THE CHALLENGES OF TECHNOLOGY TRANSFORMATION FOR SUSTAINABILITY IN THE GREEN ECONOMIC TRANSITION

***Dr. Ramavat Vaijayanti Tulsiram**

Assistant Professor, Department of Commerce

MGV's, M.P.H.Mahila College, Malegaon Camp Dist.Nashik- 423105

ABSTRACT

The Green Economy is a new way of thinking about growth and development that can lead to economic success and better living conditions for people while simultaneously encouraging environmental and social health. Society is currently undergoing a shift in the domains of technology and the green economy. It is changing business paradigms, technological creation and application, consumption and offering, and information sharing in both the human and machine worlds. A green economic strategy should priorities the development and application of sustainable technology. The primary purpose of this study is to highlight a number of issues that politicians and specialists at many levels of society must fully comprehend in order to achieve long-term technological transformation.

And also suggest some future study directions. The debates concentrate on five topics: (i) managing dispersion (and increasingly global) environmental risks; (ii) achieving drastic, instead of incremental, feasible technological change; (iii) green capitalism and also the uncertain business scenario; (iv) the state's role and designing appropriate policy mixes; and (v) addressing sectoral concerns and impacts. Long-term technological development, the article contends, would wish a reassessment of the roles of personal business and government, which future research should focus on the challenges of finding and implementing government reform instrument components in a very range of institutional settings.

Keywords: *Green Economy, Business Paradigms, Technological transformation, global, green capitalism, policy mixes*

INTRODUCTION

Over the past decade, a typical declare has been that conventional financial models want to be reformed if you would like to house weather change, biodiversity losses, water scarcity, etc., while on the equal time addressing key social and economic challenges. This debate was triggered by the worldwide financial crisis of 2008–2009, and these issues are transformed into the goal of a "green economy." additionally, countries everywhere the planet accepted the so-called 2030 Agenda for Sustainable Development goals and its 17 SDGc. These goals emphasize that eradicating global poverty requires measures that not only promote economic process but also address a range of social needs like education, hygiene, welfare, and creating jobs, all while combating pollution and temperature change. As a result, the goals for sustainable development create a real relationship between the ecological and economic systems.

They also emphasize the importance of making the transition to a green economy, which entails a radical shift toward more environmentally friendly manufacturing and consumption practices. In this study, author focus on a key component of such a transition: the creation of sustainable technological progress, i.e., production and consumption patterns that have far fewer negative effects on the natural environment, including the climate changes. The paper specifically covers variety of critical obstacles in sustaining – and overcoming – long-term technological transformation. These difficulties are posed with the goal of communicating key findings from academic research to policymakers, professionals, and also the general public.

Addressing climate and environmental issues clearly necessitates natural scientific understanding further as engineering competence in terms of the various technology solutions that will be accustomed reduce negative consequences (e.g., carbon-free energy technologies). Pursuing sustainable technological development, on the opposite hand, could be a cultural, organizational, social, and economical undertaking that entails variety of non-technical problems. Many areas, like energy generation, installation, and so on, may be characterized as socio-technical systems and/or innovation process, consistent with the so-called transitions literature. These systems are made up of a network of participants (individuals, private enterprises, research institutes, government bodies, and so on), their knowledge, and the associated institutions (legal rules, codes of conduct, etc.). To put it in our own way, the event of latest carbon-free technologies, as an example, may necessitate the establishment of latest value chains containing actors who haven't necessarily engaged within the past; this necessitates a relatively long process which will alter society in an exceedingly number of the way, including legal changes, changed consumer behavior, distributional effects, infrastructure development, and novel business models.

To put it another way, in order to achieve long-term technological transformation, economic and sociological adjustments are required in addition to technological advancement. In reality, there are several examples throughout history that demonstrate the need of addressing the organizational and institutional issues that come with technological change and modernization. During the 20 th century, productivity increased dramatically. Despite the very fact that current was discovered within the late 1870s, electric motors supplied but 5% of mechanical power in American companies in 1900, and it took another 20 years for his or her output to skyrocket. one in all the explanations for the slow adoption of electrical power was that existing factories had to alter their entire operating systems, including the assembly process, architecture, logistics, and also the ways within which workers were recruited, trained, and paid, so as to maximise the advantages of the new technology.

This key premise, that new technology adoption must be accompanied by systemic reforms, applies to both the corporate and the social level. Any new solutions must consider the complexity of the interdependencies between different types of actors with varied backgrounds, overall market dynamics, and therefore the need for knowledge building and institutional transformation. In reality, within the case of green technology, like zero-carbon processes in energy-intensive sectors, systemic reforms could also be especially important.

In light of this, the question of how to foster long-term technological progress is receiving more attention in policy circles and theoretical study. The major goal of this article is to address some of the most fundamental social challenges in seeking such transformation, as well as to present critical policy insights and vital research avenues for the future. We accomplish it by combining different strands of scholarly literature. The study highlighted on the following five overall challenges.

- *(i) managing dispersion (and increasingly global) environmental risks*
- *(ii) achieving drastic, instead of incremental, feasible technological change*
- *(iii) green capitalism and also the uncertain business scenario*
- *(iv) the state's role and designing appropriate policy mixes*
- *(v) addressing sectoral concerns and impacts.*

(i) Managing dispersion (and increasingly global) environmental risks-

Stringent limitations on emissions into the air and water were introduced through the onset of contemporary environmental policy in the year1960s. The focus was, however, almost entirely on fixed pollution sources, which have been reasonably easy to monitor and control, for example, by plant-specific emission guidelines. Furthermore, there was a major focus on local environmental implications during this time period, such as emissions into surrounding river basins having negative impact on other industries and homes in the same town.

However, throughout time, the environmental issues have been increasingly focused on reducing different types of diffuse pollution. These come from a variety of places, including agriculture, road transportation, shipping, and aircraft. Pollution from diffuse sources spreads over broad distances, and while they may not be a major source of pollution on their own, when combined with other diffuse sources, they can have significant overall effects. Universal environmental concerns such as climate variation are becoming increasingly important, and this challenge is being exacerbated by globalization and increased worldwide trade in consumer products. Managing these difficulties frequently necessitates inter-national talks and burden-sharing, which have proven problematic in and of themselves. This challenge is exemplified by the challenges in reaching a sufficiently rigorous global climate contract.

Managing emissions are notably difficult to monitor and, as a result, to control. Environmental authorities, for example, may desire to sanction incorrect waste product disposal because it would help minimize various chemical hazards, yet such performance is often covert and difficult to find out. Plastic garbage is an excellent example; it comes from millions of consumer goods, is moved across the world by currents and winds, and accumulates micro plastics, especially in the ocean. Several hazardous substances are found in consumer products. It's also tough to keep track of how these compounds might spread to humans and the environment. However, controlling diffuse pollution in such a careful manner is difficult. This establishes priorities for which types of actions should be conducted, with waste prevention taking precedence, followed by waste re-use, material recycling, waste recovery, and landfilling. Despite the fact that research has proven that this hierarchy is a sensible thumb rule from an ecological standpoint. Deviations from the grading might be motivated in a variety of ways, thus they must be taken into account.

Supporting product designs that consider reparability and reusability is one significant strategy to encourage product recycling and reuse. A modular product structure can also help to improve recyclability. This, however, comes with a set of challenges. Companies frequently design products in ways in which increase the prices of recycling for downstream processors, yet for institutional reasons, the waste recovery facility is also unable to supply the manufacturer with any incentives to regulate the merchandise design. One example is that the usage of multi-layer plastics for food packaging, which may be difficult to recycle mechanically. While promoting material and energy conservation methods can help to unravel the difficulty of varying environmental impacts.

In summary, the growing relevance of managing dispersion into the natural environment necessitates the development of indirect pollution abatement solutions for environmental preservation. cycling and resource efficiency must not overshadow the need to strengthen hazardous substance and material tracing and tracking, also providing better incentives for product design. There is a need for both technical and organizational advances.

(ii) achieving drastic, instead of incremental, feasible technological change;

Increased material and energy efficiency in existing production processes, as an example, are crucial aspects within the transition to a green economy. More substantial – and maybe radical – technological innovation, on the opposite hand, is required. as an example, replacing fossil fuels in transportation and iron and steel manufacturing necessitates fundamental technological adjustments instead of incremental efficiency gains. However, there are variety of elements that may make radical innovation impossible within the first place. Three major roadblocks are highlighted below.

First, one barrier is that the risk that enterprises that invest in technical development face, together with the financial market's limited ability to cope with the problem of long-term risk-taking. because of an absence of historical data to assess hazards, these markets may fail to supply risk management instruments for immature technologies. There also are fears that global financial sector liberalization has led to personal financial investors taking a more short-term approach. In reality, research reveals that personal enterprises' decision-making could also be skewed toward short-term gains thanks to agency issues, leading to myopic behavior even within the presence of fully efficient capital markets. Secondly, private investors may have limited incentives to make long-term technical development investments.

Third, incumbent technologies frequently suffer unfair competition from new green technologies. Because they were allowed to expand during times of less stringent environmental rules, in addition as more or less tailor-made institutions and infrastructures, the incumbents, which can be close substitutes for his or her greener counterparts, will have a relative competitive advantage.

In summary, more radical technological shifts are required for sustainability, and such shifts are characterized by long and challenging development periods during which new systemic structures such sector networks, supply chain, knowledge, and institutions must be established and aligned with emerging technologies. Overall, the private sector can not be trusted to form these structures on its own, necessitating some kind of official intervention. However, any policy instrument or policy combination that's effective must be supported a radical understanding of the underlying barriers to long-term technological growth. Technology-specific support could also be required since different technologies encounter context-specific learning processes, patenting possibilities, risk profiles, then forth.

(iii) green capitalism and also the uncertain business scenario

Since the beginning of the current environmental debate in the 1960s, economic and environmental aims have been regarded as being incompatible. It has been stated that business decisions are based on profit maximization; attempting to address environmental problems at the same time will result in lower earnings and decreased productivity. However, as concerns about the worldwide economy's environmental footprint have grown, as has the proliferation of organic products, material waste recycling labelling and climate compensation schemes, among other things, sustainability issues have begun to enter mainstream endeavor. In fact, many multinational organizations now not distinguish between environmental and general innovation; the environmental footprints of company operations are virtually constantly considered during the revolution process.

Finally, estimating how far voluntary business activities will take us down the winding road to a green economy is difficult. Industrial firms and sustainability entrepreneurs are likely to contribute to the development of new and/or refined business models (e.g., to allow for increased resource sharing and recycling) as well as the commercialization of innovations, in addition to a variety of incremental developments, such as increased energy and material efficiency as a result of increased digitalization. Businesses will most certainly pay more attention in the future to avoiding future environmental liabilities, such as the costs of contaminated land remediation or the risk of flooding as a result of climate change. It's not surprising that large insurance companies were among the first to recognize climate change as a threat to their survival.

iv) the state's role and designing appropriate policy mixes

Setting suitable "framework conditions" for the economy is a crucial issue for government policy making. This largely pertains to the legal framework, which must be predictable and transparent. Traditional environmental policy that limits emissions through taxes or performance requirements, as well as the elimination of environmentally detrimental subsidies, will continue to be vital. The purpose of such measures is to ensure that the external costs of pollution are internalized in the decision-making of businesses and people. In fact, there are multiple compelling reasons to employ a more diverse set of policy instruments in the green economy. At a broad level, promoting green technology growth, particularly essential innovation, requires a combination of policies.

In the field of waste management, policy mixes is also necessary for a range of reasons. Previous research has demonstrated that a combined output tax and recycling subsidy is a good second-best policy instrument mix in situations when dispersed pollution can't be directly regulated and monitored. The inducement encourages people to use recycled materials rather than virgin resources, lowering the quantity of waste that finally ends up in landfills. Limited incentives for product makers to deal with product design and recallability, which might cut downstream recycling costs for other businesses, could potentially drive an expanded waste management policy mix.

Supporting the development of generic technology on which entrepreneurial enterprises might build is a fundamental function for a green innovation policy. Support for public R&D and co-funding of pilot and demonstration plants helps to create variation and allows for the verification, optimization, and up-scaling of new ideas.

Green energy technology's innovation systems are typically technology-specific. Different technologies are subjected to distinct and multi-dimensional growth processes, such as bottlenecks, learning processes, and capital goods industry dynamics. The nature of knowledge spillovers and long-term dangers will differ, as will the possibility of technological lock-in linked with incumbent technology for green economy. Clearly, technology-specific policies are difficult to draught and implement; regulators often face considerable information constraints, and their decisions may be influenced by politico-economic factors such as bureaucratic incentives and lobby group interests.

In summary, present climatic and environmental challenges demand a combination of policy instruments, not least since the barriers to new sustainable technology are multi-faceted and often change amongst technologies. The addition of technology-specific laws to standard environmental rules should help to boost green innovation. This is a problem for policymakers since it necessitates a better understanding of how various policy measures interact and also the organizational factors in which they are used.

(v) addressing sectoral concerns and impacts.

The transition to a green economy, which involves technological advancement, has far-reaching implications for society as a full. Not only must new technology performance be optimised and efficient policies established, but the foremost significant distributional implications of technological change must even be recognised and addressed. All cultural changes have winners and losers, and thus the planned green transition may lack credibility among various major groups in society unless this may be understood and addressed. In South Africa, water conservation programme is an example of a green economy effort that fails to adequately understand the social dimensions of its goals.

This problem entails a variety of variables of distributional implications. One such dimension is the impact on households of various income levels. The importance of the regional dimension of sustainable development cannot be overstated. One issue in this scenario is that people are increasingly expecting any green investments made in their own town to encourage regional development, employment, and other social purposes. The growing assertion of people's rights and increased demands for direct participation in relevant decision-making processes can also be ascribed to the increased emphasis on distributional impacts at the regional level. However, green technologies may fail to have a significant positive influence on local and regional revenue and employment. Ignoring the distributional effects of long-term technology progress leads to societal conflicts, which increases commercial risks for businesses and entrepreneurs.

In summary, the varied distributional implications of sustainable technology progress should be given more attention in both scholarly study and policymaking to guarantee that this change occurs in ways that contribute to alleviate poverty. These consequences may necessitate a wider range of policies, but they also necessitate challenging trade-offs between efficiency and justice.

CONCLUSION

The breadth and depth of the societal challenges that arise as results of climatic and environmental threats are multidimensional, and during this essay, we've got focused on five major roadblocks to long-term technological advancement. These problems are universal, and that they should worry most areas, whether or not the precise answers vary counting on things. We finish by briefly outlining variety of consequences and prospects for future research endeavors during this final part. These knowledge gaps could offer valuable insights to both the scholarly community and policymakers and officials.

It should go without saying that comprehending the nature and managing socio-technical transformations is a multidisciplinary endeavor. Natural scientists and engineers, on the one hand, and social scientists, on the other, must work together to translate environmental and technical concerns into societal challenges and action. However, it is important to remember that technological change is not a linear process which includes phases such as concept development, pilot and demonstration projects, market formation, and technology dissemination, as well as significant iterations between these phases. In order to get a more in-depth understanding of how technology-specific engineering ideas might be marketed in various institutional contexts, it should be explored how bridges between different technical and social scientific fields can be constructed. Transformation studies, creative and ecological economics, as well as literature on the innovation ecosystem and technology management, among other things, may be able to help build such linkages. Other types of systems research, including power system optimization methods, will be crucial.

The comments in this paper also propose that future study should focus more on green economy. Of course, this could include new and/or altered policy instrument design, as well as numerous institutional and organizational innovations. The difficulties of establishing and executing technology-specific sustainability policies, sometimes referred to as green industrial policies, necessitate such innovation. Rather than a set of specific policy tools, these strategies are fundamentally processes of finding by both the state and industry. This entails constantly learning about the restrictions and opportunities that exist, and then responding to them.

Furthermore, the growing importance of dispersed emissions necessitates green innovation in government. Implementing environmental standards that are near to causing damage, in particular, necessitates the use of specific monitoring technology that can quantify pollutant levels. The development of innovative technologies for exa, allows for low-cost monitoring of pollutants – should be encouraged, However, it is questionable who has the motivation to strive for it and conduct such research and development. Concerns about advancements that enable consumers to better assess the environmental impacts of various products and services can be expressed in a similar manner. Private enterprises are unlikely to pursue these types of green inventions vigorously. Governments often invest considerable sums in R&D for pollution reduction technology, but we rarely see government programmes sponsoring research on technologies that can aid in implementation and environmental monitoring.

Finally, research that includes numerous effect evaluations, as well as systematic innovation in outcome measures, should facilitate the transition to a green economy. This refers to evaluations of the impacts of key baseline trends like digitalization and automation, globalization verses nationalization, and so on environmental and distributional outcomes, as well as the prospects for green innovation collaborations and various circular economy-inspired business strategies. Such studies could be particularly beneficial in establishing future greening paths for important industrial sectors. Better evaluations of policy tools and policy combinations are, without a doubt, essential. Such analyses are far from straightforward, especially in light of the growing importance of technology-specific rules. They must consider the different policies that play a role in innovation systems, as well as the importance of key policies. They must take into account the many policies' roles in the modernization systems, as well as crucial communication effects; any evaluation must also take into account policy learning through time.

REFERENCES

1. A. Technological development for sustainability: the role of network management in the innovation policy mix. Technol Forecast Soc Chang.
2. Åhman M, Nilsson LJ, Johansson B. Global climate policy and deep de- carbonization of energy-intensive industries. Clim Pol. 2017
3. Arthur WB. Competing technologies, increasing returns, and lock-in by historical small events. Econ J. 1989
4. Avent R. The wealth of humans: work, power, and status in the twenty-first century. London: St. Martin's Press; 2016.
5. Barbier E. How is the global green new deal going? Nature. 2010
6. Bartelmus P. The future we want: green growth or sustainable development? Environ Dev. 2013
7. Bek D, Nel E, Binns T. Jobs, water or conservation? Deconstructing the green economy in South Africa's working for water programme. Environ Dev. 2017
8. benefit-sharing: the case of northern Sweden. Renew Sust Energ Rev. 2015
9. Bennear LS, Stavins RN. Second-best theory and the use of multiple policy instruments. Environ Resour Econ. 2007:
10. Bergquist AK, Söderholm K, Kinneryd H, Lindmark M, Söderholm P. Command-and-control revisited: environmental compliance and technological change in Swedish industry 1970–1990. Ecol Econ. 2013
11. Budish E, Roin BN, Williams H. Do firms underinvest in long-term research? Evidence from cancer clinical trials. Am Econ Rev. 2015
12. Calcott P, Walls M. Waste, recycling, and 'design for environment': roles for markets and policy instruments. Resour Energy Econ. 2005
13. Cherian, J.; Gaikar, V.; Paul, R.; Pech, R. Corporate Culture and Its Impact on Employees' Attitude, Performance, Productivity, and Behavior: An Investigative Analysis from Selected Organizations of the United Arab Emirates (UAE). J. Open Innov. Technol. Mark. Complex. 2021, 7, 45. https://doi.org/10.3390/joitmc7010045
14. Ciscar J-C, Saveyn B, Soria A, Szabo L, Van Regemorter D, Van Ierland T. A comparability analysis of global burden sharing GHG reduction scenarios. Energy Policy. 2013
15. Cohen B. Sustainable valley entrepreneurial ecosystems. Bus Strateg Environ. 2006
16. David P. The computer and the dynamo: an historical perspective. Am Econ Rev. 1990
17. Dechezleprêtre A, Glachant M, Mohnen M. Knowledge spillovers from clean and dirty technologies: a patent citation analysis. Working paper no. 135. London: Grantham Research Institute on Climate Change and the Environment; 2017.
18. Del Rio P, Bleda M. Comparing the innovation effects of support schemes for renewable electricity technologies: a function of innovation approach. Energy Policy. 2012
19. Eggert RG, editor. Mining and the environment: international perspectives on public policy. Washington, DC: Resources for the Future; 1994.
20. Ejdemo T, Söderholm P. Wind power, regional development and
21. Jacob Cherian (2020). 'An empirical study on impact of sustainability-oriented total quality management practices on organizational performance in UAE based organization', International Journal of Mechanical and Production Engineering Research and Development (IJMPERD; http://www.tjprc.org/journals/journal-of-mechanical-engineering.
22. Jacob Cherian and Dr. Paul Raj P et al (2020), 'Do leadership styles impact organizational performance in the UAE context? A study' International Journal of Mechanical Engineering and Technology (IJMET), Volume 11, Issue 9, 2020 Pp. 23-32 http://www.iaeme.com/ijmet/issues.asp?JType=IJMET&VType=11&IType=9
23. Organisation for Economic Cooperation and Development (OECD). Interim report of the green growth strategy: implementing our commitment for a sustainable future. Paris: OECD; 2010.

24. Paul Raj P and et al (2020), 'The role of cultural diversity and how they impact work team performance' International Journal of Mechanical Engineering and Technology (IJMET), Volume 11, Issue 9, 2020 Pp. 11-22) http://www.iaeme.com/ijmet/issues.asp?JType=IJMET&VType=11&IType=9

25. Popp D, Newell R. Where does energy R&D come from? Examining crowding out from energy R&D? Energy Econ. 2012

26. Rogge KS, Reichardt K. Policy mixes for sustainability transitions: an extended concept and framework for analysis. Res Policy. 2016

27. Söderholm P, Hellsmark H, Frishammar J, Hansson J, Mossberg J, Sandström

28. United Nations Environment Programme (UNEP). A guidance manual for green economy policy assessment. New York: United Nations; 2014.

29. United Nations Environment Programme (UNEP). Towards a green economy: pathways to sustainable development and poverty eradication. Nairobi: United Nations; 2011.

30. United Nations Framework Convention on Climate Change (UNFCCC). 2016 biennial assess-ment and overview of climate finance flows report. Bonn: United Nations; 2016.

31. Unruh GC. Understanding carbon lock-in. Energy Policy. 2000;

32. Van Ewijk S, Stegemann JA. Limitations of the waste hierarchy for achieving absolute reductions in material throughput. J Clean Prod. 2016

33. Walls M, Palmer K. Upstream pollution, downstream waste disposal, and the design of comprehensive environmental policies. J Environ Econ Manag. 2001

34. Williamson O. Credible commitments: using hostages to support exchange. Am Econ Rev. 1983.