# Continuous Disruptive carbon emission: Our downfall

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**Abstract**

Sustainability concern is increasingly integrated into the agendas of businesses and policies, and its focus has enabled firms to develop enhanced opportunities for resource exploitation, operational upgrade and consumer cooperation. Studies have opined that one of the significant hindrances to the implementation of this agenda is Lack of coherent coordination of the sustainability approaches. In this work, an improvement in the level of recycling, the more the impact on the climate is generated was proposed. Mostly, this shows that when more is invested into making production processes, service rendered, manufacturing processes sustainable, there will be high impact on the climate thereby creating a balance in the triple bottom line in the working envelope.This research aims to propose a method that will give in brief an innovation that will address the threats and policy framework associated with water desalination methods to the continues carbon emission to the society.This paper envisages the greenhouse gas emission reduction using a solar PV system for seawater desalination in Southern Nigeria, which has been compared with the traditional method adopted. It can be concluded that the emission reduction capacity of the PV system will be reasonable, and it should be highly recommended as one of the essential tools to aid $CO_2$ emission reduction in water desalination processes in Southern part of Nigeria.The proposed system can only be achieved if there is enough Financial incentive. Hence it will be recommended that the Government should grant some incentives and lay down specific legislation that will ease the procedures.

**Keyword**: Carbon Emission, $CO_2$ reduction, PV cell, Desalination, Sustainability

## I. INTRODUCTION

Sustainable development as a topic of discussion in recent times has so many definitions as being able to maintain the state of an entity over a given period. However, one of the striking description that has gained more considerable usage is the one on UN report "**OUR COMMON FUTURE**" which opined that it is a development that seeks a way to compromise the capability of the future generation their own needs as the needs of the present age is being met [1]. In recent times the quest to bring about sustainable development has become a necessity, and it is placed on the shoulder of cutting-edge innovations to bring climatic changes under control as the interaction of human activity and the environment widens.Sustainability issues have forced companies to change the way they think about their business models if they want to maintain a competitive advantage. Despite the diversity of resources for sustainable production, however, the integration of this concept has not reached many companies around the world. This is due to the need to better understand the long-term interest of integrating business sustainability, difficulties in identifying the starting point for change or structuring progress in challenges. Based on this scenario, this article presents a strategic planning method for integrating sustainability in a product development process aimed at guiding, facilitating and accelerating the integration of sustainability in the sustainability process. Changing the management of the company with the support of the strategy. The process of planning and continuous improvement. This is a maturing method that can be used for any business because standard assessment parameters are used. The advantage of this research is the improvement, deepening and systematisation of sustainable development issues in the product development process through an accurate overview of the strategic planning concept and the development of a new guide. Assess the strengths and weaknesses of companies. Create a shared vision between different teams.

### *A. Climatic change*

Climatic change is brought about because of changes in the atmosphere caused by interactions between the environment and various other chemicals, geographical, biological factors within the ecosystem system. This change is unarguably one of the most significant challenges facing humankind on the face of the earth in this 21st century and the threats it poses to the global ecosystem has only recently been understood. In this study focuson the desalination of seawater, which happens to be an energy-intensive process with substantial social, environmental and economic consequences, using Africa as a case study.

***B. Desalination Technology***

The kind of technology utilised for desalination can be categorised according to the process employed. Theinvolving the change in the phase of the water(distillation), freezing of separation and hydration of the final departure.The utilisation of membrane surface properties such as in Electrodialysis and reverse osmosis.Employing selective properties of solids and liquids based on an ion as in ion exchange and extraction of resulting solvent. However, in this work, the focus will be on Distillation and Reverse Osmosis, which are the two standard methods adopted in the large sea region of southern Nigeria. Even though these processes are recent cutting-edge technologies, they can still be modified to conserve more resources like environmental, social and economical in the course of its usage in the context of the region of deployment or utilisation under study.In a bit to modify the system and change the entire status quo of operation (Disruptive innovation), the central focus will be on the energy input to the current policy adopted and the handling of the resulting by-product a waste product from the production process. Studies show that the energy put into the methods are obtained by burning fossil fuels, which, of course, is an agent of increasing carbon emission in the atmosphere.

The by-product of these methods, on the other hand, is "brine" which is a concentrated solution of up to the order 68,330 ppm (part per million) at drain point [2]. When the brine is discharged from the system, it is then mixed inside a dilution tank with incoming sea water of ambient salinity coming from the storage tank. This final mixture of lower salinity is sent to the reject tank before being pumped into the sea surface or sandy formation in the lagoon with a salinity of 300 ppm [8-10]. These two clauses energy input and the by-product disposalposes some kind climatic change undesirable to giving the triple bottom line elements economic, social and environment a fair share as sustainable development goals demand. Some of the threats associated with climate change can be categorised below depending on the nature of their impact. This research aims at proposing a method that will give in brief an innovation that will address the threats and policy framework associated with water desalination methods to the continues carbon emission to the society.

## II. METHODOLOGY

Considering the services offered by the business proposed, this management will be committed to recommending a disruptive innovation that will replace the traditional method currently employed for seawater desalination.It is an energy-intensive process and lacks important consideration of the triple bottom line elementsEnvironment, Social and Economic factors which are the core focus in the sustainability agenda for clean growth under the international requirement [11-13]. Hence this report will give in brief an innovation that will address the threats and policy framework associated with the business.

The test and implementation of this business will be focused on villages, towns, industries around the sea regions in Southern part of Nigeria utilising the traditional method of desalinating seawater and inappropriate method of by-products disposal which affects the condition of the aquatic habitat.The procedure to be deployed in developing the proposed framework and implementing its applicability will be summarised stepwise where each step represents different stages of the development of the innovative design process aimed at addressing the threats associated with the business in the context of social, economic and environmental standpoints. To this end, the design process will include the Disruptive innovation concept, Proposed design structure, Management strategy/Accounting/Reporting that aids sustainable development, Associated stakeholders and Early adopters of the innovation and Deployment of innovation to the broader market.

***A. Disruptive innovation concept.***

Disruption, as a word, is often used to mean a negative term. Thus, there is a kind of internal conflict of thoughts and opinion in the use of the term disruptive innovation. However, it is the concept that assures an entirely new solution. Since the world at large is trying all at its best to attain clean energy in every sphere of life while canvassing for sustainable development in effect, this has driven the search of ground-breaking ideas to its bounds concerning the transformation of existing systems to function in such a way as not to compromise the potentials of the future generation.

***B. Reduction of greenhouse gas emissionand Sustainability development structure***

In this chosen business of interest on Desalination of Seawater, Solar photovoltaic cells can be introduced to replace the burning of coal to generate energy where the concept of Distillation is employed to desalinate the sea water. This will discourage co2 emission and reduce the cost of burning fossil fuels continuously. Sunlight stretches in the Southern part of Nigeria where desalination of seawater is carried out mostly ranges from 9-10 months in a year and lasts between 8am and 4pm daily. Effectively, the storage of this natural renewable energy can be used to facilitate the heating of water to be desalinated.Also, as part of an effort to encourage sustainable development by preventing landfill waste, a cradle to cradle approach will be employed in the industrial process. In this aspect, the brine pumped back into the sea surface or sand formation in the lagoons which have a substantial environmental impact as it causes an ecological imbalance (increase

in water pH) will be reused which effectively would generate revenue for the business. Here the Electrolysis will be introduced in the design as shown below using the brine as an electrolyte for the system and chlorine and hydrogen as cathode and anode respectively.

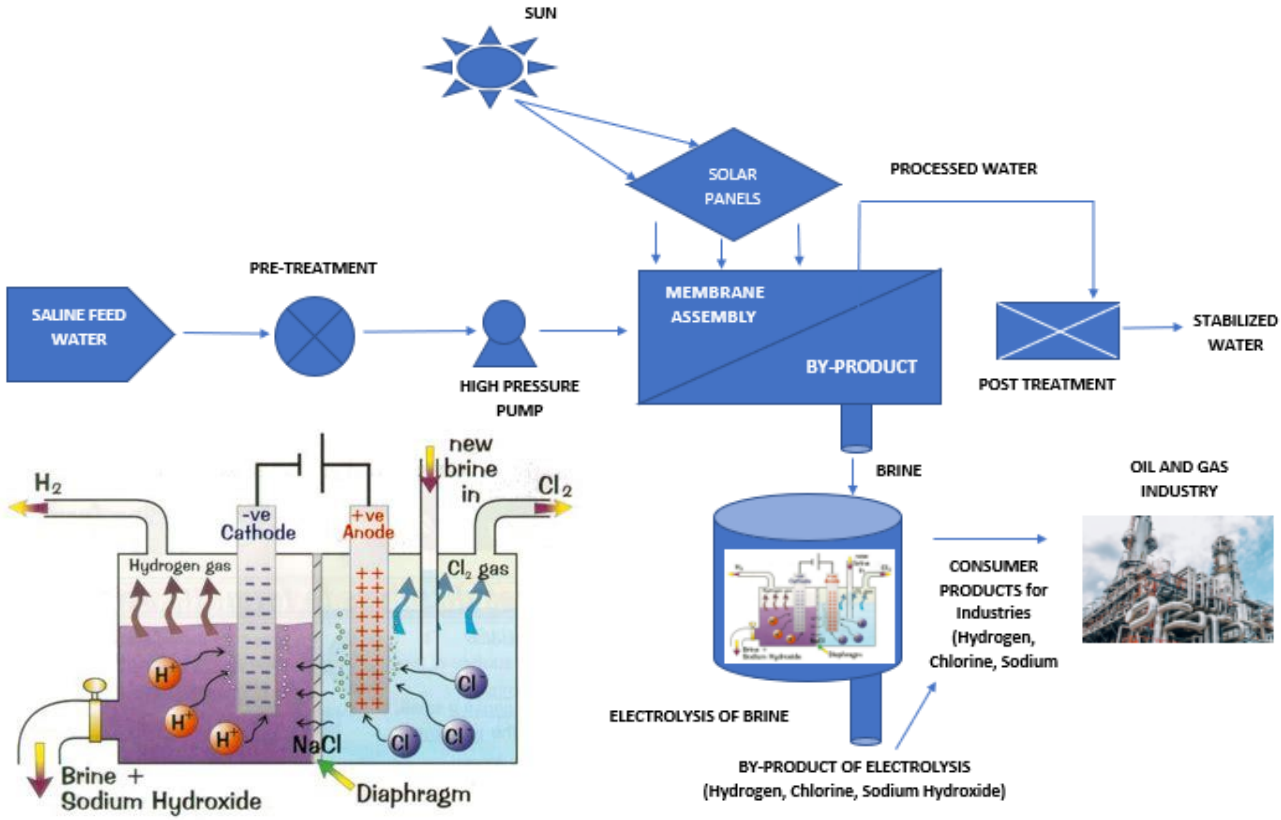


**Fig. 1. Process design of the innovation and Electrolysis of by-productbrine *[14]***

The by-products of this electrolytic setup are Chlorine gas, Hydrogen gas and Sodium hydroxide. The gases here can be stored in cylinders and sold to companies and laboratories which utilises them. While the sodium hydroxide will be sold to companies in Nigeria like the crude oil refinery which uses it as a second stage element while carrying out catalytic cracking of crude oil. This changes the concept of the old process to an entirely new process, as depicted in the diagram below.

## III. MANAGEMENT STRATEGY

The first report to be given will be on the analysis of the external and internal environment using the PEST tool. This will enable an advantageous competitive reference to be ascertained, followed by a strategy to maintain growth and sustainability. In this proposed project, using the PEST tool, the following factors were extracted;

| | |
|---|---|
| **Political Factors**<br><br>Ease of initiating the business.<br>Taxation Policy.<br>Ease of doing business in Local areas.<br>Level of Corruption in Nigeria.<br>Regulation and Deregulation trends. | **Environmental Factors**<br><br>Water reduction due to continuous extraction.<br>Carbon dioxide emission.<br>Waste process chemical disposal.<br>Land use.<br>Impacts of discharged brine on the aquatic environment. |
| **Social Factors**<br><br>Safety of the technology adopted.<br>Level of noise associated with the process.<br>Employment prospect for locals and interested persons.<br>Intergenerational equity balance. | **Economic Factors**<br>Quality of the water produced by this innovation.<br>Analysis of Internal rate of return.<br>Level of Scaling and fouling propensity.<br>Levelized/Balanced cost of water production under this innovation.<br>Robustness and Reliability of innovation. |

The strategy to be employed in implementing the innovative approach and maintaining a sustainable development will entail the following being done at different time intervals of planning, implement, auditing and reviewing

***A. Life cycle assessment***

The lifecycle of this business will be analysed highlighting the start to finish point which includes the Extracting of the sea water, Processing of the sea water, Transportation and distribution, Use/reuse of by-product and Final disposal of unused components.

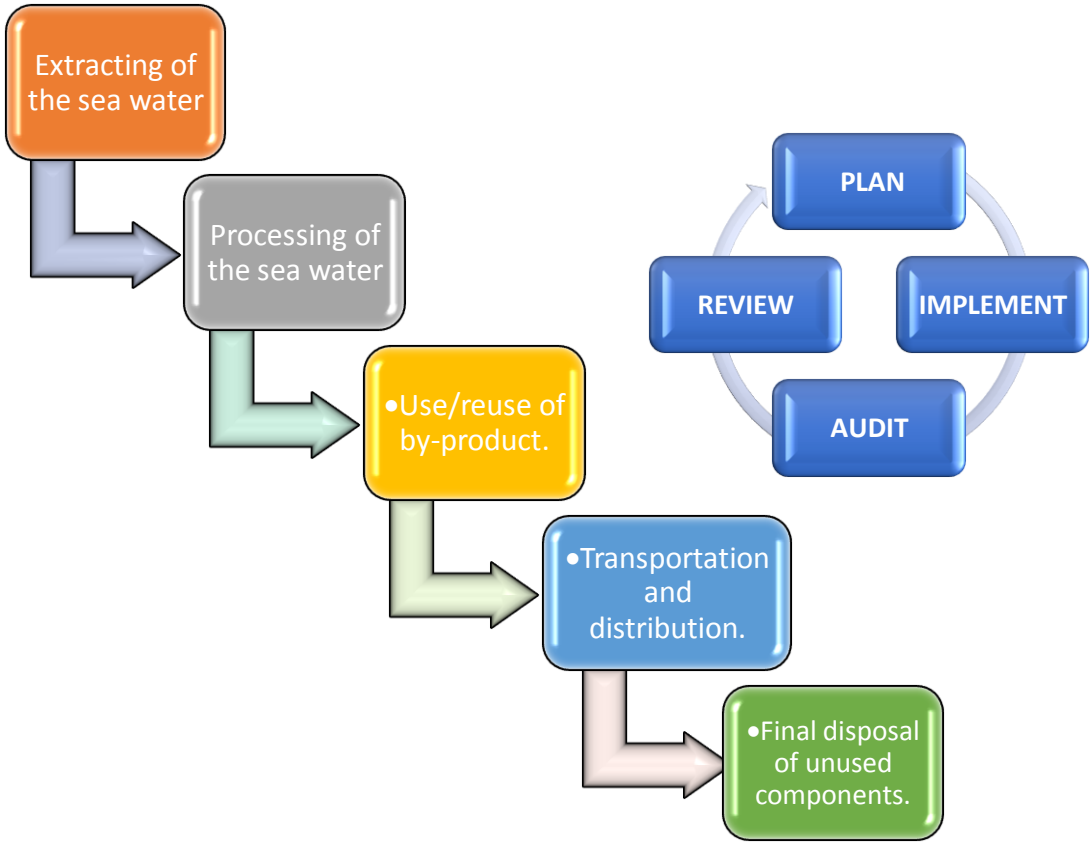


Fig. 3 Life cycle assessment and implementation plan

***B. Analysis of Environment sustainability***

This will be done as one of the aspects of accounting in order to ascertain the efficiency of the service, product or processes. In this innovation, the following will be analysed and accounted at the agreed interval. The physical flow of materials and energy inputs and product and waste outputs in the process. Measurement of all materials put into the process, emissions, recycled materials, waste disposal and outputs [15]. The measurement of pollution-related costs will determinethe costs of equipment recycling of the estimates of remediation costs with associated activities. Accounting and reporting on waste material reuse projects willinclude measurement of energy reduction initiatives report and give energy usage and pollutants data generated.

***C. Stakeholder's analysis and Mapping***

To allow planning to go according to the priority of stakeholder's position and influence on the entire project, Mendelow's matrix will be used as shown below.Keep satisfied Currently have low interest, but if dissatisfied, their interest may be aroused, and critical players Get them involved early so that goals can be integrated with organisational goals. The minimal effort has neither interest nor influence -low priority group. In Keeping informed these set are Important because they have high interest but low direct influence –need to keep in the loop otherwise they may seek additional power to subdue.

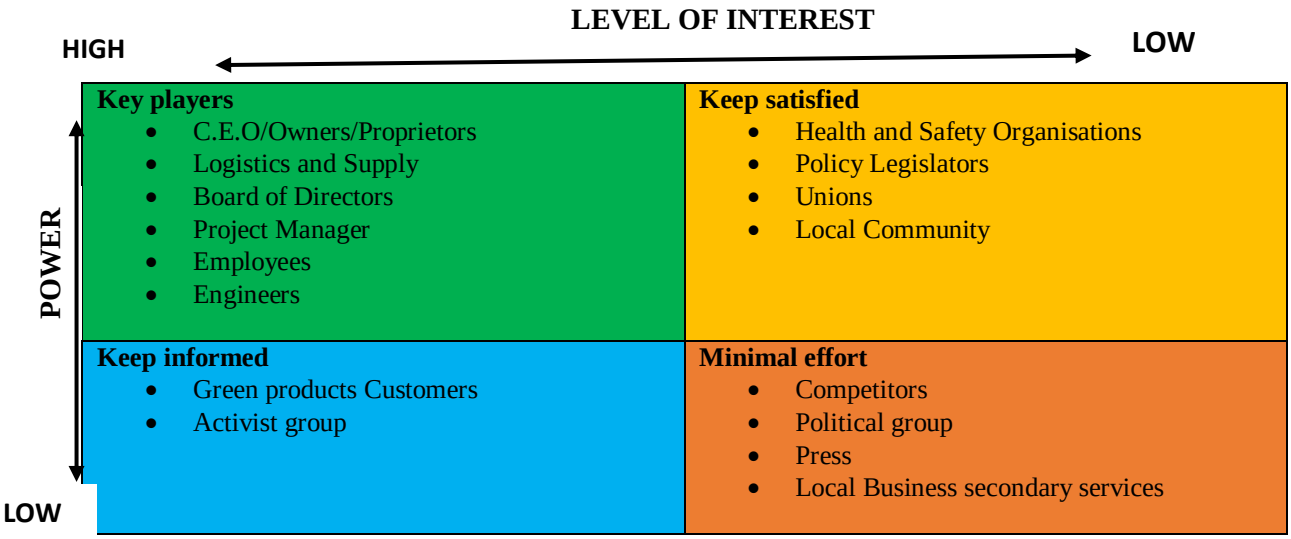


**Fig. 4 Analytical mapping in stakeholder**

## IV. RESULTS AND DISCUSSION

The measure of success of any new product or service depends on its ability to attract a series of early adopters. A previous study on renewable energy application provides several new insights regarding the early adopters of the Proposed system [16-18]. Early adopters of this system are highly educated Entrepreneurs, have high household incomes with love for green processes, are mostly Establishments comprising of Shareholders, Competitors utilising slightly different processes, Government councils. This is based on the comparison done amongst several projects involving like-processes, and from innovation theory, it is consistent with the expected socioeconomic profile of early adopters [19-21].The early adopters of this innovation are therefore grouped into the following category below;

| **FIRST ADOPTERS** | **EARLY ADOPTERS** | | LAGGARDS |
|---|---|---|---|
| | MAJORITY | MINORITY | |
| Creators of the Invention (Innovators) | Daring Entrepreneur | Environmentalists | Financially buoyant consumers |
| | Local Community Council | Government council | Technology suave consumers |
| | Close Competitors | | |

### *A. Deployment of innovation to the broader market*

Fossil fuels have been the dominant player in most energy systems, and they have been heavily invested in, and now they are very mature and well understood, and such hold immense market power. This situation - Carrying out disruptive innovation is, of course, the formidable barrier which already existing systems presents for renewable energy [20-22]. It is a challenging market to enter without a robust market to break bonds of the mindset of the market. To prove the worth of the innovation and encourage acceptance, it must demonstrate scale: Most consumers residential, industrial need large quantities of this energy even when the sources are not available. When the sun is gone at night periods. This is such a difficult thing to accomplish and a significant reason why modern renewable energy systems are undermined. Hence to deploy this innovation to the broader market, the following methods to adopt will be suggested and the benefits that accompany its growth

### *B. Consultation and Involvement*

There are lots of reasons why this act is helpful, particularly in the region where this innovation will be cited. This entails accepting people who are willing to help, volunteer, advice or give moral support. This will promote innovation as they will be the people to broadcast the effectiveness of the service among their local counterparts. Hence there is a need to do the following to make this exercise an effortless one.

This isthe best idea to solve a problem that others see, but you are blinded to it. So, before deployment effort must be made to ask the people what they like and what they want exactly. Then product or services can be tweaked to fit what they demand if need be.This requires that the service be advertised for everyone to see in order to draw their attention towards the recent development. This will give the innovation a sense of acceptance as the

focus is on a local context. Hence advocates of environmentally friendly services or products will encourage its widespread and usage among members of the community when it meets the standard so to speak. The need for a website is expedient to share information about the innovation due to the rise in internet usage that enables the efficient sharing of ideas, information, products, services, and give room for customers to give feedbacks on the impact.This will be used to facilitate the social acceptance and financial returns(economics) and of the process. This can be done using different media including "Take to doorstep" marketing. This will create room to explain the concept and reliability to customers first-hand.

### *C. Benefits that flows with growth*

**a). *Reduced Global warming***

Complete elimination of the concept of fossil fuel combustion in the processing of the sea water will mean reduction in the emission of $co_2$ which will in effect reduce the depletion of the ozone layer by some percentage.

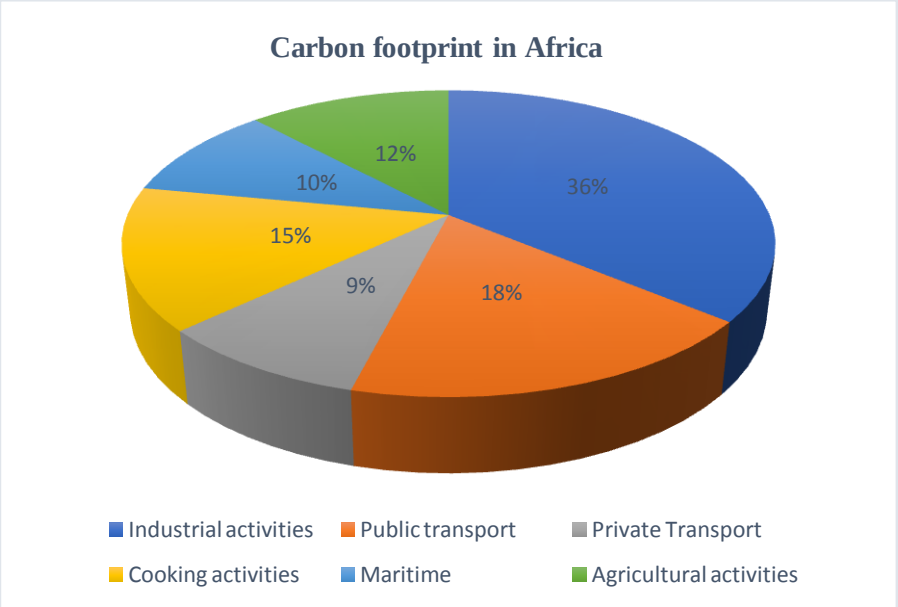


**Fig 5. Current carbon footprint in Africa obtained from the questionnaire**

### *D. Improved Public Health*

The emissions from the plant utilising fossil fuel energy are usually undesirable, and such affects the air quality. This inevitably affects humans inhaling it around the site or the nearby community. So, the wide use of this innovation will tend to eliminate this factor to a large extent and hence improve the air quality.The emergence of this innovation will, of course, require a new type of skill set. This will, therefore, create a job for an entirely new set of people with the requisite skill. It gives reduced and Stable Energy prices, the cost of obtaining fossil fuels and maintaining its plant is quite expensive, and a such is added as part of the factors of production to give the price of the services rendered to consumers. This innovation will, however, reduce the cost of services as the cost of maintaining renewable energy plant is low and renewable energy is cheaper to obtain. It will bring about reliability and resilience in the storage of the energy gotten from renewable energy sources is one thing that makes it stands out, useable, dependable and reliable. The reliability of this innovation is one that is sure since the nature of renewable energydoes not run out except for low peak period, which will depend on energy stored for emergency outcomes. There will be drastically noise reduction which is a factor associated with fossil fuel plant since it consists of rotating parts will be reduced to a considerable extent since the structure of the innovation is one that consists mostly of stationary parts. This will improve the living condition of the locals around the site. Also, improved aquatic environment condition and gave in to Cradle to Cradle.Unlike the existing method where the brine is fed back to the sea surface or sand fil lagoon, the continuous growth of this innovation will completely erase this aberration as the by-product(brine) will be re-used to generate other important chemicals highly sorted by nearby industries. This will give birth to increased revenue generation by the combined electrolysis of brine which precipitates elements like Chlorine gas, hydrogen gas and compound like sodium hydroxide, increased sales of this product and the main service rendered will increase the profit share to a large extent.

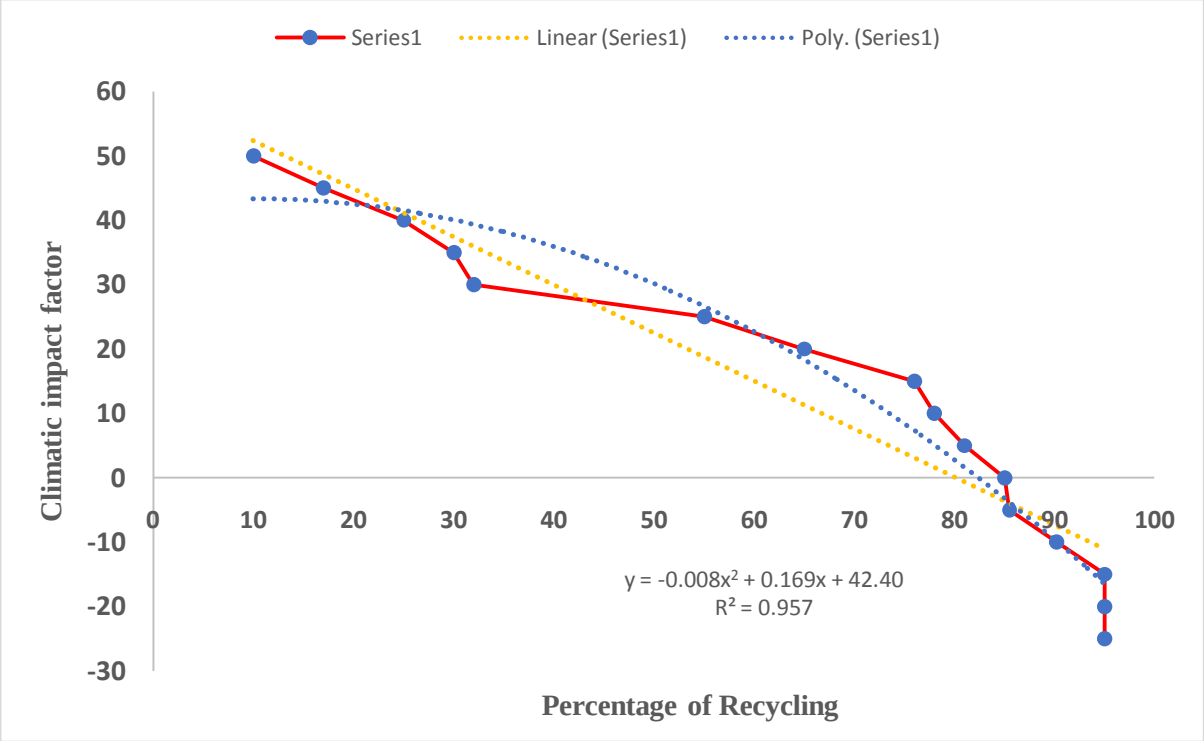


**Fig.6 Climate impact assessment if percentage recycling**

### *E. Evaluation*

The graph above shows that the more improvement on the level of recycling, the more the impact on the climate. Essentially, shows that when more is invested into making production processes, service rendered, manufacturing processes sustainable, there will be high impact on the climate thereby creating a balance in the triple bottom line in the working envelope.**T**he model equation of the evaluation of the climate assessment in percentage recycling is:

$Y=-0.0083x^2+0.1694x+42.409$
$R^2 = 0.9573$

Where y is the climate impact factor and x is the optimum percentage recycling

## V. CONCLUSION

This paper envisages the greenhouse gas emission reduction using a solar PV system for seawater desalination in Southern Nigeria, which has been compared with the traditional method adopted. It can be concluded that the emission reduction capacity of the PV system will be reasonable, and it should be highly recommended as one of the major tools to aid $CO_2$ emission reduction in water desalination processes in Southern part of Nigeria.Increase in the share of the Proposed system can only be achieved if there is sufficient Financial incentive. Hence it will be recommended that the Government should grant some incentives and also lay down certain legislation that will ease the procedures.

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