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Potential Climate Change Adaptation Strategies Suitable in the Philippine Setting

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ABSTRACT

Climate change is one of the most challenging environmental issues being faced by the world. Its effects are slowly getting worse and unbearable. Adaptation techniques are important to learn how to deal and live with climate change, and somehow address it. This paper provides possible practices and ways of adaptation to climate change that can be of help to the people. These ways include three major components: use of technical practices and strategies, execution of site-based programs, and raising people's awareness and sense of responsibility. These practices can help address the problem and improve the way of living of people while also improving the environment's situation.

INTRODUCTION

Earth has been experiencing numerous problems posing harm to the environment and the people. One of the most alarming issues of today deals with the climate. According to the Merriam-Webster Dictionary (2015), climate is the "average course or condition of the weather at a place usually over a period of years as exhibited by temperature, wind velocity, and precipitation." The specific dilemma associated with climate is climate change which is the phenomenon that changes the composition of the Earth's atmosphere caused by both natural and human activities, having either direct or indirect effects on the atmosphere (National Research Council, 1992). It is also an occurrence that can be observed as climate variability over a comparable period of time (Jepma & Munashinge, 1998). Climate change is considered as one of the major environmental issues encountered not only by a city or a country but by the entire world. Thousands of studies about climate change have been conducted since it was discovered as a threat.

Considering the reasons for the existence of the problem, two main factors were found: the natural and the human causes (United States Environmental Protection Agency [or EPA], 2010). EPA in 2010 stated that the natural causes of climate change involve the changes that happen in the Earth's orbit, variability of sun's intensity, process of the oceans' circulation and the intensifying volcanic activity. EPA also enumerated the human causes which are burning of fossil fuels, cutting down of our forests and converting of land for farms, cities, roads, and projects. Fossil fuel emits too much carbon which is very dangerous for the atmosphere or the ozone in very high amounts. Also, it is inevitable that trees in the forests help in the sequestering and storing carbon in the environment and if it will be deforested, it will accumulate in the atmosphere as greenhouse gas (GHG) (Coracero & Malabrigo, 2020).

Climate change has tremendous impacts on Earth and its people. Their impacts are listed in the succeeding statements according to the study of Bojo&Kariuki (2010). First, climate change causes the country to be very prone to intense weather conditions. Also, there comes a time of having unpredictable variation in the rainfall activity which badly affects agricultural lands and other associated activities. Another is the continuous rise of temperature usually observed. Climate change also makes different coastal communities have a problem that is threatened greatly by sea-level rise and storm surges. Honestly, poverty will be the possible outcome or result since the economic

progression of the world is being affected. Lastly, the damaged landmass and nature will be involved in having a higher cost of treatment to the bearings brought to the country by climate change and other supplementary disasters.

As a global threat, climate change affects both developed and underdeveloped countries (Chinowsky et al., 2011). The impacts of this change should have corresponding actions from the people. Adaptation to climate change can be one of their responses. As mentioned by Levina and Tirpak (2006) in their book, adaptation is defined by IPCC TAR (2001) as the "adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities." Effective adaptation measures are science-based which are products of meticulous research projects and studies of scientists and environmentalists (Swart et al., 2014). Access to this type of knowledge, together with the capability to afford the consequences of climate change, is somehow challenging for the poor and underdeveloped countries making them the most vulnerable groups among others (Government of Canada, 2020; Dervis, n.d.). Thus, providing them with a set of adaptation strategies to combat and adapt to adverse impacts of climate change is ideal.

This paper aims to provide a set of practices and ways of people's adaptation to climate change through using technological strategies, executing site-based programs, and developing their awareness and sense of responsibility.

MATERIALS AND METHODS

This research is a compilation of possible science-based practices and ways to adapt to climate change. The medium and source of information used were the internet (e.g. online publications, news, announcements) and the library of the University of the Philippines Los Baños in Laguna, Philippines. After reading some materials, the author came up with three general classifications of these practices which were the following: using technological strategies, executing site-based programs, and developing people's awareness and sense of responsibility.

The strategies provided in this study were from the reports of the following trusted scientists and international organizations: (1) Center for Climate and Energy Solutions, Virginia; (2) Climate Change Commission, Philippines; (3) Ministry of Science and Technology, China; (4) Ministry of Sustainable Development and Tourism, Podgorica, Montenegro; (5) International Federation of Red Cross and Crescent Societies, ProVention Consortium, and K. Westgate through the United Nations Framework Convention on Climate Change; (6) International Union for Conservation of Nature; (7) Lambrou and Piana through the United Nations Food and Agriculture Organization; (8) Rosenzweig et al. through the Urban Climate Change Research Network; (9) United Nations Framework Convention on Climate Change (UNFCCC) by the UN Climate Change Secretariat; (10) US Department of Transportation, USA

Specific activities on these general strategies were then enumerated and explained. Further, the claims and strategies were supported by pieces of evidence and references from published materials.

RESULTS AND DISCUSSION

Technological Methods as an Adaptation Strategy

For adaptation to climate change, one of the most efficient methods the people have to use is the strategy which deals with technological processes and concepts. Since today's generation is being exposed to the trends of the modern and scientific world, it would be easy for them to use scientific and technological ways on adapting to climate change. One is by increasing efficiency in energy consumption through different steps enumerated by the Ministry of Sustainable Development and Tourism, (2012). Initially, there must be a renewal of boilers which is included in the heat generation of the different industrial facilities working with various processes. Then, people must use more efficient vehicles like hybrid and electric vehicles, and preferring to ride in public transports. In a study conducted by the U.S. Department of Transportation (2010), using public transportation actually reduced greenhouse gas emissions where private vehicles and trucks contribute to almost 77% of the transportation emissions from both private and public vehicles. There should also be the use of heat pumps, insulation buildings with high qualities, solar power, and small cogenerations for heating purposes that are either used in the household or service division. Drennen et. al (1996)

said that if 50% of energy consumption will be by using solar energy through photovoltaics (PV), it can reduce annual harmful gas emissions to counter the prediction of 10% and 32% increase in GHG in 20 and 50 years, respectively. Since the industrial processes contribute much to the production of gases that diminishes the strength of the atmosphere, it will be beneficial if energy consumption will become efficient in heat generation. For successful adaptation, both households and service providers (e.g. industries) shall prioritize the use of solar panels and efficient lightings that can help reduce heat and global warming (Valéry et al., 2014). Also, riding in public transports decreases the number of vehicles emitting harmful gases in the environment which was studied by the U.S. Department of Transportation (2010). These steps will be of great help in attaining the projected outcome of the adaptation strategy.

The emission of harmful gases is one of the greatest factors that lead to the thinning of the atmosphere particularly the ozone layer. The Union of Concerned Scientists or UCS (2008) in the USA explained that gases found in refrigerants and aerosol sprays, known as chlorofluorocarbons (CFCs) and halons, when released in the atmosphere can deplete the ozone. Further, UCS emphasized that CFCs and halons cause chemical reactions that tear apart the ozone molecule leading to the reduction of its ultraviolet radiation-absorbing capacity. The emissions could come from humans and from natural sources or from the environment, but to a great extent, humans have contributed much to harmful gases. Technological climate change adaptation can also be done by reducing emissions through the development of technologies for GHG emission reduction (Ministry of Science and Technology [or MOST], 2007). GHG emission can be reduced by the development of effective coal-burning power generation which is a superb way. It can also be done by the invention of the consumption technology of "oil field torch gas" according to the ministry. Aside from that, energy efficiency and saving discoveries on technology must be used in building materials, steel, chemicals, construction, and other sectors. Furthermore, MOST (2010) mentioned that progress in renewable and innovative energies that includes thermal energies, fuel cells, solar power, and wind energy has been achieving advancement and progress. Renewable energies are very helpful in the control of GHG emissions, and if it will continue achieving its advancement it will contribute great benefits for the world against the threatening climate change.

Some other forms of technological adaptations can also be used in different sectors like in coastal zones and in agriculture. In coastal zones, a step by step procedure which uses technological concept is followed (UNFCCC, 2006). The first phase is the collection of the needed information with the use of high-tech equipment like tidal gauges, satellites, and remote sensors. These equipment help gain accurate findings and result omitting unexpected human errors in the midst of the data collection and the entire process. After that, the combination of the data collected to the result or data gathered through human/manual effort like interviews and surveys can be accomplished, since a person's thinking and effort also has a high demand and can be considered a factor to the success of a research. Next is the analysis and presentation of data through the use of computer programs or Geographic Information System (GIS) which is very famous nowadays. Afterward, the images and data which will be obtained from the results shown by the GIS maps will be used for planning the response to be applied. For example, hard structures like dykes will be protected, set back zones will be established and early warnings will be delivered and evacuation systems will be managed well. Another example is the elements from protected soft structures like dunes, wetland restorations, or beaches; threatened buildings will be relocated and people will be insured away or free from hazards. While in the field of agriculture the strategies which may be used are crop resilience increase and the proper water management (Smith, 2004). In increasing crop resilience, one method is the shifting of planting schedule due to inconsistent climate and crop rotation. Shifting of planting schedule is very advantageous for the farmers because they will be able to adjust to the weather. In crop rotation, it will not only help them in addressing climate change but also acts as a method of bringing back the nutrients of the soil. Whereas in the proper water management, water must be conserved, wasted water must be lessened and there must be water productivity or obtaining more crops per drop.

Site-based Programs Execution as an Adaptation Strategy

Site-based adaptation can also be a great help to cope with climate change. This kind of adaptation is the one done in a specific place or location wherein a particular strategy or technique is being taught. Site-based adaptation can be held in a community. This kind of strategy is termed as the community-based adaptation. According to Girot, Ehrhart, and Oglethorpe (2013), there should be programs like the implementation of livelihood resilience projects promoting hardier seed varieties in a community. Another action on livelihood resilience is upholding drip irrigation. Lastly, livelihood program which can help the people to raise cash or through income diversifications for the reason that in the modern-day it is irrefutable that money plays a big role for a program or project to be successful. Also, in a community, people should be taught the strategies for disaster risk reduction to minimize hazards and to save the most susceptible household and individuals from disasters. According to the World Meteorological Organization, disasters are associated with climate change especially in areas such as storm-exposed coasts, flooding river deltas, earthquake-prone valleys, and volcanic slopes (Wahlström, 2009). Thus, disaster risk management can help save several people in the community.

Another activity in the community is advocacy and social mobilization that is very objective can help in addressing the fundamental reasons of being susceptible, like the limited access to fundamental services offered, the non-ending discrimination, and other social injustices (Girot et al., 2013). Also, in the midst of climate change, food security must be one of the major priorities in a community. It is to ensure its convenience, stability, and safe and healthy food (Climate Change Commission, 2011). Food, as people know is one of the basic needs of a person aside from clothing and house. In its absence, it is also like taking the soul of a person away from his body.

There is also an ecosystem-based adaptation strategy aside from the community-based one. This kind of adaptation cares about the stability, betterment, and maintenance of the environment. It also wishes to achieve the ecological balance and never to destroy nature to be safe from hazards. As mentioned, ecological environment stability must be maintained in this kind of adaptation. It is for the environment to gain its rehabilitation and protection and for ecological services to be restored (Climate Change Commission, 2011). In other locations like in coastal areas, "infrastructure and forest/mangrove restoration" can lead to the boosting of its safety and security (Rosenzweig et al., 2015). Rosenzweig et al. (2015) through the Urban Climate Change Research Network also said that land utilization and progression planning must be upgraded, and that maintenance and preservation of wetland areas is an important ecosystem-based strategy. If the utilization of the environment and its entire component will not be in the right way, ecological stability will be disturbed.

Raising People's Awareness and Sense of Responsibility as an Adaptation Strategy

The last adaptive way to climate change is by knowing the said problem which will be seen from every individual's actions. Awareness and responsibility always come in pairs. If a person will not be aware of something, there is no way of fulfilling the assigned task or responsibility to that person. UN Secretary-General Ban Ki-Moon and UNEP Executive Director Achim Steiner agreed that: climate change is 'the defining challenge of our generation' (United Nations Environment Programme, 2008). That challenge can only be resolved by the people's awareness and responsibility. One of the ways to promote awareness is through capacity building. Capacity building is defined as educating people and giving them knowledge about the things related to climate change and their personal activities contributing to it (Cowie, 2007). As a matter of fact, according to the United Nations, support can be obtained from the workers if their communication skills and capacity will be enhanced. Also, increasing consciousness about and building capacity to respond to the changes in the climate is found to be one of the most crucial things about climate change adaptation (UNFCCC, 2011). Moreover, there are two ultimate necessities to be able to deal well with climate change. These are capacity building and capacity development. To gain a working and effective form of adaptation, the community must have the capacity to fully comprehend the matters regarding the dangers brought by climate change, learn how to exhaust the function of existing information in the surroundings, and be able to

create plans and actions to be done (International Federation of Red Cross and Red Crescent Societies et al., 2009). Further development of the community capacity will lead to the betterment of the adaptation needed to be applied by the people.

Jamieson (2009) claimed, "Climate change engages several distinct kinds of practical responsibility: prudential and ethical, with the ethical including the moral and political. However, each of these responsibilities, while figuring in how people ought to respond to climate change, deviates from standard cases in which those kinds of responsibility obtain." Therefore, responsibility though having only six syllables has its corresponding substantial actions with the involvement of a person's whole personality and morality to be able to reach the goal which is intended to be attained.

Based on Bercilla and Roxas (2012), enriched ability for climate set-ups and projecting, better prevention preparation and government capability for climate change adaptation, and a "gendered climate change knowledge management" will be achieved if there will be improvement in the information or awareness and ability of the human beings. It only explains that the essential weapon needed to be used is the knowledge and awareness a person is required to earn. Gender could also be an option in designating roles for adaptation so that it will be systematic and orderly through the promotion of gender equality. Lambrou and Piana (2006) through the Food and Agriculture Organization considered gender as the missing component of climate change response, activities, and programs. Further, the International Union for Conservation of Nature or IUCN (2015) said that men and women experienced the impacts of climate change differently, thus, both shall be considered as decision-makers, stakeholders, educators, and experts concerning climate change. This is why there must be enough budget allocated for programs on educating people regarding climate change, and that training and other awareness programs should also be possible so that all people will be knowledgeable and cooperative (Center for Climate and Energy Solutions, 2011). Once knowledge has been transmitted to the constituents, it is the only time the people will have the courage to help, suggest and cooperate to a certain activity.

CONCLUSION

Climate change seems to be a harsh problem. If the people will not do anything to address the phenomenon, it will become worse. Knowing its causes and effects, people should realize that humans are the ones who ultimately caused climate change by which effects are also at the people's expense. The people have such ways of adapting to climate change which starts from using strategies technically, accomplishing community-based adaptation activities. Likewise, possessing awareness and responsibility for climate change can aid the people to adapt to climate change and all about it. Unlike what people used to do to other problems, climate change should not be set aside. Serious, well-planned, and science-based actions are needed. Participatory adaptation is very crucial regardless of gender, race, and age. If human beings will only do every effort for that, a tasteful end will be attained not only for the present generation but also for the future generations.

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