



Review Paper

## Mitigation Option to Climate Change through Consumer Innovativeness

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### Abstract

*The purpose of this paper is to complement mitigation approach to climate change in less developed countries. The paper presents a framework for addressing climate change through individual and organizational innovativeness. Uncertainty about the future of our environment posed by climate change requires collective innovativeness by individuals, organizations and government. This paper proposes product, process, business, and information technology innovativeness as complement to mitigation strategy for managing climate change, particularly in least developed countries were highly effective and advanced disaster preparedness is minimal. This paper demonstrates that readiness to accept change is an important antecedent to becoming innovative in product, process, business and information technology. The paper also demonstrates that individual and organizational innovativeness will significantly enhance mitigation of climate change. A major responsibility of government and top management of public and private organizations is to systematically manage change; provide incentive for and encourage innovativeness to enhance mitigation approaches to managing climate change. While scholars and researchers suggest new approaches for responding and managing climate change, little attention has been directed towards the innovativeness presented in this paper. In narrowing the gap identified in the literature, this paper complements the Intergovernmental Panel on Climate Change (IPCC) fourth assessment synthesis report.*

**Keywords:** Climate change, Mitigation, Innovativeness, Readiness

### Introduction

Managing the outcome of climate change such as typhoon and heavy rainfall that lead to heavy flooding in an effective and timely manner will require highly skilled and well trained manpower equip with the latest technologically advanced tools and machines. While the developed countries have the capabilities to at least effectively manage any climate change related disaster, the least developed countries in particular don't have the capabilities such as early detection equipment and other resource for managing disaster. Despite the considerable climate change literature, adaptation and mitigation advocate among scholar in the field of environmental management, addressing climate change through innovativeness has not been given much attention. Although third world countries rely on innovative products manufactured by industrialized nations, the propensity of individuals to strictly purchase products that are environmentally friendly; and organizations such as construction industry striving to adopt innovative products, process, business and information technology will have significant impact in addressing climate change. Readiness of individuals to change from purchasing and using non environmental friendly products to products that are environmental friendly; additionally, readiness of organizations to start adopting products, process, business system that are proven to be environmentally friendly is crucial to addressing climate change. Due to aforementioned, this paper therefore

proposes innovativeness as one strategic means of managing climate change with a focus on third world countries.

This paper provides two main contributions: it clearly proposes consumer (individual) and organizational innovativeness as a means of mitigation strategies for managing climate change. Second, the framework proposed in this paper is underpinned by underpins by readiness change theory. The theory explains how individuals accept changes that are newly introduced in their organizations.

Scientists have described climate change as changes in temperature and precipitation that affects atmospheric chemistry and composition. These changes cause atmospheric degradation, usually termed "atmospheric corrosion", of material surfaces including building facades<sup>1</sup>. There is a high level of agreement among scholar on the reality of climate change<sup>2</sup>. The number of environmentally related natural disasters and catastrophes in many countries since the start of the new millennium and the continuous increase in global average temperature of air and ocean, melting of snow and ice and rising global average sea level are both indicators and evidence of regional climate change that cannot be ignored by this generation.

### Climate Change

While the literature provides various definitions of climate

change, for example United Nations Framework Convention on Climate Change (UNFCCC) defines climate change as a change of climate that is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and that is in addition to natural climate variability observed over comparable time periods. This paper adopts the definition provided by the Intergovernmental Panel on Climate Change (IPCC)<sup>3-4</sup>. In this paper, we define climate change as “change in the state of the climate that can be identified (e.g. Using statistical tests) by changes in the mean and/or the variability of its properties and that persists for an extended period, typically decades or longer. It refers to any change in climate over time, whether due to natural variability or as a result of human activity”.

Climate change is not confined to a particular continent, or part of the world. It affects all nations, developed or developing countries; rich or poor; in northern or southern regions<sup>5-6</sup>. The disturbing consequences of climate change affect all the aspects of human existence; it has direct harm on human life, such as deaths and destruction of properties resulting from extreme conditions and natural disasters. Additionally, it affects man’s physical environment, and has an indirect effect on both the national and global, economic, social and as well as political structures<sup>7-9</sup>. Consequently, efforts to address, and adapt to, the changing environment has been and still are being undertaken by the international organizations, national governments, academic institutions, and by the research and scientific communities. Climate change has been identified as one of the main challenges to mankind and if the local greenhouse gases (GHG) emissions reduction is not timely and seriously addressed, the consequences can be very devastating not only to the global environment, but to the economy and the international security as well<sup>10</sup>.

The three main variations of climate change are elevated CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O altered rainfall patterns, and temperature ranges. Adverse effects of temperature rise are continuous alterations in ecosystems; a rise in sea water level; drought some regions as well as extreme weather conditions, and severe storm. Additionally, climate change can result in economic and species losses; and spread of disease such as malaria<sup>11</sup>. Describing one of the dimensions of climate change, Kelman<sup>12</sup> notes that extreme weather has always affected humanity, bringing advantages and disadvantages for society. When a location experiences more water than has been experienced in the recent past, this can result in a flood which has the potential for killing people and damaging property including crops and erosion of arable lands. In addition, high winds and wildfires damage forests and can destroy trees, also threatening lives and properties. According to Wilby and Harris<sup>13</sup>, signals of climate change may not be statistically detectable for many decades to come. This is perhaps due to the dynamic and complex nature of both the climate and hydrological systems, thereby placing us in an uncertain future<sup>14</sup>.

While some scholars in this field of research suggest that the risks associated with climate change can only be managed by mitigation or adaptation measures, others proposed a combination of both strategies. Following the definitions of Brooks<sup>15</sup> on climate change adaptation and mitigation, the former strategy refers to adjustment in ecological, social, or economic systems in response to actual or expected climatic stimuli and their effects or impacts. The latter the former strategies aim at reducing hazards associated with climate change through preventive measures, and adaptation approach<sup>15</sup>.

**Causes of climate change:** Addressing climate change requires an understanding of the main causes. Human activities has been identified as the source carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (NO<sub>2</sub>) and halocarbons gas known to contain fluorine, chlorine or bromine. These gases resulting from human activities forms a layer known as greenhouse gas (GHGs) that radiate heat from the sun cause a drastic rise in global temperature. According to the IPCC<sup>3</sup>, human activities result in emissions of four types of gases, namely CO<sub>2</sub>, methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O) and halocarbons. Unless the activities resulting to the emissions of these gasses are stopped, atmospheric concentrations of the GHGs will increase as the activities take place and emissions will continue rather than removal processes. Particularly, global increases in CO<sub>2</sub> concentrations are as a result of fossil fuel use. The increasing level in CH<sub>4</sub> concentration has been attributed to agricultural activities and much usage of fossil fuel. Similarly, the increasing level in N<sub>2</sub>O concentration has been attributed to agricultural activities.

**Responding to climate change:** There are two main approaches for responding to climate change: adaptation and mitigation. While adaptation approach aims at reducing the impacts of weather- and climate related events such as floods, droughts and storms on those that are most vulnerable. Mitigation approach aims at a significant reduction of the GHGs. However, both approaches are very much useful for responding to climate change. Despite the mitigation undertaken in some societies, adaptation measures will be useful at regional and local levels to reduce the adverse impacts of projected climate change and variability, adaptation alone will not likely address all the impact of climate change on a long term, perhaps because its gradual increase in magnitude<sup>3-4</sup>. According to The IPCC<sup>3-4</sup>, the capacity to apply adaptive approach largely depends on a country’s natural and capital assets, human capital and institutions, governance, national income, and technology. However, developed countries with high adaptive capacity are still vulnerable to climate change, and extreme climatic conditions, for example, a heat wave in 2003 caused high levels of mortality in European cities, and Hurricane Katrina in 2005 in the United States<sup>3</sup>. When least developed countries lack the capability to effectively respond to climate change through adaptation or mitigation due to financial, technological, behavioral, political, social, institutional and cultural factors, that the best option for such society is consumer innovativeness.

While the IPCC<sup>3-4</sup>, notes that a single technology can not provide all of the mitigation solution across all economic sectors; and the diffusion of low-carbon technologies may take decades, even if investments in these technologies so attractive. Evidence suggests that least developed countries can offer a significant contribution to climate change mitigation by changing their lifestyle, behavior and consumption patterns, education and training, building occupant behavior, as well as transportation management. We argue that all these changes can be achieved through consumer and organizational innovativeness and consequently decrease the unsustainable use of fuel wood and related deforestation.

**Consumer Innovativeness and Mitigation Approach:** In the earlier work of Rogers, innovativeness was conceptualized as consumers' attitudes in accepting and purchasing new products and the latter extends to the organizational level<sup>16</sup>. Hence, consumer innovativeness could refer to individuals or organizations.

Individuals having a higher propensity to accept and purchase new products that are newly introduced into the market are considered innovative than others. Organizational innovativeness refers to the capacity of an organization to accept a new product or adopts an innovation in the form of process, concept or technology into the organizational system.

There are various definitions of innovativeness provided in the literature. There are scholars who conceptualized innovativeness as the adoption of ideas and concepts that are new to the organization or to the industries. Hence, they view innovativeness in terms of the number of units of adoption by the organization, (for example)<sup>17</sup>. Other scholars conceptualized innovativeness in term of service or product which an organization provides. For example, Hurley and Hult<sup>18</sup> view innovativeness as the propensity of an organization to introduce some new process, product, or idea. From the viewpoint of a consumer behavior, Foxall<sup>19</sup> defines innovativeness as the ability to purchase new products and services. According to Foxall<sup>19</sup>, innovativeness is a personality trait associated with acceptance for new products though vital, but an extremely risky process. Foxall<sup>19</sup> definition is on consumer innovativeness which has to do with the rate of acceptance of new products or services introduced into the market. Thus, Foxall's definition is very much relevant to change in lifestyle, consumption pattern, building occupant behavior as part of mitigation strategy which IPCC suggested. For this reason, we strongly posit that there is a relationship between innovativeness and mitigation strategy to climate change.

IPCC<sup>3-4</sup> recognizes that changes in lifestyle, behavior patterns and management practice significantly enhance climate change mitigation across economic sectors of a country such as education, energy supply, transport, building, agriculture, forestry and waste management. Issues of climate change should be incorporated into the school curriculum at all stages of

education with particular focus on the causes and solutions to climate change. At the management level across all sectors, particularly in least developed countries that depend on imported goods to review their consumption patterns towards reducing the causes of climate change.

To become an innovative, an organization must develop a culture of openness to new ideas and concepts. Perhaps the readiness to change from the usual daily routine and process by all members of an organization can enhance the culture of accepting new management style, process, services or production methods<sup>20</sup>. The extent of adoption or implementation of new ideas developed within or borrowed from outside the organization can largely influence the openness and propensity to adopt innovations. Thus innovativeness within an organization can be enhanced by periodic renewing, widening and improving individual knowledge.

In the context of climate change, this paper refers to consumer innovativeness as the ability of individuals and organizations to demand and purchase products, or adopt or uses a process or technology that are very much environmentally friendly, such as products that emit zero or least amount of CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O to the environment. This also includes product that is specifically designed to cope with climate change, such as building materials and components like stainless steel. Although adaptation to climate change is required both in the short term and longer term for addressing the impacts of climate, the IPCC<sup>3</sup> states that neither adaptation nor mitigation alone can avoid all impacts from climate change. However, both approaches can complement each other and together can significantly reduce the risks of climate change. We believe that when society, particularly in least developed countries are ready to change through behavioral innovativeness, adaptation and mitigation approach to climate change will be much more easier.

Developed countries such as United States, and United Kingdom are known for the most recent, advanced technology and needed resources to apply adaptation and mitigation approach in managing climate change. Such as early warning, flooding and storm detectors, well-structured relief operations fully managed by well trained professionals. On the contrary, the situation is different in most developing countries; this is even worse in third world countries. Consumer (individual) and organizational innovativeness will certainly be a stepping stone in managing climate change. While consumer innovativeness refers to the propensity of individual to demand and purchase innovative products, organizational innovativeness refers to propensity of an organization to adopt innovativeness product, process, business and latest information technology.

For the fact that most of the least developed countries are consumers of products imported from foreign countries. When the societies begin to demand for manufactured and assembled products such as cars, motorcycles and Lorries that emit the

least carbon emissions to the environment, compared to purchasing and consuming just any available product in the market, they are actually exhibiting consumer innovativeness Roger<sup>21</sup>, and at the same time reducing the emission of gases that causes the greenhouse effect<sup>3-4</sup>. The framework for adaptation and mitigation approach through innovativeness is presented in figure-1.

Figure 1 depicts the adaptation and mitigation approach to climate change through innovativeness whereby individuals and organizations are ready to innovative in the products, daily routine or working process, business system and most importantly their way of life through behavioral innovativeness.

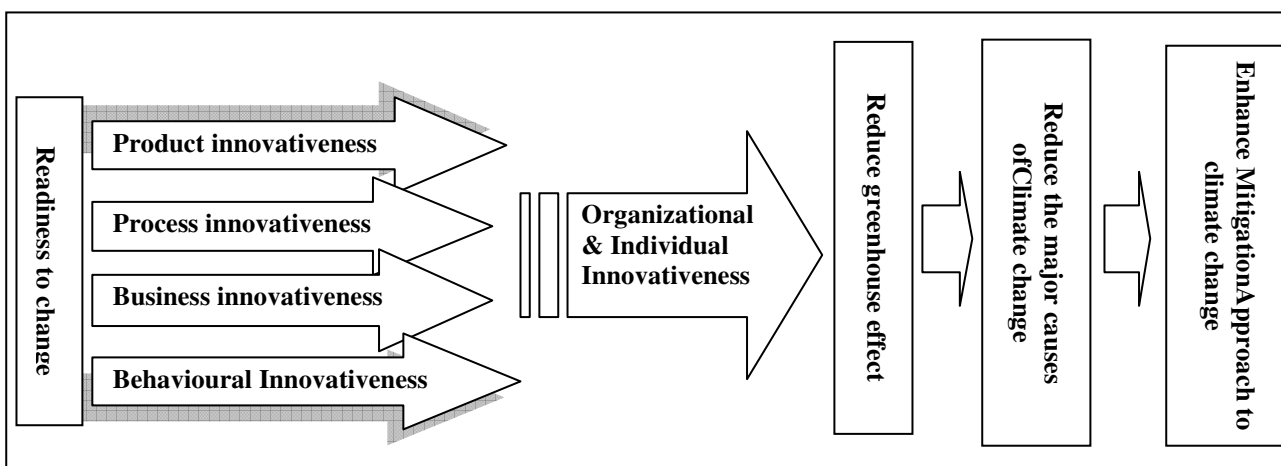
While the IPCC<sup>3-4</sup> presents some key example of mitigation approach across sector of the economy, we note that all the examples might not be applicable to least developed countries due to some limitations such as advances in science and technology as well as in the manufacturing industry. Table 1 therefore preset few mitigation approaches applicable to most of those least developed countries. The table also presents the

relationship between the mitigation approach and dimension of innovativeness.

The readiness change theory underpins the connection between mitigation to climate change and innovativeness. According to Armenakis et al.<sup>22</sup>, readiness is a psychological state that an organization can attain, when its members are positive in their attitude, belief and intention towards the change to the extent that those involved in the process begin to adapt to change and behave in the manner that conform with the change. Hence, readiness to or not-to change can significantly influence the success or failure of change in an organization, vis-a-vis change from the old way of doing thing to adopting innovations. However, there are factors contributing to individual decision of accepting or resisting a change. The two basic factors identified by Eby et al.<sup>23</sup> and Holt et al<sup>24</sup> are both individual and organizational. These two factors can be influenced by four barriers as Kotter and Chen<sup>25</sup> have suggested: first is boss barriers, second is the system barrier, third is mind barriers and fourth is the information barriers.

**Table-1**  
**Relationship between mitigation approach and innovativeness**

S/N	Sector	Key Mitigation approach	Relationship with Innovativeness
1	Energy	Switch from wood fuel to gas, renewable heat and power	Product innovativeness Behavioral innovativeness
2	Transports	Demand and purchase more fuel efficient and hybrid vehicles. Extensive use of rail, public and non-motorized transportation system.	Behavioral innovativeness
3	Building	Demand, purchase and use domestic appliances that emit zero or least CO <sub>2</sub> , CH <sub>4</sub> , and N <sub>2</sub> O	Product innovativeness Behavioral Innovativeness
4	Agriculture	Extensive use manure to reduce CH <sub>4</sub> emission, use fertilizer with least N <sub>2</sub> O to reduce emission, reduce use of fossil fuel	Behavioral Innovativeness
5	Forestry	Improve forest management, reduce deforestation, replace fossil fuel with Bioenergy	Behavioral Innovativeness
6	Waste	Minimize waste, CH <sub>4</sub> recovery system, improve recycling	Behavioral Innovativeness



**Figure-1**  
**Mitigation approach to climate change through innovativeness**

## Conclusion

In responding to the impact of climate change on the environment, peoples' life and properties, this paper identifies mitigation and adaptation as two broad strategies for managing climate change from the literature. It therefore proposed innovativeness as a means of managing climate change. In responding to climate change, this paper proposes that individuals should demand for manufactured products that are highly environmentally friendly thereby demonstrating consumer innovativeness. Priority should be placed on products such as electricity generators that emit less carbon monoxide (CO<sub>2</sub>) where public electricity is not available. This can significantly reduce the amount of the CO<sub>2</sub> causing damage to the Ozon layer. Organizations such as client and construction firms and professionals should consider climate change during the conception and preliminary designs of any project. Additionally, players in the construction industry should adopt the concept and principles of "green building" which suggest efficient utilization of energy and a healthier environment. If the least developed countries are to play a significant role in addressing the global climate change, there must be a readiness to change from all human activities contributing to the greenhouse effect to human activities the mitigate climate the causes of climate change.

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