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# Circular Economy Strategies For Resource Efficiency And Sustainable Development In Manufacturing Industries

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## Abstract

*The circular economic strategies are interrelated with those economic activities which help to save resources. This enhances the value of all resources which can be recycled or reused. In modern times several manufacturing industries like the electronics industry, toy industry, furniture and home appliances industries use this economic strategy for organisational development. Refurbishment is another important method which helps to remake the old material as new. This helps to develop sustainable processes of development and reduces the factors which cause environmental degradation. This study has discussed about the effects of circular economic activities on the sustainable development of manufacturing industries.*

***Keywords:*** *Manufacturing industries, recycle, reuse, refurbish and sustainable development.*

## Introduction

The term economic development denotes the development of the purchasing power opportunity and the development of earning through the conduction of economic activities. On the other hand, the resources are limited and they need fru[1]itful utilisation of resources to increase the production quantity as well as decrease the wastage amount. Circular economy strategies help to reuse resources by converting them into different forms. On the other hand, the resources are being reused through the use of different techniques and technology to reduce the cost of production. This study has analysed the impact of circular economy strategies on the processes of increasing resource efficiency and sustainable development.

## Aim

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This study aims to analyse the impact of circular economy strategies on the sustainable development, resource management and development of manufacturing industries.

**Objectives**

- To analyse the impact of circular economy strategies on resource management
- To know the meaning of sustainable development and how it helps to make fruitful utilization of resources
- To inspect the factors which create obstacles in the implementation of circular economy strategies
- To suggest the most effective ways to use circular economy strategies for sustainable development

**Literature review**

**Concept of Circular Economy Strategies and its effects on economic development**

There are limited resources on the earth and the development of economic plans has been done to make fruitful utilisation of the resources. Circular economy strategies include those manufacturing processes which help to reuse the resources in several forms (Yang et al. 2023). Economic development is possible through the implication of resource management strategies. This means the processes which help to reuse the resources and manage to reduce wastage quantity is best for the economic development. On the other hand, circular economy strategies help to increase the value of resources by implementing reuse strategies (Dissanayake & Weerasinghe, 2021). The most important strategies of the circular economy are rethinking, reusing, reducing, repairing, recycling and refurbishing. All these different processes of circular economy strategies have the same objectives (Eberhardt, Birkved & Birgisdottir, 2022). Resource management strategies need to be implemented in all economic sectors to reduce the wastage of resources. The income of an organisation increases with the development of a resource management plan (Rahla, Mateus & Bragança, 2021). Most effective resource management plans help to reduce wastage and cost of production too.


**Figure 1: Circular economy strategies**

(Source: Influenced by Baars et al. 2021)

The above figure represents circular economy strategies which help to know its effectiveness. The recycling process of circular economy strategies helps to reuse resources multiple times (Baars et al. 2021). Refurbishing is an important process of this economic strategy as this guides the remaking of any old material as new. Thus, the implication of circular economy strategies is important for reducing the cost of production which is essential for economic development.

**Effects of circular economy strategies on the resource management and sustainable development processes in manufacturing industries**

Circular economy strategies are quite helpful and guide to reuse the of resources. This strategy increases the value of resources and helps enhance the resource management system process. Circular economy strategies help to reduce wastage and enhance the resource management processes (Velasco-Muñoz et al. 2021). This means that circular economy strategies are important for reducing wastage, and fruitful utilisation of available resources. On the other hand, the processes that followed in the circular economy strategies reduce the rate of pollution (Liu et al. 2022). Environmental degradation can be controlled through the implementation of these economic activities. Circular economy strategies have been invented to promote the views of sustainable development (Bertino et al. 2021). Thus, the implication of circular economy strategies is important for sustainable development and to manage resources.


**Figure 2: Supply chain circle of circular economic strategies**

(Source: Mah, 2021)

The above figure helps to under the processes that followed in the circular economic strategies. Understanding of the circular economic chain is important for developing the best resource management plan (Mah, 2021).

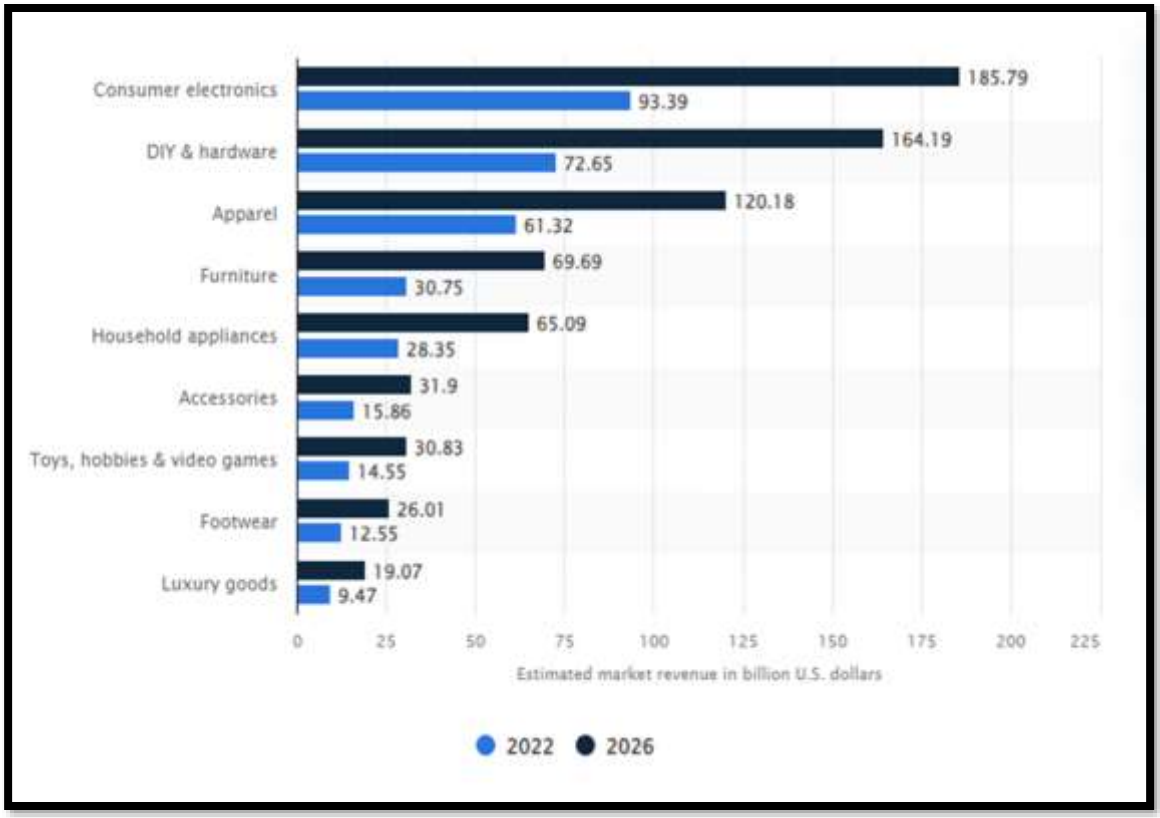


**Figure 3: Revenue of circular economy market from 2022 to 2026**

(Source: Statista, 2023)

The above figure represents the revenue amount of the circular economy from 2022 to 2026 in different sectors. The revenue of the circular economy of consumer electronics products is highest which is 93.39 billion US dollars in 2022 and is expected to increase to 185.79 billion US dollars (Statista, 2023). The revenue of other important circular economy sectors is DIY and hardware, apparel, furniture, and household appliances and their revenue were 72.65 billion USD, 61.32 billion USD, 30.75 billion USD and 28.35 billion USD respectively in 2022. This figure has been used to demarcate the development scope and future possibilities of a circular economy structure.

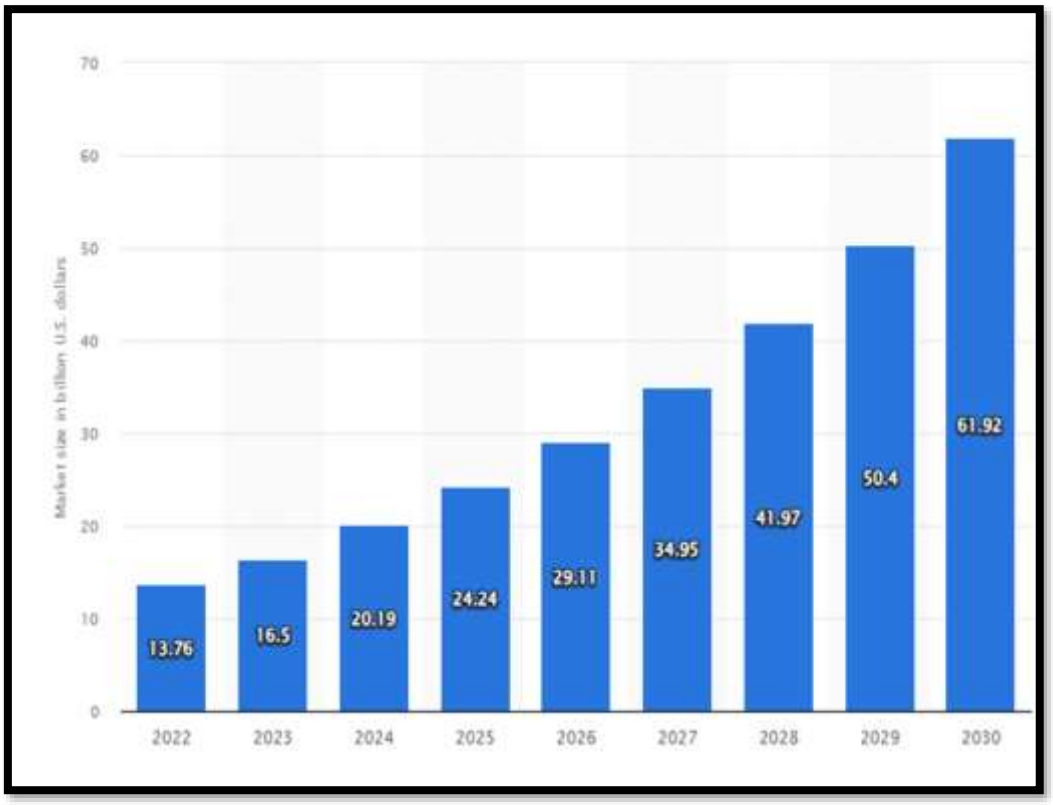


**Figure 4: Market size of green technology and sustainability strategies from 2022 to 2030**

(Source: Statista, 2023)

The above figure represents the market size of green technology which is essential for sustainable development. The market size of green technology was 13.76 billion US dollars in 2022 and that increased to 16.5 billion US dollars in 2023 (Statista, 2023). The market size of this technology is expected to increase up to 61.92 billion US dollars in 2030. Green technology depends on renewable energy. This technology reduces pollution and helps to enhance environmental conditions (Klein, Ramos & Deutz, 2020). Thus, the implication of green technology reduces the cost of production and promotes the thoughts of sustainable development.


**Figure 5: Different processes of circular economy strategy**

(Source: Influenced by Peña et al. 2021)

Circular economic strategies help to develop environmental conditions as this preferred sustainable production process (Peña et al. 2021). The implication of this technology is cost-effective and reduces the quantity of organisational pollutants.

**Challenges that create problems in the implementation of circular economy challenges**

The most important challenge of the circular economy challenges is related to its installation cost. The cost of these technologies is comparatively higher than the traditional technologies. The primary cost of modernised and innovative technologies is high and it becomes a barrier to these technologies (Moktadir et al. 2020). On the other hand, traders face difficulties in finding an effective circular supply chain. On the other hand, the circular economy strategies are complicated processes and need more technological support or innovations (Akinade et al. 2020). These are the challenges that decrease the potentiality of this technology.

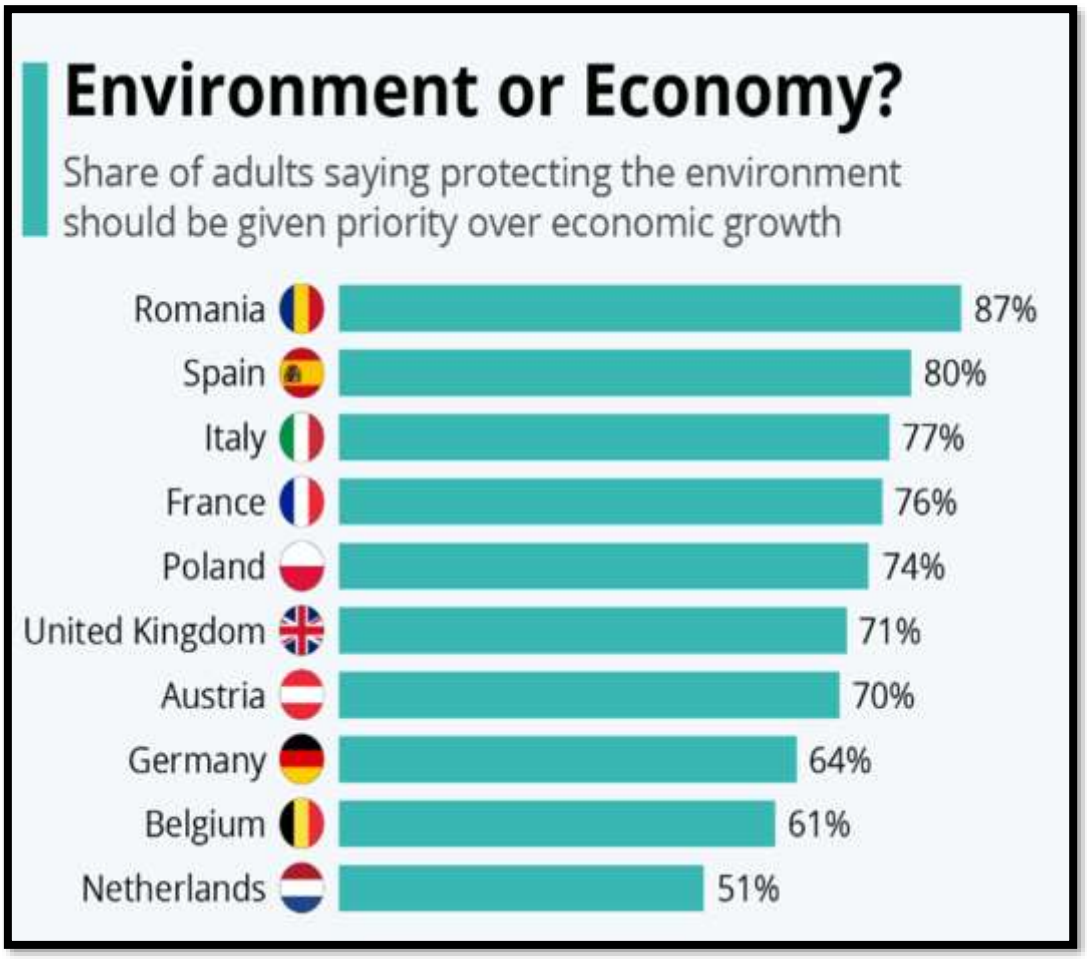


**Figure 6: The number of respondents who support environmental development rather than economic growth**

(Source: Statista, 2020)

The above figure represents a survey report where the respondents support environmental development over economic development. The opinion of 87% respondents of in Romania has argued about environmental development (Statista, 2020). This figure has been used in this study to represent the need to use sustainable energy in the manufacturing industries. The government need to support the manufacturing industries to implement sustainable technologies (Acerbi & Taisch, 2020).

**Theoretical frameworks**

**Sustainable development theory**

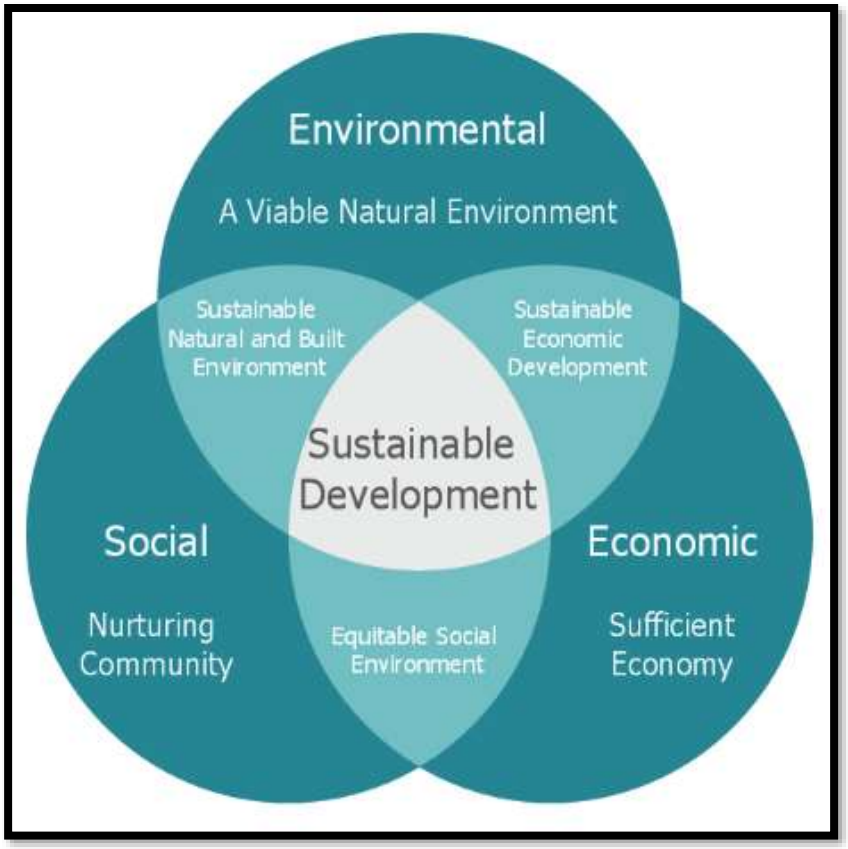


**Figure 7: Sustainable development theory**

(Source: 18)

This theory has been defined by the World Commission on Environment. The main objective of this theory is to guide human beings to follow the paths of sustainable development. Sustainable development is the most crucial thing and this needs to be used to save the environment (Lonca et al. 2020). This theory has been used in this study to state the importance of sustainable development and its effects. Green technology and circular economy strategies need to be followed to promote the views of sustainable development and reduce pollution (Joensuu, Edelman & Saari, 2020).

**Methodology**

The modernised economic activities and scope are increasing with technological development. Technological support is necessary for developing the production processes and production quantity (Hailemariam & Erdiaw-Kwasie, 2023). Circular economic strategies mainly include processes such as refurbished, recycling and reuse technologies and this depends on the technological innovations. The use of green energy is increasing in the global market as this helps to reduce the cost of production (Rusch, Schöggl & Baumgartner, 2023). Modernised technologies increase the scope of using green technologies such as solar technology, windmills, and hydro-power systems. These methods help to increase opportunity for industrial sectors by reducing production costs (Neligan et al. 2023).

## V. Findings and results

The development of sustainable technologies and circular economy strategies are necessary for solving the problems of scarcity of resources. The manufacturing costs of the industries are increasing with the rising price of fossil fuels (Fortunati, Martiniello & Morea, 2020). Circular economy strategies help the manufacturing industries to use the same resources circularly through the process of recycling and refurbishing. Circular economic practices help to reduce the cost of raw materials (Ferasso et al. 2020). This increases the profit-making scope of manufacturing industries. On the other hand, sustainable technologies are those technologies which have less pollution rate or no pollution (Kennedy & Linnenluecke, 2022). These technologies include electric energy, hydropower energy, wind energy and solar energy. The sustainable path of industrial development is quite complicated and there is more research and development for a successive technical update (Pan, Wong & Li, 2022).

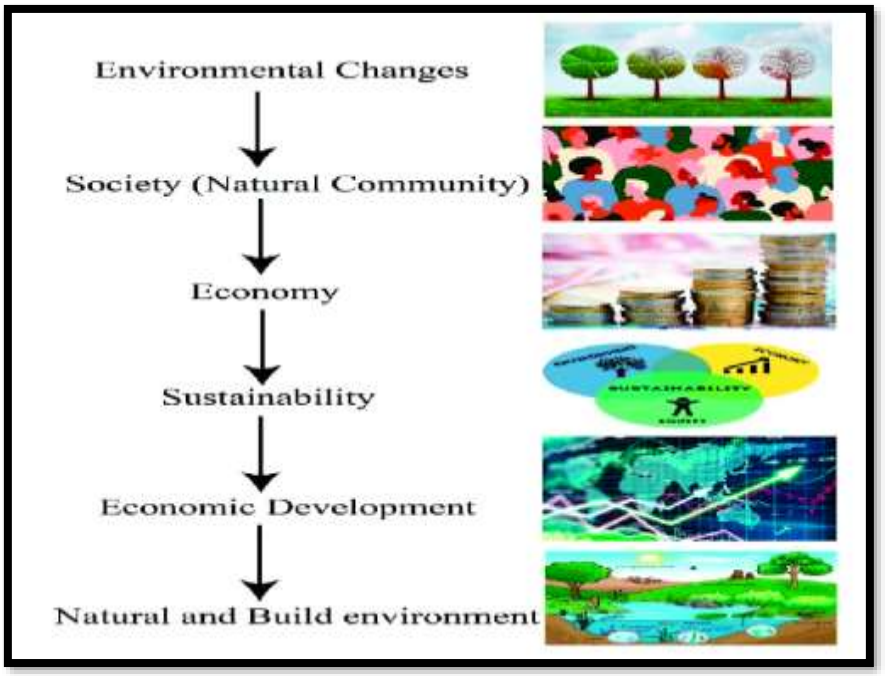


**Figure 8: Relation between environment and sustainability**

(Source: Influenced by Giorgi et al. 2022)

The green energy is the main future of the earth after fossil fuel. The consumption of fossil fuels like coal, and petroleum products degrades the environmental condition and there needs to be a substitute product to save the planet from industrial pollution (Giorgi et al. 2022).

Manufacturing industries of electronics, furniture, home appliances, accessories, footwear, toys, and luxury goods are using circular economic strategies. These industries are increasing their business by following processes like refurbishing, reusing and recycling (Akhimien, Latif & Hou, 2021). This helps to increase the revenue generation capabilities of manufacturing industries. The adaptation of modernised technologies is complicated and the government should provide ample scope to the manufacturing industries to shift their technologies (Smol et al. 2020). The governmental contribution helps to motivate the

manufacturing industries to follow the sustainable path of production. The use of solar energy is gradually increasing with the development of solar plant technology (Mazur-Wierzbicka, 2021). Thus, it has been analysed that the use of circular economic strategies enhances the opportunity for manufacturing industries to reduce production costs. On the other hand, this economic practice is quite capable of managing the quantity of solid waste (Maranesi & De Giovanni, 2020). Thus, this study has found that this practice brings a revolution in the industrial field.

**Discussion**

Circular economic strategies are full of innovative technologies where the used materials and waste products are being used as raw materials. This strategy reduces the cost of raw materials as well as increases the value of used products. The use of waste products helps to manage solid waste and plastic waste (Opferkuch et al. 2021). Manufacturing industries are using this strategy to reduce production costs and earn higher revenue. The implication of circular economic strategies is essential for sustainable development (Awasthi et al. 2022).


**Figure 9: Features of sustainable development**

(Source: Influenced by Santa-Maria, Vermeulen & Baumgartner, 2022)

A sustainable development system reduces pollution rate and it is essential for enhancing the quality of air and water. Manufacturing industries are reusing water, resources, and energy too (Hoang et al. 2022). The coal energy can be reusable after converting it into the form of charcoal. Manufacturing industries are facing financial challenges to implement modernised and sustainable-based technologies (Santa-Maria, Vermeulen & Baumgartner, 2022). The governmental subsidies will increase their interest in using circular economic strategies and green energy. Fossil fuels are not renewable energy and this creates huge air pollution which adversely affects the earth's environment (Androniceanu, Kinnunen, & Georgescu, 2021).

Thus, the innovation of precise and supervised technology is important for increasing the use of circular economy strategies.

## Conclusion

This study has found that circular economic strategies are being followed in the manufacturing industries to reduce production costs. On the other hand, this is one of the best strategies that promote sustainable development. The installation cost of these technologies is comparatively higher and this factor ceases the organisational motives to use this technology. On the other hand, the government and several international organisations are providing subsidies to develop green energy-based technologies. The development of sustainable processes of manufacturing is essential for reducing pollution and organisational costs. The market value of the circular economy strategy is increasing with increasing its benefits and usability in the industrial sector. This has been concluded that circular economic strategies need to be followed for the sustainable growth of manufacturing industries.

## Future of the research

This study has been prepared to represent the usefulness of circular economy strategies and sustainable sources of energy in the manufacturing industries. It has been analysed that this strategy of production reduces the cost of production and increases the opportunities for manufacturing industries to get higher returns from businesses (Oluleye et al. 2022). On the other hand, this study helps to understand the positive effects of using sustainable energies. The use of sustainable energies reduces the environmental degradation rate and helps to develop the business without hampering the environmental elements (Bressanelli et al. 2020). This study helps to understand the values of modernised technologies which divert the energy consumption methods. Thus, this study is helpful for those people who are connected with the manufacturing industry. On the other hand, this can guide the values of renewable energies which is important for future development.

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