
THE IMPACT OF CIRCULAR ECONOMY ON ECONOMIC DEVELOPMENT IN EGYPT

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Abstract: *In response to the climate challenge, an alternative economic system is gaining popularity and interest: the circular economy. The main objectives of this research is to Change behavior and spread the awareness about circular economy to reduce pressure on the environment by reducing the amounts of wastes and keeping resources in circulation to generate more environmental, financial and economic benefits. Through this research we investigated the impact of circular economy on fashion industry (circular fashion) on water and energy expenses, increasing income and decreasing cost; and the percentage of pollution.*

The methodology used in this research is the quantitative method, where primary data were collected through the questionnaires. The research proved a significant correlation between the independent variable and all the above mentioned dependent variables. All of those correlations have a great reflection on environmental, social and economic performance that lead to economic development. Furthermore, the research shows how the application of circular fashion can be done in small scale (13 villages). Moreover, how the implementations on small scale (13 villages) support the implementations on large scale (all over Egypt) and accelerate the economic resilient development.

Keywords: *Circular economy, Cradle to cradle, Cradle to grave, Traditional linear economy, Circular fashion, EPA (Environmental Protection Agency), Garments, Systems thinking, Recycling, Reuse in cascades, Door to door waste collection, 13 villages.*

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Introduction

In response to the climate challenge, an alternative economic system is gaining popularity and interest: the circular economy. This research is going to be about the circular economy or the cradle to cradle life system and its impact on economic development.

Circular economy is the best alternative to linear or traditional economy which aims to keep resources in circulation and generate zero wastes. Therefore, Building capital rather than producing is the most important issue that should be taken in consideration; because building strong and wealthy capital means building strong and healthy economic basis .otherwise, it will reflect on the GDP and develop the economic statue. Nowadays, circular economy is considered as a fast new model for resilient growth. So the circular economy is the best solution to build healthy infrastructure, cradle to cradle life system and sustainable economic system.

Circular economy means keeping resources in circulation as long as possible to extract the maximum value from them and generate zero wastes.it not only increases the economic growth but also the economy development in the country. Circular economy could be implemented in several ways such as circular fashion, waste management and cultivation through biological residuals for example cultivating mushrooms from coffee residuals.

The fashion industry has an important role in the path towards sustainability, the circular economy and economic development. Due it's highly environmental impact. Furthermore, circular economy's process is very complicated to implement; because it depends on 20% technology and 80% changing behavior. For this reason, we will start implementations on small scale (13 villages) to make it more easily to achieve it in effective and right way and after that we will extent all over Egypt. The following section overview the literature, followed by the methodology and finally the conclusion.

Literature Review

The traditional linear economic growth model is only seeking to achieve the GDP growth and economic development at the expense of the environment and the resources. Beside, this model has unethical flaws and considered as a "from cradle to grave" approach; in which means having a hidden agenda to maximize sales and at the same time still producing wastes .on the contrary, the circular economy development model sets the principles of "Reduce, Reuse and Recycle", the holistic value principles and sustainable value principles to achieve sustainable development, "from cradle to cradle" approach and remedy the ethical flaws of the traditional linear model. Therefore, circular economy is considered as ethical and sustainable development approaches that create actual welfare and economic development. (Qiao, F.and Qiao, N., 2013), (Veronica Prez, 2021).

According to the EPA (Environmental Protection Agency), reusing is basically increasing the useful life of an item or material. Learning to reuse items and materials is an essential step in the waste management hierarchy. Keeping a box of things, you can reuse (not hoarding, though) is a good way to start to reuse, for example, using second-hand clothing. (Hyejune Park, 2020)

There is a linkage between circular economy and economic growth. Peter proved in his research how the growth and implementations of circular economy can potentially deliver economic benefits such as increased material productivity and low structural unemployment and how the indicators to support a developing circular economy can be constructed from available information with examples from the UK and Europe; also it presents the results from an indicative quantification of pervious scenarios illustrating the expansion in circular economy activities in Europe to 2030 through the labor market potential.

The importance of an expansion in circular economy activity comes from the observation that across Europe there are substantial economic and environmental challenges in the way its economies utilize labor and scarce natural resources. In 2014, unemployment had increased in every single European country except Germany compared to 2008 when the financial crisis began. There are indicators that employment is recovering and unemployment is starting to show signs of stabilization or is falling in some countries across Europe , but unemployment remains sharply higher in many countries, especially for certain occupational types and age groups. Beside substantial environmental benefits, the potential growing of circular economy offers to create jobs through decreasing structural mismatch in high unemployment regions in Europe. The Development of circular economy itself considered as a major industrial transformation, because when previous

industrial transitions have focused on labor productivity and have often involved using less labor and the creation of high unemployment, the growth of circular economy involves using more labor and fewer resources to increase efficiency in economic activity. (Mitchell, Peter and James, Keith, September 2015) (Roxy Nucu, 2020).

There are two facts that Donald A.R. George followed in his research, the first one is the Environmental quality cannot be maintained or improved via economic growth. And the second one is the improvement in environmental quality can only be achieved by an increase in the environmental self-renewal rate or the recycling ratio. So in his research, he presented a theoretical model merging the concept of circular economic activities and constructed a circular economy model with two types of economic resources. The first one is polluting input and second one is recyclable input. Because their results indicate that the factors affecting economic growth include the marginal product of the recyclable input, the recycling ratio, the cost of using the environmentally polluting input and the level of pollution arising from the employment of the polluting input. Also, their analysis shows that opposite to the Environmental Kuznets Curve (EKC), the environmental quality cannot be maintained or improved via economic growth. Instead, the improvement in environmental quality as measured by a reduction in pollution can only be achieved by an increase in the environmental self-renewal rate or the recycling ratio.

So the best solution to resolve the problem of decreasing economic resources is developing the perspective of circular economy, substituting the conventional unidirectional concept of resources and products in the market economy with the circular economy and achieving sustainable growth and treat economic waste as a useful economic resource. (George, Donald and Lin, B.C.A. and Chen, Yunmin, November 2015), (Laxmi Adrianna Haigh, 2022).

Nowadays, there are some problems like the resources shortage, resource exhaustion and environment pollution resulted from economic development. That's make people pay more attention to environment and resources. Under the concept of the cycle utilization of materials, circular economy could improve the utilization efficiency of resources and energy, and farthest decrease waste emission, and protect the ecology environment. (Chuang, Li, January 2010). There is a need for growth parameter beyond the gross domestic product (GDP) due to no accounting of many elements of general well-being. Also Integration of economic and ecological factors is essential for identifying priorities and formulating policies for sustainable development. So the natural Capital Approach is the tool to protect native

ecosystem integrity and facilitate sustainable development. Furthermore, Identifying and quantifying this capital and its ecosystem services provides additional economic rationale for effective environmental planning and management. (Karki, Bhavna, January 2015), (Paul Glaum, Valentin coccco, and Fernanda S. Valdovinos, 2020).

There is a huge impact of fashion industrial development on growth and the impact of this growth on poverty and income inequality .fashion has affected on Economic Growth from Egyptian Small Industries through the Home Economy theories. Moreover, the share of poor people in the global population has declined during recent decades. (Elnashar, Elsayed, February 2020).

Textile and garment industry ranks among the dirtiest sectors in the world .the control of social and environmental resources in the entire product life cycle is consider as the long-term success of this sector. The concept of 'circular economy' (CE) is rapidly becoming a new model for resilient growth. Despite that CE is still only widely recognized as a waste management and recycling strategy, but the economic opportunities are much broader and more diverse. To guarantee sustainable growth the success of the CE in developing countries will be important to global efforts .Brazil's textile and garment industry is considered as the largest full textile chain in the West and ranks among the top textiles and apparel producers in the world. Moreover, this sector is the second largest generator of producing jobs in Brazil. In contrast, of the estimated 8 million workers, 6.5 are irregular. So the circular approaches have value network and economic benefits fit with existing domestic industrial and social development strategies and support them, (Galatti, Leticia and Baruke-Ramos, Julia, November 2019).

In the literature review, the relation between the circular economy and economic development in general was mentioned, also how the circular economy can be a very important tool to enhance environmental and economic performance, and how its absence also can affect their performance in a negative way. The previous points were mentioned generally and not particular in Egypt; but in Egypt, there are a lot of resources but we follow the traditional economy or the linear economy and "cradle to grave" strategy that waste a lot of those resources and leads to resources shortage, resource exhaustion, environment pollution, negative externalities and useless residuals on the long term. Gradually, there is no economic development will be happened even if there is economic growth. Because it makes no sense to achieve high economic growth rates and individuals in society suffer from poverty and environmental degradation so, what we mean here is achieving economic development, not just increasing economic growth.

Fashion industry ranks as a second polluter after oil industry; moreover, fashion industry requires a very long and complicated supply chain; which is associated with large consumption of water and energy, use of chemical substances, water and air pollutions, wastes from production and finally micro plastic generation. (Fashion Issues). There is a lack of awareness about the waste management collection and how to separate biological wastes and technological wastes to implement effective circular economy. In 13 villages, there are a lot of resources and wastes, also there is a lack of income sources and huge number of unemployment; but they didn't know how to extract the maximum benefits from those resources .Moreover, they have harmful behavior on the environment.

Research Objective

Based on research problem, the research objectives can be:

- Achieving the circular economy and cradle to cradle life system.
- Boosting economic development.
- Reducing pressure on the environment by reducing the amounts of wastes.
- Changing behavior and spread the awareness.
- Creating source of income.
- Keeping resources in circulation to generate more environmental, financial and economic benefits by circular fashion, door to door collection.
- Solving the economic and environmental problems in 13 villages by establishing economical relationships with each other.
- Doing collaborations with government and private sectors to help in implementations.

Research Importance

This paper will highlight the impact of circular economy on economic development, and how the creation of the most effective possible ways to implement circular economy enhances the economic and environmental performance. Moreover, how the implementations on small scale (13 villages) support the implementations on large scale (all over Egypt) and accelerate the economic resilient development. Circular economy has large scale of implementations in several fields. Therefore, this paper mainly

focuses on circular economy in fashion industry which is circular fashion and measures its impact.

The paper aim to answer the following questions : Are the electricity and water expenses influenced by circular fashion? Are increasing income and decreasing costs influenced by circular fashion? Is the percentage of pollution influenced by circular fashion?

The objective of the following section is to highlight the different aspects concerning the circular economy, and its relation to different variables including circular economy in fashion (circular fashion), circular economy through door to door's collection , circular economy coffee cultivation and the economic development.

Circular Economy

The circular economy is different from traditional economy or linear economy. The linear or traditional economy is focusing to produce largest amount of products rather than building capital or taking the environment in consideration. It deals with raw materials in an inefficient way by following (take – make or produce – dispose) process. It follows short term strategy from purchase to sales. It also follows down cycling strategy for reusing the products, which means to take a product or material and turn it into another thing of lesser value, and in some cases, it compromises the integrity of the material so it can't be turned back into the original product or another product in the same quality. (Bocken, Bakker & De Pauw, 2015) (Dora Chixu, 2020).

Circular economy is an alternative to a traditional linear economy in which means closed loop system to keep resources in circulation for as long as possible, extract the maximum value from them and the raw materials, components and products lose their value as little as possible, then recover and regenerate products and materials at the end of each service life or product life. To implement circular economy it requires 20% of technology and 80% of changing behavior. (Bocken, Bakker & De Pauw, 2015).

There are more than 100 different definitions of circular economy because the concept of circular economy is applied by a diverse group of researchers and professionals .While this diversity of definitions makes it more difficult to make circularity measurable. (Julian Kirchherr, M.P. Hekkert, 2017).Consequently, there is a huge consensus that the most of definitions often focus on the use of raw materials (resources) or on system change and the definitions that focus on resources usage often follow the 3-R approach: (Bocken, Bakker & De Pauw, 2015) (Dora Chixu, 2020).

Reduce: which means minimize use of raw materials.

Reuse: it means maximize reuse of products and components.

Recycle: which means high quality reuse of raw materials.

Typology of Restorative Systems in Circular Economy According to the Type of Materials

The inner circle: This system is more related to technical materials than the biological materials. This system follows the rule of the smallest or inner circle, the less processing, labor, energy and new material required to be of original value again. (Ellen MacArthur Foundation, December, 2015). There are different reuses levels for technical material cycle which are:

- **Maintenance and repairing:** to repair and maintain during the usage period to extend the lifespan as much as possible.
- **Redistribution or reusing:** to direct reuse by remarketing the product.
- **Remanufacturing or refurbishing:** to totally refurbish and repair of product through the manufacturer.
- **Recycling:** to retrieve and regenerate parts or materials from the products for another reuse.

Reuse in Cascades: Cascading means using a part of the product for another application when a product doesn't able to perform its initial function any more. Cascading is different than the ordinary reuse or recycling in changing function and the extent to which the product is processed. During cascading, the quality of material is reduced and energy is also consumed. (Ellen Macarthur Foundation, January, 2021). For more explanation: if i have a cotton t shirt, when it reused, it will be sold in a second-hand shop as worn T-shirt. When it recycled, it will be shredded into cotton fibers then spun into new yarn, and in case of Cascading, the old T-shirt will be used as cushion filling.

Long Term Cycles : This is strategy for both the biological materials and the technical materials which aims to keep the lifespan of a product as long as possible; the product lifespan can be extended by following the multiple consecutive cycles of direct reuse by facilitating the interchangeability of products and maintaining products in properly way to use them for a long time without repairing. (Bocken, Bakker & De Pauw, 2015) (Ellen MacArthur Foundation, Jan 9, 2023).

Pure Flows : This is system also for both the biological materials and the technical materials; which follows the strategy of separating the residual flows from each other after use to ensure that they are not contaminated with toxic materials or other materials or getting toxic from the interaction with each other. (Ellen MacArthur Foundation, Jan 9, 2023).

Circular Economy in Fashion or Circular Fashion

The Impact of Linear Fast Fashion Industry

The consumption of fashion has rapidly grown in recent years and the demand of Fast fashion has become more prevalent. The linear fast fashion model “take-make-dispose” depends on consuming large quantities of easily accessible resources and energy then generates a lot of emissions, wastes, causing high levels of pollution including the usage of toxic chemicals, dangerous dyes, and synthetics fibers seeping into water supplies and in our ocean. Clothing is produced on shorter timeframes to satisfy demand for the latest trends and new designs that appeared every few weeks. Despite, the Clothing costs have risen slower than other consumer goods. While, the growth of middle class expands, the purchases will increase to match their needs. According to this continued growth, the consumption of resources will increase in tripling by 2050. Furthermore, Over 60% of textiles that used in the clothing industry are made in China and India, where coal-fueled power plants increase the carbon footprint of each piece of garment that produced. This pressure will exhaust the resources, destroy the environment and kill the planet. (Drew, Deborah & Reichart, Elizabeth, January,2019).

1.2.2. Circular Fashion

The concept of circular fashion depends on the main principles of circular economy and sustainable development then relates them together to the fashion industry in a wide approach. Circular fashion is the regenerative system that keeping the garments in circulation as long as possible; while their maximum value is retained and returned safely to remanufacture. The circular fashion concerns on the sixteen key principles for product entire life cycle from design and sourcing, to production, transportation, storage, marketing and sale, as well as the user phase and the product’s end of life. (MOTIF, 2020)

It is complicated because it starts with product design. Therefore, fashion products should be designed with high longevity, resource efficiency, non-toxicity, biodegradability, recyclability, good ethics in mind; and give priority to local, non-toxic, renewable, biodegradable and recyclable

resources which means if the products are not suitable for recycling, the material should be biodegradable and use it as compost for plants and other organisms in the ecosystem to be efficient, safe and eco- friendly. (MOTIF, 2020)

1.2.3. *Principles of Circular Fashion*

The Green Strategy firm is an innovation driven and research based consultancy firm specializing in sustainability and circularity issues of the fashion industry, has set sixteen key principles to support and promote a more circular and sustainable fashion, apparel and textile industry: (MOTIF, 2020). The first 13 principles are defined from the perspective of producer:

1. Designing with a purpose.
2. Designing for longevity.
3. Designing for resource efficiency.
4. Designing for biodegradability.
5. Designing for recyclability.
6. Creating Source and produce locally.
7. Creating Source and produce without toxicity.
8. Creating Source and produce with efficiency.
9. Defining Source and produce with renewables.
10. Following Source and produce with good ethics.
11. Providing services for longer life supporting.
12. Reuse, recycle or use all remains as compost.
13. Collaborating well and widely eco-friendly attitude.

The other 3 principles are related to consumer's perspective:

1. Using, washing and repairing with caring of product.
2. Considering loan, rent, swap or redesign or other alternatives instead of buying new.
3. Buying quality not quantity.

The Benefits of Circular Fashion

The ultimate and main goal of achieving circular fashion is that the garment's lifecycle shouldn't bring any socio-economic or environmental harm. Besides that, there are four main key advantages of circular fashion which are: (MOTIF, 2020)

- Creating eco-friendly industries specially the fashion industry; and job opportunities.
- Decreasing dependency on imported raw materials and using the local materials.
- Eco-friendly brands build a better public image and encourage other brands to go ecofriendly.
- Eliminating the environmental damage, saving resources to meet human demand and achieving being welfare.

Limitations of Circular Fashion

Although there are several advantages in a circular fashion model, but there are some limitations in this cycle as well: (MOTIF, 2020)

- Consumers' behavior and dependency on their actions.
- It is complicated to Create and design a new business model on the basis of recycled goods.
- Creating integration across the entire product lifecycle from raw material to disposal.

Circular Economy Door to Door Waste Collection

Door to door waste collection is one of waste management collection strategies; in which aims to collect recyclable materials or food waste from residents' doorsteps in nearly common area for collecting from the street and transported to specialized companies or factories. (Lucia Botti, Daria Battini, Fabio Sgarbossa, Cristina Mora, 2020).

The Steps of Door to Door Waste Collections

Door to door waste collection can be implemented in different ways; but those are the common effective steps: (Lucia Botti, Daria Battini, Fabio Sgarbossa, Cristina Mora, 2020)

- Step one: find the directions (company or factor) who will take those wastes and collaborating with them.
- Step two: put 3 large containers with name tag of each one to make the people separate the wastes easily in each central collection point.
- Step three: transported those containers to their specialized directions.

The Advantages of Door to Door Waste Collections

Door to door waste collections have several environmental and economic advantages which are:

- Achieving the circular economy in small scale (daily life).
- Get rid of the garbage in efficient right ways -
- Turning the liability of waste to profit.
- Decreasing the negative externalities.
- Reducing the pressure on environment.
- After recycling those wastes, it will be raw material of another industry.

The Current Economy in Egypt

The Egyptian economy has validated its resilient and flexibility to achieve great growth. Due to extensive administrative and economic reforms that causing to expand productivity and achieve sustainable development. The accurate implementation of economic reforms together with effective financial policies have resulted in a more resilient Egyptian economy in the face of internal and external challenges, atop of which the coronavirus pandemic. (State Information Service, 02 February 2022). According the implementation of reform programs, there are positive results. The real GDP grew at 4.2% in fiscal year 2018, compared to 3.3% in Fiscal Year 2021. The economic growth is occurred by exporting goods and services, private consumption, public investments and the dynamism of the tourism, gas, and ICT and construction sectors. (The World Bank, 2022)

World Bank noted that economic reforms in recent years helped stabilize the Egyptian economy and improve its financial performance, which helped rehabilitate it to overcome the Corona crisis. It reported Moody's stated that the track record in implementing economic and financial reforms supports Egypt's credit file, in addition to its contribution to restoring the economy's achievement of primary surpluses, which are likely to continue to be achieved in the coming years.

The Waste Management Strategies in Egypt

Waste management in Egypt has been a serious technical, legal and commercial challenge. The actual cost of waste is not just the cost of thrown- away materials; but the inefficient usage of raw materials, exceeding the limited usage of energy and water, waste eliminations; and waste treatment. (The Waste Management Regulatory Authority, 2022).

According the estimations of central agency for public mobilization and statistics, the 44.8 percent of Egyptian households throw away their garbage into the streets; while the other 55.2 percent get rid of their garbage through private companies and garbage collectors. (Egypt Today, October 2022)

A total of 80 million tons of garbage are collected in Egypt each year, with most of them ending up in piles in the streets. The government has taken several steps over the years to contain the growing waste crisis in the country by raising awareness and announcing fines of up to LE 20,000 for littering streets. (Egypt today, 29 Jan 2020).

The Current Situation of Renewable Energy in Egypt

The demand for energy is rapidly increasing .due to the great population growth. The economic development in Egypt depends on the energy sector which represents 13.1% of overall gross domestic product .Recently , the Egyptian government follows an energy diversification strategy that known as the Integrated Sustainable Energy Strategy ISES to 2035. This strategy accelerates the development of renewable energy and energy efficiency. (International Renewable Energy Agency, 2018)

Egypt has the capacity and potential to generate up to 53 percent of its electricity from renewable sources by 2030. Moreover, keeping higher shares of renewable energy could reduce the bill of country's energy by up to USD 900 million annually in 2030. (International Renewable Energy Agency, 2018). In 2021, the share of renewables in the maximum load reached 31 percent of the total generated energy, the percentage of renewables in the energy mix rose by 14.4 percent in 2022.

Renewables reduced carbon emissions by 3,500 tons, and saved fuel by 1,430 tons, Egypt had signed 16 MoUs in the fields of green hydrogen and green ammonia. (Egypt Today, 14 Nov. 2022)

The Application of Circular Economy in Middle East Countries and Africa

The Middle East faces the challenges occurred by low oil prices and environmental issues such as water shortages. Therefore, the shifting towards circular economy is necessary and inevitable. The Gulf Cooperation Council region can save up to about 138 billion US dollars by 2030 by following circular economy; According to a new report published at the World Government Summit held in Dubai. (Rafael

Widmer, September 2017). Therefore, African countries need to follow and implement the circular economy to reduce waste production and pollution whilst promoting sustainable growth and to be environmentally friendly. Circular economy can help Africa to solve environmental challenges and crises. According to the second Einstein Forum that held in Rwanda in 2018. (UNESCO International, Institute for Capacity building in Africa, 2018)

Circular Economy in Egypt

Circular economy concept is not popular in Egypt. The most common popular thing about circular economy in Egypt is the recycling. But since, renewable energy is widely used in Egypt there are several mega projects for wind energy and solar energy. Bio energy and waste to Energy are become more popular, but still there is a lack of know how. Recycling is well known in Egypt, but it is limited to some industries and not sufficient.

Circular economy is a master key solution of many issues in Egypt. Egypt has garbage and waste problems and by implementing circular economy through door to door waste collection, the waste would be minimized. Egypt has a great ambitious vision for 2030 and most of its goals are more relevant to circular economy and waste management. Circular economy has an economic value such as creating jobs and reducing imports. This is the right time for investors to shift and invest in circular economy in Egypt. The shifting is already starting; and according to investment laws and government incentives the early investors would have many advantages of what the government is offering.

Research Methodology

This section focuses on the research methodology which is required to answer the research questions and to accept or reject the hypotheses. It also includes the research design, research framework, research hypotheses, research variables and measurement, the target population and sampling, data collection, and the statistical analysis techniques used.

This research was began with exploratory one to define the problem, get more insights and better understanding of it to define accurate research problem variables and main research questions; and develop these questions and hypotheses.

Then, the conclusive one was in the second stage of research. This stage was essential and more advanced to test the hypotheses and examine the relationships between independent and dependent variables. In this

stage the data analysis was quantitative and sample was large and representative. Moreover, the outcomes of the Findings were used to describe the situation, evaluate and analysis the data, then using them as input into decision making or to predict the best solutions for research problem. The data collection method for this research was the questionnaires.

Research Hypotheses

H₁: There is a significant correlation between electricity and water expenses; and circular fashion.

H₂: There is a significant correlation between increasing income and decreasing costs; and circular fashion.

H₃: There is a significant correlation between percentage of pollution and circular fashion.

This research is based on 3 dependent variables are influenced by one independent variable. The dependent variables are:

Y₁: The electricity and water expenses

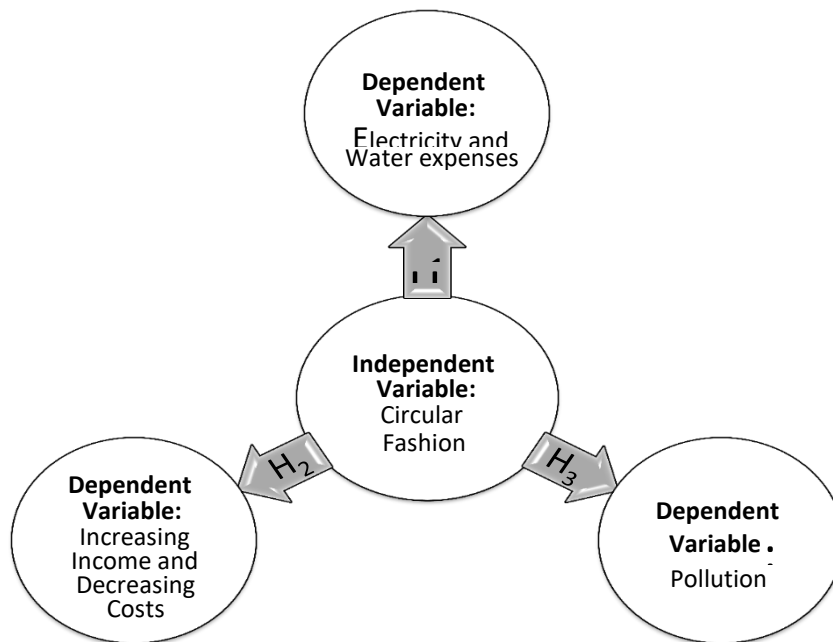
Y₂: Increasing income and decreasing costs.

Y₃: The pollution.

Besides the independent variable which is: **X:** Circular fashion.

Research Model (Conceptual Framework):

Figure 1: Conceptual framework.



Population and Sampling Design

The target population that holds needed information in the research to analyze. The target population was defined in terms of element, sampling units, extent and time. The element was males or females head of the textile factories and clothing factories. The sampling units were the textile factories and clothing factories then males or females head of the factories. The extend was in Cairo & Belbeis -Egypt .the time was November, 2022. The expected sample size of this research was 150 respondents, done by personal and electronic interviewing. But the actual sample size was 119 respondents after excluding 31 respondents were incomplete and insufficient ones.

Data Analysis Technique: In any research, the method of data analysis is a very necessary practice to support the data collected. The researcher analyzed the questionnaire statistically using computer software named statistical Package for social science (SPSS). The cross-tabulations, ANOVA, chi square, and correlations were used to show the relationship between the

variables. The results of statistical analytical procedures will be discussed, through distributing surveys, and analyzing the data, many tests were used such as descriptive analysis, correlation, regression and ANOVA test. Afterwards, correlation and regression analysis will be conducted to measure the relationship between dependent and independent variable. **Descriptive Statistical Analysis:** It includes descriptive and frequencies for all the survey questions to measure the average of the responses for each question for each variable.

Analyzing the Dependent Variable " Y_1 " Electricity & Water expenses:
Table 1: Electricity & Water expenses frequency table.

N Valid	119
Missing	0
Mean	3.0303
Std. Error of Mean	.08942
Median	3.0000
Mode	2.20 ^a
Std. Deviation	.97551
Variance	.952
Skewness	.182
Std. Error of Skewness	.222
Kurtosis	-.874-
Std. Error of Kurtosis	.440
Range	3.80
Minimum	1.20
Maximum	5.00
Percentiles 25	2.2000
50	3.0000
75	3.8000

Table 1 illustrates that the Minimum value of Y_1 was (1.01) and the Maximum value was (5.00). Also, the Average of Y_1 was (3.1010). The average of 25% of respondents' answers was (2.2000), the average of 50% of respondents' answers was (3.0000); and the average of 75% of respondents' answers was (3.8000).

Analyzing the Dependent Variable “Y₂” Increasing Income & Decreasing Cost

Table 2: Increasing income and Decreasing costs frequency table

N Valid	119
Missing	0
Mean	3.8004
Std. Error of Mean	.05546
Median	3.7500
Mode	4.00
Std. Deviation	.60505
Variance	.366
Skewness	-.160-
Std. Error of Skewness	.222
Kurtosis	.676
Std. Error of Kurtosis	.440
Range	3.25
Minimum	1.75
Maximum	5.00
Percentiles 25	3.2500
50	3.7500
75	4.2500

Table 2 illustrates that the Minimum value of Y₂ was (1.75) and the Maximum value was (5.00). Moreover, the Average of Y₂ was (3.8004). The average of 25% of respondents' answers was (3.2500), the average of 50% of respondents' answers was (3.7500); and the average of 75% of respondents' answers was (4.2500).

Analyzing the Dependent Variable “Y3” pollution

Table 3: pollution frequency table

N Valid	119
Missing	0
Mean	3.8378
Std. Error of Mean	.04701
Median	3.6700
Mode	3.67
Std. Deviation	.51285
Variance	.263
Skewness	-.214-
Std. Error of Skewness	.222
Kurtosis	-.048-
Std. Error of Kurtosis	.440
Range	2.33
Minimum	2.67
Maximum	5.00
Percentiles 25	3.6700
50	3.6700
75	4.3300

Table 3 illustrates that the Minimum value of Y_3 was (2.67) and the Maximum value was (5.00). The Average of Y_3 was (3.8378). The average of 25% of respondents' answers was (3.6700), the average of 50% of respondents' answers was (3.6700); and the average of 75% of respondents' answers was (4.3300).

Analyzing the Independent Variable “X”: Circular Fashion

Table 4: circular fashion frequency table.

N Valid	119
Missing	0
Mean	3.8050
Std. Error of Mean	.05721
Median	3.8000
Mode	4.00
Std. Deviation	.62407
Variance	.389
Skewness	-.167-
Std. Error of Skewness	.222
Kurtosis	.349
Std. Error of Kurtosis	.440
Range	3.00
Minimum	2.00
Maximum	5.00
Percentiles 25	3.2000
50	3.8000
75	4.0000

Table4 demonstrates that the Minimum value of X was (2.00) and the Maximum value was (5.00). Besides, The Average of X was (3.8050). The average of 25% of respondents' answers was (3.2000), the average of 50% of respondents' answers was (3.8000); and the average of 75% of respondents' answers was (4.0000).

Correlation Coefficient Analysis

Correlation Between Electricity & Water Expenses "Y1" and Circular Fashion "X"

Table 5: Correlation between electricity & water expenses"Y1"and circular fashion "X".

Descriptive Statistics			
	Mean	Std. Deviation	N
Circular Fashion	3.8050	.62407	119
Electricity & Water expenses	3.0303	.97551	119

Correlations			
		Circular Fashion	Electricity & Water expenses
Circular Fashion	Pearson Correlation	1	-.744-**
	Sig. (2-tailed)		.000
	N	119	119
Electricity & Water expenses	Pearson Correlation	-.744-**	1
	Sig. (2-tailed)	.000	
	N	119	119

**. Correlation is significant at the 0.01 level (2-tailed).

Table5 demonstrates the degree of correlation with Pearson coefficient which is the most appropriate for the type of data between (Y₁, X), has reached (-74.4%) with a significant degree of (0.000) which is less than (5%), that means the correlation is statistically significant and the negative sign refers to a negative relation between electricity & water expenses and circular fashion on other side.

Regression : R² is (55.3%), and it indicates that every change with a degree (100%) that occurs in Y₁ will be (55.3%) of this change due to the change in X.

Table 6: Regression analysis between electricity & water expenses"Y1"and circular fashion "X"

Model Summary^b					
<i>Model</i>	<i>R</i>	<i>R Square</i>	<i>Adjusted R Square</i>	<i>Std. Error of the Estimate</i>	<i>Durbin-Watson</i>
1	.744 ^a	.553	.549	.65503	0.274
a. Predictors: (Constant), Circular Fashion					
b. Dependent Variable: Electricity & Water expenses					

The ANOVA test examines the significance level of the regression analysis. If the significance is below the accepted level of 0.05 then the data was significant, so we can accept the hypothesis.

Table 7: ANOVA Test between electricity & water expenses"Y₁"and circular fashion "X"

ANOVA^b						
<i>Model</i>		<i>Sum of Squares</i>	<i>df</i>	<i>Mean Square</i>	<i>F</i>	<i>Sig.</i>
1	Regression	62.091	1	62.091	144.712	.000 ^a
	Residual	50.200	117	.429		
	Total	112.291	118			
a. Predictors: (Constant), Circular Fashion						
b. Dependent Variable: Electricity & Water expenses						
Coefficients						
<i>Model</i>		<i>Unstandardized Coefficients</i>		<i>Standardized Coefficients</i>	<i>t</i>	<i>Sig.</i>
		B	Std. Error	Beta		
1	(Constant)	7.453	.373		20.007	.000
	Circular Fashion	-1.162-	.097	-.744-	-12.0-	.000
a. Dependent Variable: Electricity & Water expenses						

Coefficients ^a			
Model		95.0% Confidence Interval for B	
		Lower Bound	Upper Bound
1	(Constant)	6.715	8.191
	Circular Fashion	-1.354-	-.971-

a. Dependent Variable: Electricity & Water expenses

Residuals Statistics ^a					
	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	1.6413	5.1283	3.0303	.72539	119
Residual	-	1.15871	.00000	.65225	119
Std. Predicted Value	1.03611-				
	-	2.892	.000	1.000	119
Std. Residual	1.915-				
	-	1.769	.000	.996	119
	1.582-				

a. Dependent Variable: Electricity & Water expenses

The previous tables demonstrate the estimated statistical model that presents the relationship between (Y_1 , X) can be concluded as follows:

$$Y_1 = 7.453 - 1.162 X + E$$

Correlation Coefficient Analysis

Correlation between increasing income & Decreasing costs " Y_2 " and circular fashion " X ":

Table 8: Correlation between increasing income & Decreasing costs "Y2"and circular fashion "X":

Descriptive Statistics			
	<i>Mean</i>	<i>Std. Deviation</i>	<i>N</i>
Circular Fashion	3.8050	.62407	119
Income vs. Costs	3.8004	.60505	119
Correlations			
		<i>Circular Fashion</i>	<i>Income Costs</i> vs
Circular Fashion	Pearson Correlation	1	.949**
	Sig. (2-tailed)		.000
	N	119	119
Income vs Costs	Pearson Correlation	.949**	1
	Sig. (2-tailed)	.000	
	N	119	119

** . Correlation is significant at the 0.01 level (2-tailed).

Table 8 demonstrates the degree of correlation with Pearson coefficient which is the most appropriate for the type of data between (Y2, X), has reached (94.9 %) with a significant degree of (0.000) which is less than (5%), that means the correlation is statistically significant.

Regression: R^2 is (90.0%), and it indicates that every change with a degree (100%) that occurs in Y_2 will be (90.0%) of this change due to the change in X and that the rest (10.0%) Refer to other factors and variables.

Table 9: the regression analysis between increasing income & Decreasing costs "Y2"and circular fashion "X"

Model Summary ^b						
Model	R	R Square	Adjusted Square	R	Std. Error of the Estimate	Durbin-Watson
1	.949 ^a	.900	.899		.19213	2.034

a. Predictors: (Constant), Circular Fashion

b. Dependent Variable: Income vs Costs

ANOVA Test

Table10: ANOVA Test between increasing income & Decreasing costs "Y2"and circular fashion "X"

ANOVA^b

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	38.878	1	38.878	1053.169	.000 ^a
	Residual	4.319	117	.037		
	Total	43.197	118			

a. Predictors: (Constant), Circular Fashion

b. Dependent Variable: Income vs Costs

Coefficients^a

Model		Unstandardized Coefficients	Standardized Coefficients	t	Sig.
		B	Beta		
1	(Constant)	.301		2.752	.007
	Circular Fashion	.920	.949	32.453	.000

a. Dependent Variable: Income vs Costs

Coefficients^a

Model		95.0% Confidence Interval for B	
		Lower Bound	Upper Bound
1	(Constant)	.084	.517

	Circular Fashion	.864	.976
Coefficients^a			
Model		95.0% Confidence Interval for B	
		Lower Bound	Upper Bound
1	(Constant)	.084	.517
	Circular Fashion	.864	.976

a. Dependent Variable: Income vs Costs

Residuals Statistics^a					
	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	2.1402	4.8995	3.8004	.57400	119
Residual	-.39020-	1.92585	.00000	.19132	119
Std. Predicted Value	-2.892-	1.915	.000	1.000	119
Std. Residual	-2.031-	10.023	.000	.996	119

a. Dependent Variable: Income vs. Costs

The previous tables demonstrate the estimated statistical model that presents the relationship between (Y₂, X) can be concluded as follows:

$$Y_2 = 0.301 + 0.920 X + E$$

Correlation Coefficient Analysis

Correlation Between Pollution "Y3" and Circular Fashion "X":

Table 11: Correlation between pollution "Y3" and circular fashion "X"

Descriptive Statistics			
	Mean	Std. Deviation	N
Circular Fashion	3.8050	.62407	119
Pollution	3.8378	.51285	119

Correlations			
		Circular Fashion	Polution
Circular Fashion	Pearson Correlation	1	.701**
	Sig. (2-tailed)		.000
	N	119	119
Pollution	Pearson Correlation	.701**	1
	Sig. (2-tailed)	.000	
	N	119	119

** . Correlation is significant at the 0.01 level (2-tailed).

Table11 demonstrates the degree of correlation with Pearson coefficient which is the most appropriate for the type of data- between (Y3, X), has reached(70.1%) with a significant degree of (0.000) which is less than (5%), that means the correlation is statistically significant.

Regression: R^2 is (49.2%), and it indicates that every change with a degree (100%) that occurs in Y_3 will be (49.2%) of this change due to the change in X and that the rest (50.8%) Refer to other factors and variables.

Table 12: regression analysis between pollution "Y3"and circular fashion "X"

Model Summary ^b						
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson	
1	.701 ^a	.492	.487	.36718		1.
a. Predictors: (Constant), Circular Fashion						
b. Dependent Variable: Pollution						

ANOVA Test

Table 13: ANOVA Test between pollution "Y3"and circular fashion "X"

ANOVA^b

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	15.261	1	15.261	113.198	.000a
	Residual	15.774	117	.135		
	Total	31.035	118			

a. Predictors: (Constant), Circular Fashion

b. Dependent Variable: Polution

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.645	.209		7.878	.000
	Circular Fashion	.576	.054	.701	10.639	.000

a. Dependent Variable: Pollution

Coefficients

Model		95.0% Confidence Interval for B			
		Lower Bound		Upper Bound	
1	(Constant)	1.232		2.059	
	Circular Fashion	.469		.684	

a. Dependent Variable: Pollution

Residuals Statistics^a

	Minimum	Maximum	Mean	Std. Deviation	N
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Predicted Value	2.7976	4.5264	3.8378	.35963	119
Residual	-.96592-	1.87236	.00000	.36562	119
Std. Predicted Value	-2.892-	1.915	.000	1.000	119
Std. Residual	-	5.099	.000	.996	119
	2.631-				

a. Dependent Variable: Pollution

The previous tables demonstrate the estimated statistical model that presents the relationship between (Y_3 , X) can be concluded as follows:

$$Y_3 = 1.645 + 0.576 X + E$$

Discussion and Recommendations

The aim of this research is to investigate the impact of circular economy in fashion industry (circular fashion) on economic development. It means to investigate the impact of circular economy on electricity and water expenses, increasing income and decreasing costs; and pollution. Several statistical analytical results were shown in this research. Thereby, it had shown a significant correlation between electricity and water expenses; and circular fashion which had reached to (-74.4%) with a significant degree of (0.000) that is less than (5%). it means the correlation is statistically significant and the negative sign refers to a negative relation between electricity & water expenses and circular fashion on other side.

As for increasing income and decreasing costs, there is a significant correlation between them and circular fashion which had reached to (94.9 %) with a significant degree of (0.000) that is less than (5%). it means the correlation is statistically significant.

Furthermore, there is a significant correlation between reducing the percentage of pollution and circular fashion which had reached (70.1%) with a significant degree of (0.000) that is less than (5%). It means the correlation is statistically significant.

All of those significant correlations are strong and serious indicators that can lead to economic development and achieve the welfare and sustainable economy.

Managerial Implications

This research needs several managerial implications to be applied and be implemented. While the majority respondents about the good

significant impact of circular fashion on reducing the water and energy expenses, increasing income and decreasing costs; and the percentage of pollution was found. Thereby, It will reflect on resources and energy availability, production effectiveness and the health of economy overall. Circular fashion is considered as a part of circular economy system which aims to produce, distribute, consume, return, upcycle and then recycle or reproduce.

Therefore, the implementation of circular fashion should follow 4 stages. The first stage is the design stage which aims to design for a purpose, longevity, resource efficiency, recyclability or biodegradability; because if we can't recycle it or reproduce it again and keep it in circulation, it will be degradable after specific period of time and won't be harmful anymore.

The second stage is the sourcing and production stage which aims to source and produce more locally without toxicity materials or residuals by using certified cotton and to be efficient in energy and water usage with renewables ones as much as possible by following good ethics and credibility.

The third stage is the service stage which aims to provide services from the manufacturer to support the long life of garments, inform the customers how to deal with pieces and how long they can use it before return it.

The fourth stage is the consuming stage which require from the consumer to collaborate well with the idea of circulation , use ,clean and repair carefully to keep garments in good conditions as long as possible. Thereby, the consumer will be able to accept the idea of rent, loan, swap, secondhand or upgrade rather than purchasing new ones or replace it with the new ones.

Finally , each manufacturer uses specific materials and knows very well its own mechanism of production and how to deal with them after returning .therefore, each manufacturer should put a serial code for each piece will be produced from its production to make sure it will be return for the same manufacturer easily. Thereby, the idea of circular fashion will be implemented which aims to keep garments in circulation as much as possible to extract the maximum benefits from it with zero wastes, ecofriendly and resource saver.

Applied Studies in 13 Villages

Project Idea: “Best creation of sustainable future fashion”.

Circular fashion is considered as an application of circular economy. Thereby, the idea behind circular fashion is focusing on the reusability of garments and materials to keep garments in circulation as much as possible and extract the maximum benefits from them with zero wastes.

The main purpose of implementing circular fashion in 13 villages is helping people there to dress well by sustainable fashion model. As the garments are essential products in daily life such as food, water and medicine. No one can live without garments so all people deserves to dress sustainably well. By applying circular fashion, it will mainly address several goals of sustainable development goals in 13 villages. Thereby, it will build sustainable foundation, achieve welfare and accelerate healthy development there.

Circular fashion and Sustainable Development goals

There is a connection between circular fashion and the sixth goal, eighth goal, tenth goal, twelfth goal, and the thirteenth goal of United Nations sustainable development goals. The sixth goal is clean water and sanitation which aims to ensure availability and sustainable management of water and sanitation for all. The eighth goal is decent work and economic growth which aims to promote sustainable and inclusive economic growth, full and productive employment and decent work for all. The tenth goal is reduced inequalities which aim to reduce inequality inside and across countries. The twelfth goal is responsible consumption and production which aims to guarantee sustainable consumption and production patterns. The thirteenth goal is climate action which aims to take immediate and urgent action to fight climate change and its consequences. Therefore, circular fashion is a key for achieving those goals of United Nations sustainable development goals.

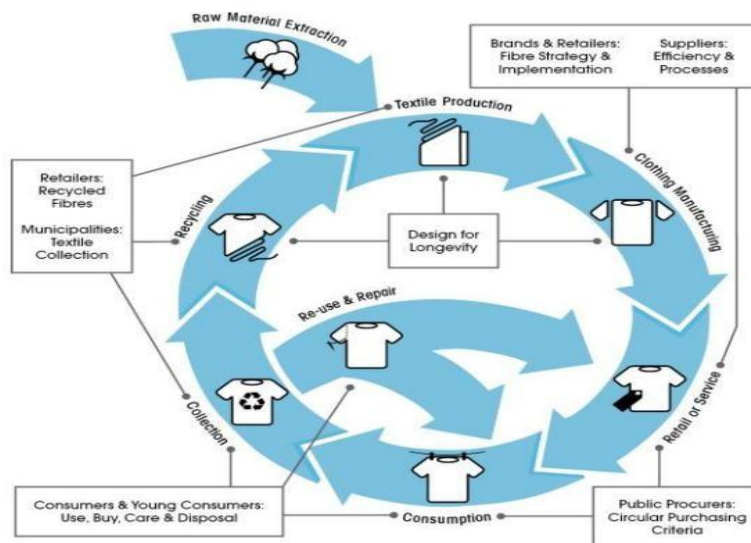
The Mechanism of Implementation in 13 Villages

The most people in 13 villages have limited income or low budget for buying garment and most of them have a lot of children need garments. Therefore, the best sustainable costless implementation of circular fashion in 13 villages is:

1. To find manufacturer that using sustainable fibers and 100% cotton (NatureTex).
2. To open shop as outlet to sell the defective clothes from NatureTex factory with lower price.

3. To engage customers with how to use those garments and circularity idea.
4. To engage consumers with returning and collecting process by giving them discount percentage on next purchase.
5. To separate collected garments for upcycling and recycling process.
6. To cooperate with textile recycling factory, if Nature Tex doesn't have the capacity to buy Textile recycling machine for textile waste with high output.
7. To reproduce this output and sell it as a new line for 13 villages.

Figure 6: The Mechanism of Circular Fashion (ECAP, 2019).



Project Gains

The implementation of circular fashion in 13 villages has environmental, social and economic impacts. Since the circular fashion will:

-Reduce garments footprint on water, energy and wastes.

- Minimize the damage to environment, save resources to meet human demand and achieving welfare.
- Help low and middle income people to dress their children well.
- Redistribute of income.
- Promote competition and innovation in resource efficient design and textile fiber recycling to foster growth in textile sector.
- Influence people to adopt more with the idea of circularity and circular economy; and behave sustainably.

Project Limitations

There are a lot of limitations could limit me when I implement the circular fashion in 13 villages like:

- The new introduction of circular fashion in Egypt and how to apply it.
- Unexpected behaviors or reactions from people towards circular fashion.
- Keeping resources in circulation as long as possible.
- Achieving cradle to cradle not cradle to grave for zero wastes and residuals.
- Find financial support to buy Textile recycling machines.
- Find Textile recycling factory to cooperate with.

Research Limitations

During the process of conducting this research, there were some drawbacks that faced the researcher. Therefore, it is necessary to identify and mention all limitations in order to allow future researchers conducting further researches in this study. The first limitation was the lack of data availability about circular economy and its pillars. Especially, there were very limited studies about circular economy in fashion industries (circular fashion) and its impact. Besides, there was also limited data about the mechanism of implementation and deeply detailed data about realistic implementations.

The second limitation was the nature of respondents and the number of respondents obtained in this research. Since the managerial level was the only target respondents, it was too specific target respondents for the researcher to obtain for. In addition, the sample size was limited to 119 respondents instead of 150 respondents due to the unexpected crisis which is coronavirus. Also, the unpopularity of circular economy and circular fashion in Egypt had a serious role to limit the sample size.

Recommendations

Future Recommendations for Egyptian Government

The results of this research show the significant impact of circular economy mainly circular fashion on economic development. As a circular fashion has significant correlations with water & energy expenses, increasing income & decreasing costs and pollution; which have a great reflection on environmental and economic performance. Therefore, the first recommendation for the government is to engage with the idea of circular fashion and start to open huge recycling textile factory that depends on collecting old and unwanted clothes and converting them again into yarns for yarning like Hong Kong city. (Hadeel Adel, 2018). This factory will collect the old and worn garments from retail companies or non-governmental organizations (NGOs), and once the garbage waste connects to the factory, 3 production lines begin to sort and sterilize the clothes in preparation for converting them into textile yarns again, then distributing and shipping them as raw material to Clothing factories.

The second recommendation for the government is to reduce the taxation on the factories that applied and followed the circular fashion to encourage them.

The third recommendation for the government is to set regulations for all industries and upcoming projects to follow circular economy and achieve cradle to cradle system. Also, all industries can exchange their wastes with each other because the wastes in industry may be considered as a raw material for another industry. The circularity process shouldn't be in the same industry.

Future Recommendations for Private Sectors

The private sectors should also engage with idea of circular economy and circular fashion. Therefore, the first recommendation for textile private sector is to start applying circular fashion by using 100% cotton and reduce the percentage of chemicals. After that they can buy recycling textile machines to help them, if they have the capacity or collaborating with another factory to recycle collected garments to yarn them again.

The second recommendation is that all industries can exchange their wastes with each other because the wastes in industry may be considered as a raw material for another industry. Since the circularity process shouldn't be in the same industry.

Future recommendations for Sustaining Circular Fashion in 13 villages

The implementation of circular fashion in 13 villages is such as golden great opportunity; because the implementation on small scale will be easier to manage and control. The idea is not only to start but also to know how to grow and sustain. Therefore, the first recommendation is to be selective, productive and efficient in implementation. The second recommendation, it's too costly to start from zero. Therefore, it is necessary to find brand that have:

- Credibility with people there.
- Nearby location.
- 100% cotton production with limited amount of chemicals.

Thereby, NatureTex is the best choice; because it has all those requirements. The third recommendation is to keep attracting people through:

- Good customer service.
- Discount percentages.
- Opening beautiful small place and focusing on smallest details.

The fourth recommendation is to put business plan which is already mentioned in applied studies; and keep closed eyes on the market updates.

The fifth recommendation is to be productive as much as possible by knowing when to do what.

The last recommendation is to give up perfection and learn how to develop ourselves. It means nothing will be perfect 100% in short period and face some difficulties.

If all of those recommendations are followed, it will be easy to deliver and sustain the idea of circular fashion by building customer loyalty and convincing them to return the old pieces.

Moreover, circular economy is considered as a key of sustaining any project in 13 villages.

Recommendations for Future Researches

This research faced some limitations as mentioned before. Therefore, those recommendations may be cover the limitations for the future researches. According to the lack of previous studies about circular economy and circular fashion, the future researches should cover the other pillars of circular economy; and if it will be about circular fashion, it should cover different variables than the variables in this research.

The second recommendation is to expand the sample size for more than 150 and above to increase accuracy. Also, future research is

recommended to target another segment of target population to ensure variation of respondents.

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Appendix:

.Survey form: Firstly, questions related to the variable of electricity and water expenses (Y1):

N	The questionnaire	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1	Do you think that energy and electricity consumption are directly affected by circular fashion process?					
2	Factory electricity consumption is decreased with increasing reliance on circular fashion?					
3	Factory water consumption is directly affected by circular fashion process?					
4	In your opinion, does the circularity process save water sources?					
5	Is the consumption of energy sources in general reduced by increasing dependence on circularity process?					

Secondly, questions related to the variable of increasing income and decreasing costs (Y2):

N	The questionnaire	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1	Is garment circulation process considered as a factor in increasing revenue?					
2	In your opinion, do you think that the effect of garment circulation on decreasing costs reflects on increasing revenue?					

3	Are raw material costs decreasing as a result of the application of garment circulation process?
4	Garment circulation helps marketing readymade garment factories?

Thirdly: Questions related to the pollution variable (Y3):

N	The questionnaire	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1	Pollution rates fall in the atmosphere as a result of the application of the process of garment circulation?					
2	The volume of gases emitted in the manufacturing process is less if the application of garment circulation is applied?					
3	The amount of waste polluting the environment decreases as a result of applying the garment circulation process?					

Fourthly: Questions related to the variable of circular fashion (X):

N	The questionnaire	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1	Garment circulation is considered as an influencing process in international industry					
2	Trends now?					
3	Now, there are many industries follow circularity process?					
4	The garment circulation process particularly effects on revenue of garment factories?					
5	Does the garment circulation affect the					

promotion of garment
factories at a lower cost?
