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Opinion

Nanotechnology for the Green Economy and Sustainable Development

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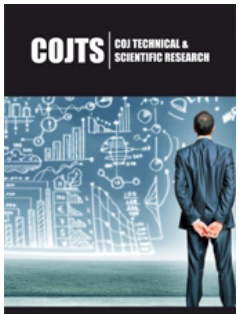

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Nowadays, particularly in a globe with finite resources, the existing economic development paradigm, which is predicated on continuously increasing resource consumption and pollutants emission, cannot be perpetuated. Pollution is produced as a result of developing and boosting industrial output, which leads to an adverse impact on the ecosystem and all aspects of human life. These circumstances have led to the concept of a "green economy" emerging that introduces the opportunity to change the way to manage the relationship between the economic and environmental spheres [1,2].

Green Economy

It is an approach of economics known as the "green economy" that aims to simultaneously satisfy the needs of humanity and nature while promoting peaceful interaction between the two. Environmental policies, sustainable agriculture, alternative energy sources, and wildlife conservation are among the topics that green economists may research. In addition, the "green economy" is a foundation for society's continued development and is regarded as a key factor in the advancement of sustainable development. Companies can use the "green economy" to further their research and development as well as apply it in various fields. [3].

Green Nanotechnology

In this context, a concept known as "green nanotechnology" has also emerged which aims to use nanotechnology progress in engineering and materials science to produce energy-efficient, environmentally sustainable products and processes, and commercially viable. It also refers to the employment of eco-friendly resources, termed "green materials," in the creation of nanometer-sized materials within a process known as "green synthesis". A wide range of economic sectors, including clean technologies, energy production and storage, construction, and related infrastructure businesses, are anticipated to be impacted by these applications. It may also, be possible to reduce the utilization of traditional raw materials, make power delivery systems more dependable, efficient, and safe, or use construction materials or unconventional water sources to improve ecosystem and livelihood conditions. For instance, wastewater, whether from municipalities or industries can be converted into renewable energy. The globe generates more than 900km^3 of wastewater annually, which consumes a large quantity of energy through treatment processes, but currently, wastewater can be reused for energy production by utilizing new technology such as nanotechnology and environmentally friendly techniques [1,4].

On the other hand, nanoscale materials such as fullerenes, nano colloids, nanotubes, self-organized particles, surfactants, nanocrystals, and nano capsules have well-developed surfaces and provide higher atoms. Surface evolution leads to an increase in the contribution

of surface atoms and changes in reactivity and properties. Owing to their unique properties, nanoproducts find wide-ranging applications, from electronics, optics, and environmental protection to medicine and pharmacy [5]. In the medical field, nanotechnology is experiencing rapid growth, with many diverse potential applications being explored in the field of biomedicine, including the control of infectious diseases. Not only does nanotechnology have the potential to offer improvements to current methods of immunization, drug design and delivery, diagnosis, and control of transient infections, but it also unexpectedly offers many new tools and capabilities. Recently, infectious diseases are appearing at frightening rates, and dangerous bacteria and fungi are developing their medication resistance. Despite an improved understanding of microbial pathophysiology and the use of contemporary therapies, drug-resistant microbial infections continue to be linked with high rates of morbidity and mortality. As a result, there is a pressing demand to identify and find new antimicrobial agents, as well as novel development techniques such as nanotechnology for the next generation of antibiotics to manage microbial diseases [6,7]. So, as a component of a strategy to lower environmental risks associated with economic growth, the creation of a green economy is considered crucial. Moreover, the merger between the green economy and nanotechnology can introduce new eco-friendly techniques to overcome recent societal problems in different aspects whether environmental, medical, or industrial.

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