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GREEN ECONOMY AND ITS DEVELOPMENT STATUS

Madina Jumaniyozovna Bobojonova

Asian International University

Abstract: In the current era of rapid economic development, resource scarcity or, rather, the emergence of global problems is becoming evident. The limitations of natural resources and issues related to their non-renewability significantly impact all areas of human activity, including economic activities. Scientific study of this problem began gaining popularity in the 1960s and 1970s. During this period, a new direction called "environmental economics" emerged in economic literature, based on the principles of traditional economics.
In the 1980s and 1990s, the science of ecological economics emerged as an alternative to solving environmental problems through narrow economic approaches and began to develop rapidly. In 1989, the "Green Economy Development Plan" was used by leading economists for the UK government.

Keywords: green economy, diffuse, green capitalism, business-as-usual, market dynamics, energy,innovation.

Unlike environmental or ecological economics, the "green economy" has a more practical nature. The "green economy" is not a scientific field but primarily pertains to real economic policy and specific activity sectors (energy, innovation, agriculture, etc.).
The green economy is an economy aimed at reducing ecological risks and environmental scarcity while promoting sustainable development without harming the environment. It is closely linked to ecological economics but has a more politically applicable orientation.
The general purpose of this article is to discuss a number of challenges encountered in implementing sustainable technological changes, which must be properly understood by policymakers and specialists at various levels of society. Additionally, we identify some directions for future research.

Discussions focus on five issues:

- Tackling diffuse and increasingly global environmental risks;

- Achieving fundamentally sustainable technological changes, not just incremental ones;

- Addressing green capitalism and the uncertain business-as-usual scenario;

- Defining the role of the state and developing the appropriate policy mix;
- Dealing with issues and impacts of distribution.

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Achieving sustainable technological change requires re-evaluating the respective roles of private industry and the state. Future research must address challenges related to identifying and implementing new policy tool combinations in diverse institutional settings.
In the last decade, there have been frequent calls to reform traditional economic models to address issues such as climate change, biodiversity loss, and water scarcity while simultaneously resolving major social and economic challenges. The global financial crisis of 2008-2009 further intensified these debates, transforming these concerns into the idea of a "green economy."

In 2015, the countries of the world adopted the 2030 Agenda for Sustainable Development, which included 17 Sustainable Development Goals (SDGs). These goals acknowledge the necessity of eradicating global poverty while addressing various social needs such as education, healthcare, social protection, and job creation through strategies that ensure economic growth. At the same time, these goals emphasize the importance of combating environmental pollution and climate change. Thus, the SDGs establish a tangible connection between ecological systems and economic systems. They also strengthen the necessity of transitioning to a "green" economy\u2014a shift toward more sustainable production and consumption patterns. We focus on a crucial component of this transition: fostering sustainable technological changes. This entails production and consumption practices that exert significantly less negative impact on the natural environment, including the global climate. Specifically, this article explores key challenges to supporting and overcoming barriers to sustainable technological transitions. These challenges are presented to policymakers, specialists, and the broader public, drawing on key lessons from academic research.

Solving climate and environmental problems undoubtedly requires natural scientific knowledge and technical solutions, such as carbon-free energy technologies. However, implementing sustainable technological transitions also involves numerous non-technical challenges within social, organizational, political, and economic domains.
For example, literature on "transitions" recognizes that many sectors, such as energy production and water supply, are socio-technical and innovation systems. These systems comprise networks of participants (individuals, private firms, research institutes, government bodies, etc.), the knowledge they hold, and associated institutions (legal regulations, behavioral norms, etc.).

Developing new carbon-neutral technologies often necessitates creating new value chains that may include participants who were not previously connected. This process can result in significant societal transformations that may take considerable time.
Examples of required changes include amending legislation, altering consumer behavior, addressing distribution impacts, developing infrastructure, and creating new business models.
Achieving sustainable technological change requires not only technological progress but also economic and social adaptation. Historical examples illustrate the organizational and institutional challenges associated with technological changes and innovations.

For instance, during the 20th century, the societal impact of electricity in terms of increased labor productivity was profound. However, despite electricity being discovered in the late 1870s, by 1900, less than 5% of mechanical power in U.S. factories was supplied by electric motors. It took another two decades before significant productivity gains were realized. The slow diffusion of electricity was primarily due to the need for comprehensive changes in factories, including production processes, building architecture, logistics, and labor practices.

A similar phenomenon occurred during the second half of the 20th century with computers. Many companies invested heavily in computers but initially saw little benefit. To

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effectively utilize new technologies, firms had to implement systemic changes, such as decentralizing supply chains, outsourcing, and optimizing processes while offering consumers greater choice.

The necessity of pairing new technologies with systemic changes applies at both corporate and societal levels. Innovative solutions must account for the complexities of interconnected participants, market dynamics, and institutional reforms. This is particularly critical for green technologies in energy-intensive industries, such as carbon-free processes.

The question of how to promote sustainable technological transitions has gained increasing attention in both policy discussions and scientific research. Therefore, the primary objective of this article is to discuss the most pressing social challenges associated with these transitions, provide key takeaways for policymakers, and outline important directions for future research.

Key challenges addressed in the article include:

- Combating diffuse and increasingly global environmental risks.
- Achieving fundamentally sustainable technological changes, not just incremental ones.
- Navigating the rise of green capitalism and uncertain business-as-usual scenarios.
- Defining the role of the state and developing an appropriate policy mix.
- Resolving issues related to distribution and impact.

The first two challenges encompass the diverse tasks necessary for achieving sustainable technological changes and the barriers to their implementation. The remaining issues pertain to the roles and responsibilities of key actors, such as private enterprises and government bodies, in the transition process.

Each challenge involves specific tasks that are identified and elaborated upon in detail within each section of this article. Additionally, we provide recommendations for addressing and managing these challenges, though specific solutions may vary based on national or regional contexts. The article concludes by outlining several key areas for future research and emphasizing studies that can support green socio-technical transitions.

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