well as soil. Green Technology can help to minimize the usage of fertilizers and other chemical substances that can help in increasing the soil quality.

Green technology has many branches based on application areas. Green technology utilizes the natural resources in order to make life easier in many ways. Some of the potential application areas are production of energy, nanotechnology, green computing, management of waste and eco-friendly motor vehicles etc. Apart from its advantages, green technology has some disadvantages also as listen in Table 5.

Table 5: List of Demerits Associated with the Green Technology and Their Explanations

Demerits	Explanations
High R&D costs	Green technology needs high capital investment for the R&D in order to make this technology mature for commercial use.
Technical issues	Since, the green technology is an emerging technology that is why it may face several technical issues in daily to daily basis usage.
High product costs	Like other new technologies, green technology is also quite expensive in the beginning. As time passes, the cost of the products will reduce.
Job losses	Convectional technologies creates employment at large scale but if companies shift their businesses from conventional technologies to green technology then people who are working in the convectional technologies will lose their jobs. IT will be hard to find another job for those peoples.
High implementation costs	The companies' charges high costs for the implementation of the green technology based businesses.
Lack of understanding and knowledge among general public	Since, large population of the world still uneducated. They are not aware about the issues related to the ecosystems that are why it will be difficult for those peoples to understand the importance of green products.
Required regulatory framework	In order to run green technology based business, it required sophisticated regulatory framework for the implementation.

DISCUSSION

Existing commercial technologies in various fields including agriculture, automobile, healthcare, education and space etc. shows its own importance for different applications. But the most common issue associated with the existing technologies is harming of ecosystem and environment and it also shows the adverse effect on humans as well as on animals. In order to overcome such issues, green technology comes into the picture that provides an efficient solution to conserve the ecosystem. It helps in reducing the level of harmful gases in the environment, reduction in water and soil pollution, requires simple equipment and less maintenance resulting in less capital requirement minimize the wastage of power by utilizing the natural resources and reuse the natural resources efficiently. It helps in maintaining the lifestyle in better manner. Since, green technology is a new and emerging technology that is why it is many challenges for the deployment. Green technology is in developing mode and facing many challenges such as financial crunch and lack of knowledge. It must be ensure that these two factors must be addressed before the implementation of the green technology. Without addressing these issues, it will be difficult to take this technology to the next level.

CONCLUSION

Climate change, global warming and damaging of ecosystem are the major issue in front of the world. The existing commercial technologies have many drawbacks that show much adverse effect on the ecosystem in different ways. Green technology provides an effective and efficient solution to tackle these issues. Green technology utilizes green resources in order to produce green or non-toxic products. It shows huge positive impact on the ecosystem and the environment. It can implement in different field's including agriculture, automobile, healthcare and sustainable energy etc. Part from various benefits of the green technology, there are some challenges also linked such as lack of awareness, less financial investment, less R&D and high

implementation and maintenance costs etc that needs to address for the proper growth. It is recommended that government must make proper policies and take initiatives for the implementation of the new technology and also spread awareness about the importance of healthy ecosystem and environment as well as usage of green products among the general public.

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