

# Environmentally Sound Technologies for Mitigation of Climate Change

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## Abstract

This paper examines the impact of environmentally sound technologies on climate change in Nigeria and recommends ways for policy decisions. Using literature review and case study, it is revealed that energy companies use environmentally sound technologies to mitigate climate change. It recommends the need to embrace environmentally sound technologies,

## Introduction

Rapid growth of innovative technologies has significantly impacted oil and gas development in the last few decades. These trends have profound implications for the world economy such that, increasingly, major decisions around the world on energy issues are driven by sustainability. Industrialization and economic growth are responsible for many industrial environmental dangers in the developing and developing economies of the world. Air pollution caused by emission from fossil fuel combustion is a growing problem. (UNDP, 2000).

The availability of energy is critical for economic and industrial development, and so is the emerging consensus on the role of fossil fuels in promoting global warming. However, years of consumption of fossil fuels have led to several environmental issues. Some of those issues include global warming and air pollution with their attendant health challenges which impact of the quality of life of the world's peoples (Manisalidis, 2020; Martins et al., 2019). In fact, according to the World Bank's Global Gas Flaring Tracker Report, gas flared from the oil and gas industry releases certain pollutants into the atmosphere which include CO<sub>2</sub>, methane and black carbon, also known as soot (The World Bank, 2021). These pollutants, particularly CO<sub>2</sub> are the biggest contributors of climate change, which is now biggest risk facing mankind (Anderson, 2016). For instance, the top seven gas flaring countries of Russia, Iraq, Iran, the United States, Algeria, Venezuela and Nigeria are said to account for about 40% of global oil production and about 65% total gas flared into the atmosphere from their oil and gas activities (The World Bank, 2021). Within the last five years, the top seven countries have flared close 500 billion cubic meters of gas into the atmosphere. See Table 1 for volume of gas flared by the big seven for the last five years

In order to evolve a sustainable pattern, reduce the impact of fossil fuels on the planet, and ensure long-term development, there is now a major shift towards

renewables and the improvement of energy efficiency in all sectors (Martins, 2019; UNDP, 2000). Conversely, achieving sustainable energy systems is herculean task despite the efforts made by stakeholders such as governments, international agencies, etc. (Martins, 2019).

The rapid globalisation and rationalisation of the energy industries generally and the petroleum industry in particular, coupled with the giant strides in environmentalism have made in the last two decades highlight the importance of the transfer of environmentally sound technology, cooperation, and capacity building. It is suggested that environmentally sound technologies (ESTs) that will lower the rate of air pollution be developed and applied in all industries (Manisalidis et al., 2020). ESTs can reduce environmental pollution by adopting of efficient technologies (Kumar et al., 2020). There is no universally acceptable definition of environmental sound technology (Robinson, 1992). The environmental soundness of technologies is a relative rather than an absolute term, as it is dependent on technical and economic conditions as well as the level of environmental standards.

It was nevertheless agreed at UNCED that environmentally sound technologies protect the environment, are less polluting, use resources in a more sustainable manner, recycle more of their waste and product, and handle residual waste in more acceptable manner than the technologies for which they were substitutes (Agenda 21). Such technology can be referred to as clean technologies and include air pollution cleaning equipment, others are renewable technologies such as solar panels and wind turbines, increasing the uptake of those technologies can result in several benefits for the environment (UNEP).

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Table 1: Volume of gas flared by the top seven gas flaring countries for 2016-2020 (billion cubic meters)

Country	2016	2017	2018	2019	2020	Total
Russia	22.37	19.92	21.28	23.21	24.88	111.66
Iraq	17.73	17.84	17.82	17.91	17.37	88.67
Iran	16.41	17.67	17.28	13.78	13.26	78.4
United States	8.86	9.48	14.07	17.29	11.81	61.51
Algeria	9.10	8.80	9.01	9.34	9.32	45.57
Venezuela	9.35	7.00	8.22	9.54	8.59	42.7
Nigeria	7.31	7.65	7.44	7.83	7.20	37.43
<b>Grand Total</b>						<b>465.94</b>

Source: Extracted from The World Bank, 2021.

In the context of pollution, environmentally sound technologies are processes and “product technologies” which generate low or no waste, in order to prevent pollution. Also included in the concept are the “end of pipe” technologies for treating pollution after its generation. Environmentally sound technologies are more than just individual technologies, but systems which include know-how, procedure, goods and services and equipment including organisational and managerial procedures.

The need for favourable access to and transfer of environmentally sound technologies to Nigeria cannot be overemphasized. This is partly because the availability of scientific and technological information and access and transfer of environmentally sound technology are essential requirements for sustainable development.

Ibibia (2002) submitted that the increasing spate oil and gas exploration and development in Nigeria have brought considerable strain on the Niger Delta environment in Nigeria and highlighted the urgency for diffusion of clean technologies. Not being unmindful of the growing influence of international environmental law and the changing standards of environmental performance in the home countries of oil and gas multinational enterprise, the Nigerian Government has introduced environmental regulatory pressures to bear on oil and gas industry operations.

Furthermore, Ibibia (2002) posited that one possible way by which industry can avoid violating these new standards and yet remain competitive is to take the initiative in introducing clean technologies in all aspects of their operations rather than assume that because of their technological backwardness, Nigeria can serve as a dumping ground for obsolete technologies. But more importantly, the government has to chart the way forward.

In Nigeria, the awareness by country of the damage of pollution arising from projects where oil companies are located has increased their cost to the extent that communities are demanding compensation. According to Falobi (2009), natural gas in Nigeria has not attained its potential as a major source of fiscal revenue in the domestic economy because of inadequate funding for infrastructure development, inept pricing of natural gas for domestic gas policy and regulatory framework and environmental degradation due to gas flaring.

Other factors are:

- i. The huge cost of developing major and interconnecting network of gas pipeline
- ii. Limited no of appropriate reservoir conducive for gas reinjection/storage and economics of doing so
- iii. Low technological and industrial base
- iv. Limited regional and international gas market
- v. Inadequate fiscal and gas pricing policies to encourage investment
- vi. The difficult terrain of Niger Delta which hindered the gas gathering process

The combination of these factors sub-optimizes Nigeria’s competitive position in a rapidly evolving and intensely competitive global gas business. However,

the gas infrastructure blueprint aims to address these barriers and leverage a diversified industry player base to actualize this. According to this day report of 30th October (2013): Clear gas development policies can help boost the economy, power generation and improve the standard of living for Nigerians. The report stated further that the federal government of Nigeria should harness the potentials of the nation’s enormous gas reserves by establishing a win-win situation that would serve as investments in domestic gas projects. The report also sought the creation of positive incentives to encourage local and international investments in the entire gas value chain, while promoting a willing buyer-willing seller market-driven pricing regime.

Against the backdrop the research question is what do policy makers need to know about oil and gas development project to produce development support strategies that are environmentally effective? The objective of the study is to examine the impact of environmentally sound technology on climate change in Niger Delta.

### Methodology

The methodology involves collection of secondary data from literature review and the case study of international and indigenous oil and gas operators in Niger Delta region of Nigeria.

### Result and discussion

Effective management of the environmental impact of project is a major concern in the oil and gas industry. According to Herriot watt Institute of petroleum studies (2005): *Pollution and other forms of environmental damage are common by products of most industrial activities and classified by economist as “externalities” implying zero financial implication to business. In the absence of effective penalties the avoidance of pollution increases operating cost and is likely to reduce rather than to enhance profitability. Therefore there is no direct, economics incentives for profit maximizing organisation to think about pollution. It is consequently necessary for government to build a framework of legislation for environment protection.*

Ecological analysis is necessary especially with the recent environmental degradation caused by pollution related industries. It is concerned with the analysis of how to mitigate possible damage to a manageable level. No industry has higher environmental and climate change concerns around the world than oil and gas. For policy makers it should be noted that environmental considerations and public opposition to oil and gas projects affect opportunities for investment and the cost of projects. Technology is both an input and output of business organisations as well as being an environmental influence on them.

Environmentally sound technology encompasses an evolving group of method and materials for production of essential nontoxic product by oil and gas operators. Oil and gas development are very important drivers for job creation and also a pillar of economic growth in many oil and gas producing countries. They play prominent roles in the development of developed countries

in terms of creating employment opportunities. The oil and gas operators generate waste and pollution from their practices and business because of their informal nature and lack of regulation and supervision. The pollution produced by the oil and gas industries have contributed immensely to the global warming and natural resources depletion leading to many economic and social problems such as:

### Case study of application of environmentally sound technologies by energy companies.

1. According to the investor village report (2011): The company Britania – U a marginal field operator currently produces 2.2mmscfd of gas from its Ajapa field out of which 1.8mmscfd is reserved to power the production system on board the Floating Production, Storage and Offloading owned by the company, while the balance of 400scfd is small to be used for anything, rather the company fixed sonic flare tip, which is the latest technology ever to be used in the country, which cleans out the poisonous elements and emits smokeless air into the environment.
2. Total energy Nigeria limited, as part of its drive towards clean energy and reduction of carbon emissions, embarked on the installation of solar energy at its offices, retail outlets, and project sites adding to the deployment of modern technologies in its operations. TotalEnergies, through its Joint Venture with the Nigerian National Petroleum Corporation (NNPC), earned \$1.4 million through the sales of Carbon Credit on the United Kingdom market in 2020.
3. The Southern Swamp Associated Gas Solutions project captures gas produced alongside oil in the Niger Delta to help reduce flaring. The Shell Petroleum Development Company of Nigeria Ltd (SPDC) Joint Venture reported a 17% decrease in routine flaring in 2020. Further associated gas flaring reductions by SPDC are anticipated with the completion of commissioning of the Forcados Yokri gas-gathering project in 2021. This is in line with Vijay (2012), submission that: "By reducing gas flaring, oil producing countries and companies are improving energy efficiencies and mitigating climate change. Instead of wasting this valuable resource, we now need to develop gas market and infrastructure so the associated gas can be utilized to generate electricity and cleaner cooking fuels."

### Conclusion and recommendations

The study set out the one of the strategies and mechanisms for implementing the techniques for managing the environmental aspect of the energy industry. It was revealed that technology may involve, but is by no means restricted to equipment, patents processes and copy rights. It is rather of host of intricate interconnected factors that traverse equipment, patents, processes and copyrights and most importantly knowledge of how to invent, manipulate and use the above-men-

tioned factors towards the attainment of definite goals. in recent time emphasis has shifted from the transfer of technology per se to environmentally sound technology for climate change mitigation.

- Research and development efforts should be geared towards innovation, dissemination and management of environmentally sound technology.
- Education and training program should be tailored to meet the need for environmentally sound technologies with interdisciplinary outlooks.
- There should be an emphasis on the building of capabilities for craft persons, technicians and middle level managers, scientist, engineers and educators as well as developing their corresponding social and managerial support systems.
- There should be collaborative efforts of governments, industries and individuals towards the implementations of environmentally sound technologies.

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