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# Sustainable Development & Innovative Clean Technology

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***Abstract:*** ***The use of renewable and non-renewable resources in such a manner that satisfies our current needs but does not compromise the future availability of resources. Sustainability tries to find a way in which human beings live comfortably, but respecting Mother Nature. It is a way for people to use resources with the resources running out.***
***The world is not something we enjoy today, it was here before we were born and it might be here after we leave. Sustainable development solutions must meet Environmental, Economic and Social goals simultaneously to satisfy basic needs all over nation. It uses various strategies for employing the existing resources optimally so that a responsible and beneficial balance can be achieved over the longer term. Socio-political ability of a community to develop processes & structures which not only meet the needs of its current members but also support ability of future generations to maintain a healthy community.***
***Clean technology is a term which describes products, processes or services which reduces waste and encourage use resources in an optimizing way. It focusses on recycling, use of renewable energy sources, sustainable or green transport and use of energy saving bulbs and grey water. Clean technology promotes productive and balanced use of the natural resources on the planet.***
***The paper aims at studying various innovative techniques incorporating green and healthy living and proper implementation of the sustainable development tools and strategies going into effect now which will determine the future which will further inherit our tomorrow.***
***Keywords: Renewable and non-renewable resources, sustainability, socio-political, green transport***

## I. INTRODUCTION

Development means making life better and better for e.g., to have a better standard of living and an improved quality of life.
*Sustainable Development* means making sure that the things we do, the goods we buy & the lifestyle we have today will not harm the environment for us, for people in other places & for future generation. Sustainable development means
Thinking about our careful use of the Earth's resources
Looking at levels of consumption and waste
Realising that we are each responsible for our actions, and what we do can have a huge effect on other people & places.
At the Earth Summit in Rio de Janeiro in 1992, sustainable development was established as the guiding principle for policy-making.
If we don't take care of world we live in now, we won't have anything leave behind for the future generation. The world is not something we enjoy today, it was here before we were born and it might be here after we leave.
"One person can make a difference……and everyone should try". Youth are the most important actors in sustainable development.
It is the intersection of three pillars: Environment, Economy and Society.

Fig 1. Sustainable development pillars

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Let's figure out the three pillars of Sustainable Development one by one – *Environmental sustainability* can be met without reducing its capacity to allow all people to live well, now and in the future. This environmental pillar of Sustainable Development is crucial, once we understand the resources that the planet offers are finite it becomes visible that current methods of consumption are using up more resources that the planet can afford.

Examples of how human activities have altered the planet are:

Increased quality of air, land & water
Protection of ecosystems and biosphere
Better management of waste and pollution
Measures to ensure resource sustainability and harmony
Protection of marine, flora, fauna species

*Economic sustainability* use various strategies for making use of existing resources optimally so that a responsible and beneficial balance can be achieved over the longer term. The economic pillar is frequently made to be the strongest or even the only pillar in development.

Opportunities for growth
Increased GDP for growth
Prevention of practices which misuse resources
System stability and security
Green jobs and eradication of unemployment

*Socio-political* ability of a community to develop processes & structures which not only meet the needs of its present-day members but also boost ability of future generations to maintain a healthy agglomeration. It includes:

Better life chances and opportunities & food security
Equitable distribution of resources
Eradication of poverty and exclusion
Participation and inclusion of everyone

To keep track of everything the principles behind sustainable development: *principles such as green living, social progress, equality, and responsible consumption and so on,* it is easy to reach accommodation about what sustainable development exactly means, and what conditions are necessary to achieve it for a better tomorrow. Imagine what would happen if for example, all the forests were to be destroyed and the rivers were dry for the sake of building and industry. Imagine if there were no tress at all on earth: would life be possible?

Many conflicting views of sustainable development believe that it is actually anti-growth and anti-wealth. On the opponent side, sustainable development is about balance and holistic approach to development. This means that some things need to be canned and sustained while others should be given the persuasion to be developed.

*What needs to be sustained?*

People and cultures
Natural Resources
Biodiversity
Environment & Ecosystems

*A. What needs to be developed?*

Quality of life & Equal opportunity
Institutions
Fare Income & Communication
Justice and Social Equality

What is the role of an individual in sustainable development? It needs the active involvement of all stakeholders: NGOs, government, private sector but also civil society. It is not just policy makers, or the politicians, who decide how the sustainable development should be like. The most important stakeholders in sustainable development is WE as an individual!

We have to recall policy-makers to make decisions which protect your future: we can reminisce them that we want better jobs, cleaner cities, more equitable resources distribution, and above all, a guarantee that our future is secure and is full of opportunities, a pleasant world to live in and a healthy planet for more happily living life.

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Also sustainable development is especially important for the youngster as it is they who can contribute towards betterment of the society and environment as a whole. The implementation of sustainable development policies going into effect now will determine the future which will inherit our tomorrow! Because it is the youth who will inherit the planet, by advocating for, and adopting sustainable practices, you are actively participating in shaping your own future.

Rapid growth has had an impact on everything around including air and water. There are different sustainable forms of energy such as Biomass energy, geothermal energy, hydroelectric power, and wind energy, solar energy (Passive and Active).

Sustainable development is a common agenda for global reference, which everybody agrees upon, but bringing this global concern into public policies is a difficult task.

To achieve sustainable development goals, India faces some defiance as last month, 193 countries gathered together at the UN Summit on the SDGs (Sustainable Development Goals) to take on an ambitious new global development agenda. Long ways with other world leaders, Prime Minister Modi too expressed India's commitment to work towards achieving these goals by means of 2030. Comprising 17 goals and 169 targets the SDGs expand itself on the millennium development goals (MDGs) adopted in 2000 which are due to expire this year.

But how disparate are the SDGs to the MGDs and what will be the key challenges in achieving them? This paper looks into some of them.

*Neighbourhood sustainability* includes water, food, waste management, green space, walkable urbanism & community space.

Water as neighbourhood sustainability includes drilled wells, dug wells and also rainwater harvesting through a system of cisterns and catchments.

Food comprise with backyard gardens, farmers' markets, buying produce in season, buying locally or sustainably grown produce.

Community Green Space Supports Walkable Urbanism safer for children & also pedestrian and bike friendly.

Water Management includes recycling, composting & use of landfill to power sewage treatment plant.

Home sustainability sustains home design, interior products & also building materials. Home design deals neighbourhood sustainability as green roofs, facing north and south to catch southeast breezes also trees placed on the east and west sides of the house- mixture of native deciduous and evergreen trees also solar panels in yard or on roof.

Building Materials backup with sustainability by comprising doubled-paned windows, salvaged wood, local materials (-stores like Green Builders Source) and sustainable insulation: insulation made from soy and recycled fiberglass insulation).

And last but not the least one of the important neighbourhood sustainability comprises energy star appliances, compact fluorescent light bulbs, repurposed hardwood floors and cabinetry, recycled carpet or carpet made of natural fibres, low-flow faucets and toilets countertops made of recycled materials: glass, aluminium, paper etc.

As all the things have pros & cons, so if we look at them, sustainable development also has few limitations. One of them is that it is generically more costly to fabricate goods and services in an environmentally safer way than in a non-sustainable and deleterious manner.

1) *Clean technology*: Clean technology refers to a set of technologies which aims at reducing or optimizing the use of natural resources and thereby minimizing the harmful impacts of technology on environment by sustaining a healthy surrounding. It includes the activities such as recycling, use of renewable energy sources, green transport, green chemistry and more. Also known as 'cleantech', it is an industrial term which is used to describe products or services adopted to improve operational performance, productivity, or efficiency while reducing costs, inputs, energy consumption, waste, or environmental pollution. The idea of cleantech first emerged among a group of technologies and industries which was based on the principles of biology, resource efficiency and use of technology to improvise the basic industries. The various examples include energy efficiency, non-toxic materials, purification of water, solar and wind energy. There was an increasing concern regarding the optimized use of natural resources and proper utilization of the new technologies has increased with two trends: firstly, there was a decline in the relative cost of employing these technologies and secondly, growing understanding of the resources used in the 19th century and early 20th century, such as fossil fuel power plants, the internal combustion engine and an emerging understanding of their impacts caused on the physical environment. Nick Parker and Keith Raab, founders of the Cleantech Venture, popularized clean technology in large parts throughout the world. They began the work as a term to describe the 'green and clean' technologies, which included solar, biofuels, fuel cells, water remediation, and renewable power generation. This Cleantech Group developed and now operates a popular conference. The investors registered a large number of the cleantech related domain names. At the initial level, the motive of the conferences were the capitalists and startup companies operating in sectors covered by the term. Thereafter the term has come into wide use in the media and so broader investment community and industries organized numerous conferences, websites, magazines, newsletters and companies that had grown into the third largest venture capital

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investment sector behind IT and biotech. Cleantech is the application of environmental science, green chemistry, environmental monitoring and various electronic devices to monitor, model and preserve the natural environment and resources, and to restraint the negative impacts of human involvement. The term is also used to describe technologies involving sustainable energy generation such as photovoltaic, wind turbines, bioreactors, etc. Sustainable development is the essence of environmental technologies. The term environmental technologies also refers to describe a class of electronic devices that can promote sustainable management of all the available resources. There are many industrial sectors where cleantech has been implemented. The major ones among them are energy, water and waste water, advanced materials, transportation, agriculture, energy efficiency and manufacturing. The largest of these sectors is energy which can range from biodiesel, clean coal and fuel cells, to wind and solar energy. Interest in clean energy is driven by the issues on sustainability, oil depletion and energy saving concerns. Within the energy sector there are major concerns of clean energy including solar, wind and biofuels. Finally, the emerging interest in clean technology energy arises from the increased recognition that costs can be significantly reduced if energy efficiency is addressed.

2) *Solar Power:* The best option for clean technology is solar power. Solar power obtains usable energy from sunlight and the energy can be converted into various useful forms. Solar energy finds many applications, such as heat and electricity, and is very attractive because it is plentiful, clean and pollution free. However, solar power is still costly as compared to grid electricity. With economies of scale from its widespread use, this energy may become more and more competitive.
3) *Wind*: Wind power is the conversion of wind energy into more useful forms, usually electricity. Its use has quadrupled between 2000 and 2006. Wind energy is a renewable and clean source of energy, but this energy source is unlikely to grow to be more than a supplemental source of energy and although it is expected to grow quickly, solar power remains the more appealing investment because of its high growth rate, more profit and wide range of investment options.
4) *Biofuel*: Biofuels are derived from biomass, living organisms or their metabolic by-products, such as manure, corn, soybeans, sugar cane, palm oil etc. This is a renewable source of energy and it is a form of stored solar energy. But use of biomass can still cause global warming when the natural carbon equilibrium is disturbed, such as in deforestation. The major drawback of its use is that it puts pressure on grain costs and water supplies, which can subsequently increase the cost of raising livestock. The cleantech water industry is focused in several areas which includes waste water treatment and general filtration. The worldwide consumption of water continues to grow as it is used in modern agriculture and industry. In the years to come, fragmentation of the water industry is likely to change. As the industry becomes more concentrated and popular, it is likely to seek ways to use waste water plants more efficiently, use chemicals better and use less power. The best way to make energy is to make use of alternative source of energy instead of using it in first place. The green products require fewer natural resources which implies that these products will cost less either up front or over the total time period of their utilization. The common examples include fluorescent light bulbs and improved packaging that reduces waste. These products need not be high tech, but the more economic sense they make for consumers, the more likely they are to be adopted. Tesla Motors is one of the successful cleantech startups in the world. The sector recently announced plans to invest $2 billion in a large-scale factory in order to produce cheaper batteries, and stock shares increased rapidly after the news of the company's growth and production outlook. This would have been impossible without the Department of Energy loan program that helped get the company grow off the ground. Tesla is a good example of the United States' commitment to the advancement of clean technologies and it is step ahead for building a cleantech era. The New York governor, Cuomo recently announced an initiative to provide an additional $30 million to encourage more large-scale solar and biogas projects in the New York City area.

Fig 2. Sustainable living cycle

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With increasing awareness and concern towards environment, clean-tech companies are becoming more sophisticated and innovative. An entire new industry has been created employing use of information technology to reduce energy consumption. Smart-grid hardware are being used worldwide.

There are various countries adopting the smart energy measures in order to promote cleantech worldwide. Fortunately, the recent data suggests that after years of fluctuations, the interest of people in this technology and its use is rapidly increasing. Solar energy, wind energy, and hybrid and electric cars are becoming more popular among people as compared to the ancient times. Innovative home energy management systems involving smart appliances have shown a significant increase over the past few years.

The major factor contributing to the popularity of clean technology and its usage all over the world is its less cost. The clean technology employs devices which are economic, affordable and accessible. According to the Department of Energy,

The cost of solar panels has reduced by 75 percent since 2008.

The cost of LED lights fell 85 percent since 2008.

The cost of electric vehicle batteries has dropped by 50 percent than what it was four years before.

A continued investment in the cleantech will pave the way for a sustainable, healthy and clean energy future that aims at growing our economy, helps families save money, and reduces pollution that causes climatic changes.

Confidence in the clean-tech sector's future is dependent on the need for sustainable solutions for the wellbeing of the planet which supports an ever-wealthier population. Over the next 20 years, it is probable that the number of middle-class consumers will rise to some three billion from 1.8 billion today. Their new lifestyles will require more resources, including energy.

This abrupt rise in demand will occur when finding, developing, and extracting the new sources of energy and resources will be challenging and expensive.

In order to sustain life on earth, we must adopt cleantech and step towards sustainable development. It paves the way to recover the depleted natural resources so as to keep them preserved for the future generation to use.

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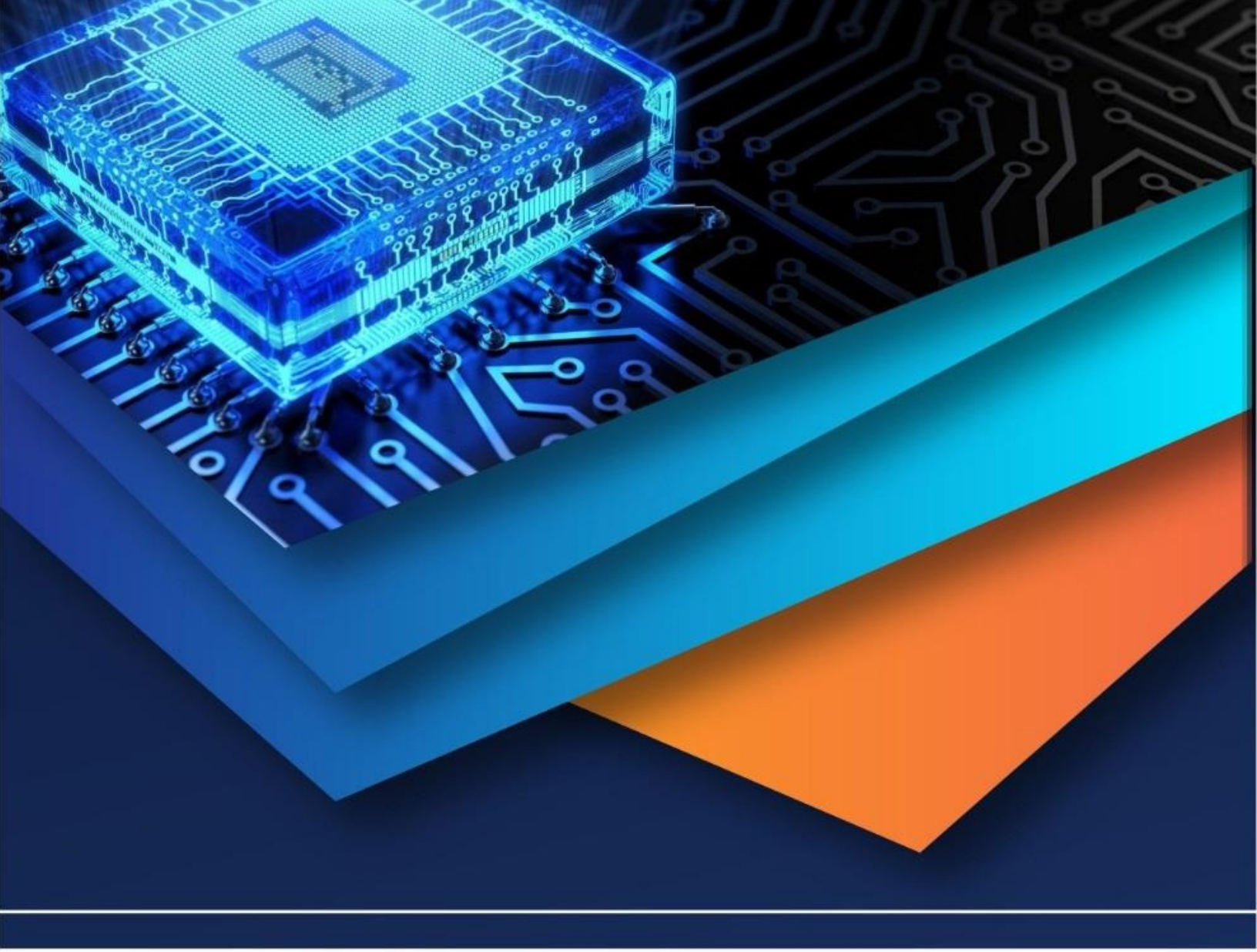

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