

To cite this article: Uday Bhatia (2023). SUSTAINING THE FUTURE: AN EXPLORATORY STUDY ON INNOVATIVE CARBON REDUCTION TECHNOLOGIES IN EMERGING ECONOMIES LIKE INDIA, International Journal of Education and Social Science Research (IJESSR) 6 (5): 378-389 Article No. 855, Sub Id 1344

## SUSTAINING THE FUTURE: AN EXPLORATORY STUDY ON INNOVATIVE CARBON REDUCTION TECHNOLOGIES IN EMERGING ECONOMIES LIKE INDIA

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DOI: <https://doi.org/10.37500/IJESSR.2023.6524>

### ABSTRACT

Sustainable development and protecting the environment are extremely important in the world today. The situation demands a collective effort by all nations of the world to come up with a viable solution. This involves labeling environmentally friendly goods as ‘World Public Goods’ and the importance of financing from both the public and the private sectors.

**Research Question:** Sustainable development, climate change, and protecting the environment for future generations are the main objectives of all developing and developed nations. The path to achieving the above objectives is the need of the hour. How is the world going to achieve the above objectives collectively and individually? Are there new carbon reduction products that are being invented? Are all the economies going to adopt world public goods? Will there ever be a consensus? These and more will be attempted to be addressed in the course of the research paper.

**KEYWORDS:** Sustainable development goals, World Public Goods, Green Finance, Public Private Partnership, Innovative Technology, anthropogenic, absolute decoupling, net zero impact.

### 1. INTRODUCTION

Sustainable development has become an extremely important pressing issue for all the economies of the world today. With the disastrous effect of climate change all over the world, the sudden realization of stabilizing its impact has become a major problem that has to be addressed. This is irrespective of whether the economy is a developing one or a developed one. The four main types of sustainability are:

- Human
- Social
- Economic
- Environmental

It is imperative to understand that how we live today is as important as leaving behind a legacy for future generations. For this, it is necessary to take cognizance of economic growth, social inclusion, and environmental protection. Since Britain developed in the 18th century, nations have been pursuing development with scant care for the environment and short-term gains are overshadowed by longer-term costs. The extent of fossil fuel that has been utilized in the process has resulted in greenhouse gasses, as well as a huge amount of carbon imprints in the world. The sudden impact of environmental degradation and the disastrous effect of climate change all over the world has resulted in the world sitting up and realizing the urgent need to address these complex issues. Sustainable goals are a part of every meeting, that the world leaders attend. This could be in the form of G20, G7, ASEAN, or any meeting that the UN has, all of them have the word sustainable development, and leaving a legacy for future generations added in their final declaration

**Figure 1: picturisation of Sustainability**



**Source: Getty image**

## **2. DEFINITION**

Where development is sustainable, everyone has access to decent work, quality healthcare, and education. The use of natural resources should be such that they avoid pollution as well as permanent damage to the environment, public policy choices should be adopted so that no one should be left behind.

The theme of the just concluded G20, in India, adequately explains the emphasis on the fight against climate change. The theme ‘One Earth, One Family, One Future’, especially ‘One Earth’ is the first action that all countries must take in their step to fight against climate change.

### **2.1 Sustainable Development and Sustainable Goals**

The word sustainability is derived from the Latin word (sustinere which is further divided into tenere, to hold; sus, up), today it is used in a way that there is something that has to be ‘supported’. The environmental, societal, and economic considerations have to be supported for future generations. This means intergenerational equity, gender equity, social tolerance, poverty alleviation, environmental preservation and restoration, natural resource conservation, and building just and peaceful societies.

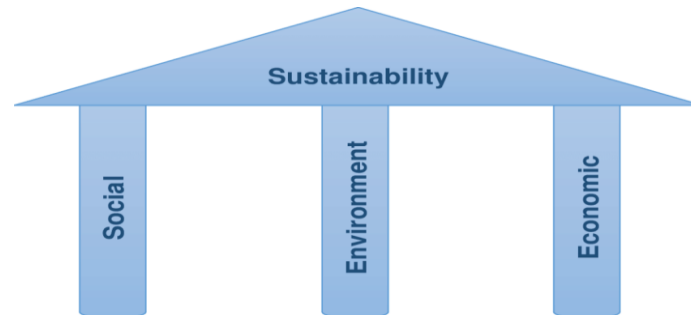
The late 1960s and early 1970s witnessed the rise of the modern environmental movement in the West. There is a strong possibility that environmental concerns emerged at this point as the 'basic economic needs' had been met following the growth process post-war period. Prominent works like 'Limits to Growth', (1972), and Schumacher's 'Small is Beautiful', (1973), argued that the modern growth-based economy was unsustainable on a finite planet. The growth process of the earlier industrialized economies brought in its wake gross inequalities and poverty. The growth process of recent emerging economies has started moving towards a direction that includes the 'social needs' approach and the 'basic needs' approach. It was indicators like poverty, unemployment, and inequality that provided a truer depiction of the state of 'development' or 'progress'. These concerns led to the final formation of the 'Three Pillars of Sustainability'.

Sustainability is a broader term that should take care that resources are not depleted for future generations, in all the aspects mentioned in the above paragraph. Sustainable development is a process that improves long-term economic well-being and quality of life without compromising future generations' ability to meet their needs.

Sustainability encompasses three pillars:

- **Economic/profits.** Businesses should start working towards profits earned through sustainable growth, which continuously improves over the long term. In these cases, the emphasis is on the production, distribution, and consumption of goods and services. The moment companies embrace the mantra of sustainability, it essentially means that companies cannot profit at the expense of work exploitation or irresponsible and criminal exploitation of the environment. There is a cyclical process of benefits between sustainability and the economy.
- **Environmental/planet.** This requires reducing carbon footprints, waste, and water usage while maximizing energy efficiency, helping in the provision of environmental and financial benefits. It is under this pillar, that firms study sustainable ways to accomplish the lowest possible impact on the environment.
- **Social/people-** This supports the creation of healthy and livable communities that can sustain themselves, which means employee health, safety, wellness work-life balance, and diversity and equity. This is a part of the human capital of the economy that searches for a well-cared and healthy society that provides an environment that stimulates the legitimate and healthy work relationship, to favor the personal and collective development of all people involved.

All of the above are interconnected with each other, interacting harmoniously, to sustain sustainability.

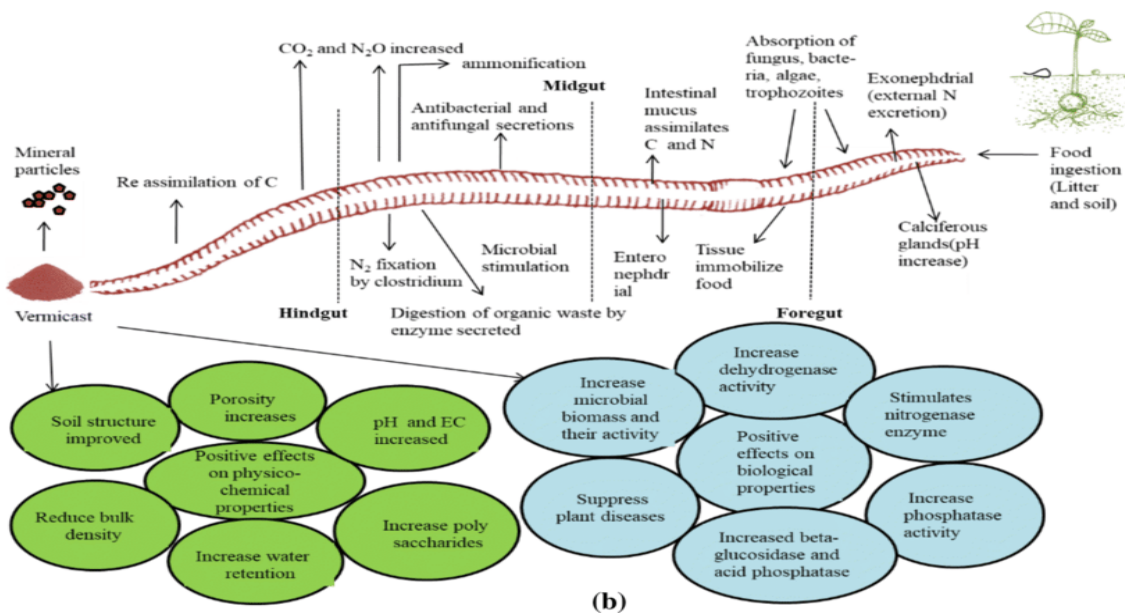
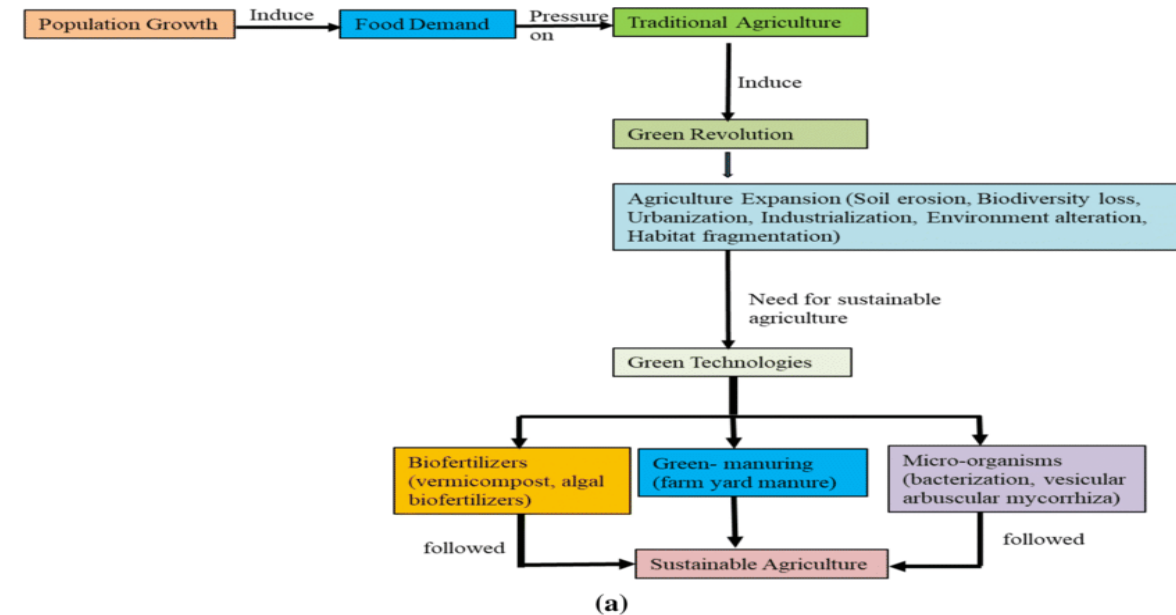
**Figure 2: Three Pillars of Sustainability**

Source: Sustainability success.com

## 2.2 Protecting the Environment for future generations

It is critical to protect the environment to reduce the destruction of ecosystems caused by a myriad of anthropogenic activities, which include mining, release of industrial waste, smelting of iron ore, and incineration of fossil fuel, particularly coal. Scientists use the word “anthropogenic” in referring to environmental change caused or influenced by people, either directly or indirectly.

**Fig 3: Impact Of Anthropogenic Activities**



Source: [www.researchgate.com](http://www.researchgate.com) (adapted from Lemitri et al (2014)).

Several research proposals<sup>1</sup> have indicated that independent agencies are the most capable of conducting research and long-term planning, such that legislation could be in a position to consider the impact of their decisions over the next 100 years. This would recognize the fact that the agency (public and private), would be functioning in a counter-majoritarian manner to protect future

generations. All government agencies today should adopt and encourage the public to think about the consequences of their action on future generations.

There is an emerging understanding that present generations have a responsibility to preserve the environment so that the coming generations can enjoy it. A combination of independent evaluations as well as representative advocacy will be better equipped to prevent environmental degradation and safeguard the interests of future generations.

### **3. Difficulties faced by Developing Economies in achieving Environmental targets**

Environmental issues are multi-faceted, and a one-size-fits-all strategy cannot solve all these issues. Green Growth oversees economic growth and development while utilizing natural assets for the well-being of humanity. When output and consumption increase there is likely to be an increased cost that is imposed on the environment, which by implication increases the consumption of non-renewable resources furthering the levels of pollution.

Given the difference between developed and developing countries, the impact on the environment is going to be different. While developing countries have a high pollution rate, developed countries are the largest contributors to carbon dioxide emissions, but at a decreasing rate. (imf.org. Emerging Markets and Developing Economies: Sustaining Growth in a Less Supportive External Environment, 2017). Regulatory mechanisms must work actively towards achieving 'Green Growth'.

Adaptation towards sustainable development, especially for developing economies, should safeguard the agriculture sector, manage the impact of climate change on the environment, and make the infrastructure more resilient. It is possible to gain in the long run in the form of savings from investment in resilience and coping mechanisms such as better irrigation, improved seed varieties, strengthened health systems, and greater access to finance and telecommunications. All of the above have a cost to it.

<sup>1</sup>Policy and Society, Volume 31, 2012-Issue3: The Role of Agencies in Policy Making.

<sup>1</sup> Achieving Sustainable Development and Promoting Development Cooperation; Dialogues at the Economic and Social Council; United Nations.

For poor countries, this could reach 0.25% of global gross domestic product per year, which may be quite unmanageable for them (The costs and benefits of environmental sustainability; 2021. Springer Link). It is a fact that countries that need to adapt the most, (the

developing ones), lack the means to do so. It is the responsibility of the developed nations to help the other nations achieve their goals. Adaptation support should supplement existing aid, with streamlined conditionality that is in synchronization with the country's institutional capacity.

This is an extremely important step, as the impact of climate change is being felt worldwide, and there is no discrimination between developed or emerging market economies. The developed economies

reached their GDP (Gross Domestic Product) goals largely due to the consumption of fossil fuels, with scant regard for the environment. It is only in the latter decades of the 20<sup>th</sup> century that the full force of the impact of overconsumption of fossil fuels has been felt. To achieve higher GDP growth rates, it is easiest to consume fossil fuels, but given the climate change situation today this process will lead to more harm. To safeguard vulnerable underdeveloped countries, it is imperative to use fossil fuels judiciously, and at the same time develop alternative sources of energy, with financial aid from World agencies, and developed economies.

**Figure 4: Sustainable Development for Developing Economies**



Source: OECD library

#### 4. Innovative products and Technologies that aid in this process

Technologies to achieve sustainability must reduce carbon emissions. As these economies develop there is increasing use of fossil fuels which harm the environment. A sincere attempt has to be made for energy to be used efficiently. There are various ways in which this could be achieved:

- By using less electricity in the production process. The use of clean energy has an important role in reducing air pollution.
- The main problem that developing economies have to grapple with is 'poverty'. It is extremely difficult to address sustainable growth when the economy is facing poverty challenges. In such a scenario, to attempt to achieve both goals (growth with sustainability), research has to be directed towards addressing the following:

(1) mobile telephony,

- (2) fuel-efficient stoves: use of bio-fuel,
- (3) clean drinking water,
- (4) household electrification; solar energy, LED light efficiency
- (5) judicious use of scarce water resources
- (6) public electric transport; using batteries for such vehicles requires systems that are cheap and have adequate long-term energy storage facilities.
- (7) Plastic recycling
- (8) using Hydrogen, and/or ethanol as an alternative source of fuel to petrol and diesel

#### **4.1 Specific Policies in Achieving Sustainability by Developing Economies**

Some basic innovations are required to be implemented by developing economies at the grassroots level. These would need to be implemented by all stakeholders including the Central government, State government, and the private sector.

In the agricultural sector, this would involve using fertilizer that does not increase carbon imprints in the atmosphere, which involves the reduction of reliance on non-renewable energy, reducing chemical fertilizers, saving scarce resources as well as the increasing use of agrarian methods like composting, animal manure, cover cropping, and rotation of complementary crops.

#### **4.2 Latest Practical Sustainable Inventions**

- Inventions have been discovered like bulbs that have a storage capacity. These store electricity when power is available, and can glow when there is a power outage. One of such a kind has been patented by ‘Uday Electric’. This is among the first bulbs in the market to have a backup of 8 hours. It is used extensively in the rural sector where electricity is extremely erratic. Such types of innovations are useful for the urban sector too where there are frequent power cuts.
- Encouraging rural households to use liquid petroleum Gas (LPG) instead of firewood will help preserve the forests as well as the health of women in rural areas. Burning of firewood emits a large amount of GHG (Green House Gas), into the atmosphere which is completely avoidable for both health and sustainability reasons.
- There has been a concerted effort to move towards electric vehicles as research has indicated that one of the major causes of air pollution is vehicular emissions. Public and private electric vehicles have been encouraged by the central as well as state governments by offering buyers substantive subsidies. The main problem is that the batteries that are being used are mainly lithium ones, and the mining of this metal emits greenhouse gasses in the atmosphere. Research and development are moving at a frantic pace to overcome this issue, as well as developing a cheaper prototype, such that the demand increases and economies of scale are achieved. Encouraging the use of electricity as an alternative fuel to petrol, diesel, and Compressed Natural Gas will go a long way in achieving sustainable goals.



**Figure 5: Sustainable farming methods**

Source: Farmhos.blogspot.com

Increasing the use of solar and wind energy will result in decreasing the dependence on fossil fuels. As the demand increases these products would achieve economies of scale resulting in cheaper and more efficient technology.

Besides the above, utmost care has to be taken in the daily use of products that can be effectively recycled. India is one of the first economies that banned the use of 'single-use plastic'. This at present is not being effectively implemented but it is a step in the right direction. There is a concerted effort by all municipalities in the city to educate consumers on the segregation of various types of garbage. This awareness helps in achieving sustainable goals.

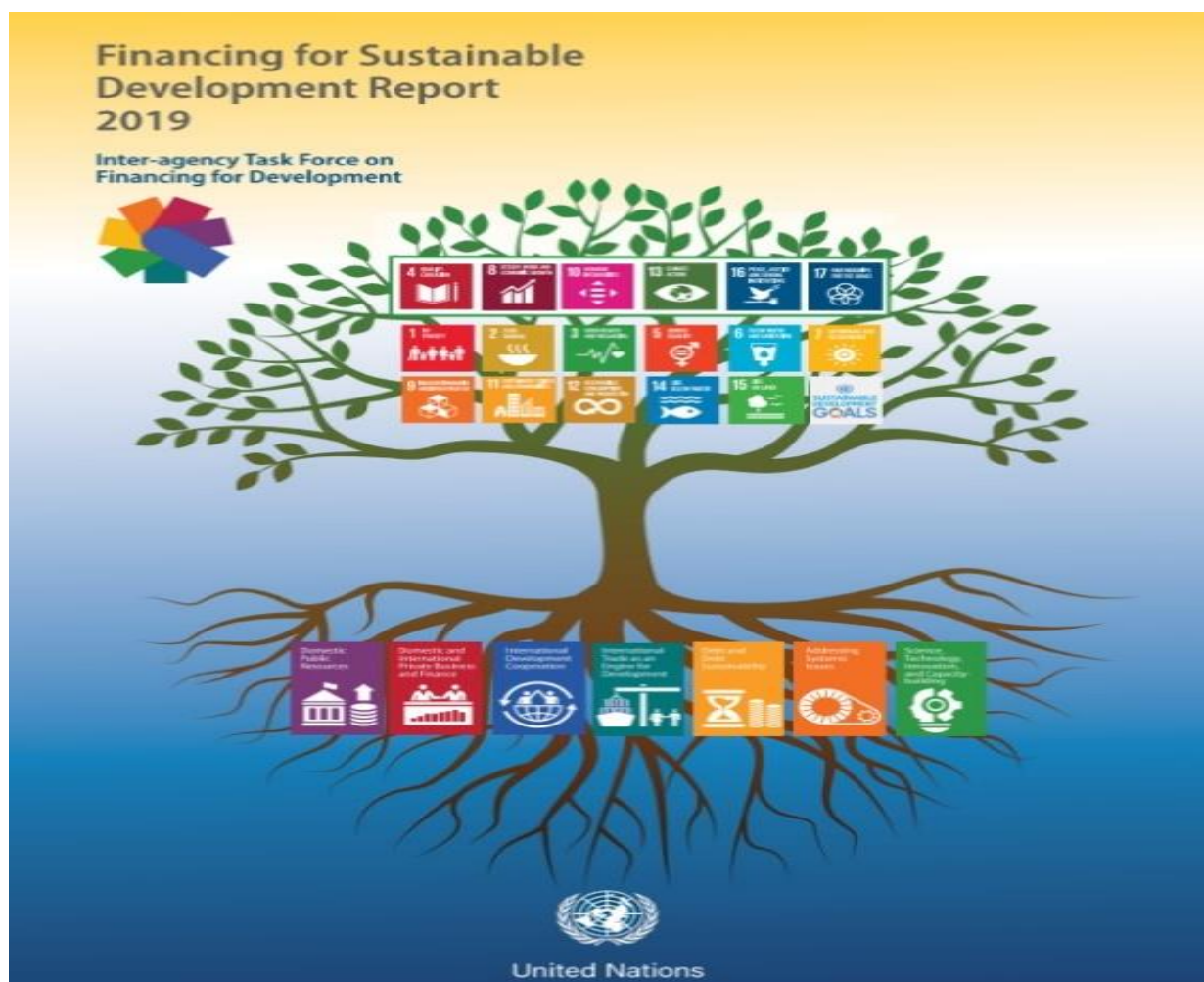
### **5. World Wide Consensus at various multilateral forums in achieving a 'better world for future generations'**

Worldwide consensus towards achieving a better world would be to label all goods that help in sustainability as 'Global Public Goods'. Once this has been done then the issue of financing is a collective responsibility of the world, it is here that the developed nations can contribute more than the developing ones. The 'Free Rider' (this is a type of market failure wherein a person or a company gets an advantage of the product or service without paying for it.), problem would also be solved once the commodities are labeled 'Global Public Goods'. It has to be a collective world effort to solve the disastrous effects of climate change. Along with this, climate finance should add to and not be a substitute for ongoing development assistance. There must be synergy between public and private

finance to achieve sustainability goals. Public funds can play an important role in de-risking lending to emerging and developing economies. This can be achieved through blended investment programs that combine public, philanthropic, institutional, and private investors with optimal allocation of risk to each, through hybrid funds.

Companies are sensing business opportunities in the large number of innovations that are required to move to net zero impact. If there is government backing for such funding the risk reduces.

**Figure 6: Financing for sustainability.**



Source: rotary service. world press.com

SDGs as a sustainable agenda is possible only if there is synergy between all the countries of the world. There are various concepts to achieve this; one of them is the concept of ‘Absolute decoupling’, which implies an absolute reduction in environmental pressures while growth accelerates, resulting in the growth efficiency ratio (GDP/resource use ratio), exceeding the increase in GDP. The case of absolute decoupling is very rare. What normally occurs is a vicious circle in which the poorest countries tend

to continue to have high levels of poverty, high social exclusion, and low levels of growth. If the population is unaware and uninterested in sustainable activities and innovations, the country will be unable to progress in its sustainable development. The responsibility for sustainable development lies not only with citizens but also with all actors in society, including governments, private institutions, companies, universities, and research institutions. At times there is policy failure in driving sustainable development, which includes conflict of interest, inadequate administrative resources, implementation of incentives, as well as a lack of policy specifications. The achievement of SDGs seems to depend on the level of wealth of countries, with the most developed economies showing the greatest capacity for innovation. Implementing sustainability in countries is not a low-cost strategy. When implementing these new sustainable development strategies and instruments, it is essential to consider the finite nature of economic growth and the limits of the physical ecosystem. It may be impossible to achieve sustainable development because unconstrained economic growth would lead to environmental degradation. This decline occurs because high economic growth raises concern for the conservation and protection of biodiversity.

It is, thus, important to consider the following rules:

- 1) The link between innovation and sustainable development
- 2) The need to study the characteristics of each innovation system to apply sustainable development policies and initiatives tailored to each country or region and thus ensure the effectiveness and success of sustainability
- 3) The limited power of economic growth in the context of sustainable development.
- 4) Technological, political, and market facilitators, which may also influence the achievement of sustainable development.

## 6. CONCLUSION

To achieve the goals of protecting the environment, it is essential to understand the various nuances that are involved in achieving these difficult but imperative goals. Besides considering the level of development of the economy, the other issues that have to be adequately addressed are:

- Financing
- Global Public Goods
- Country wise specific issues, and local governments reactive policies towards protecting the environment.
- Inculcating sustainable practices from the grassroots.

All the above will go a long and constructive way in saving the environment.

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