

## **The Impacts of Climate Change on Animal Health and Economy: A Way Forward for Policy Option**

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### **ABSTRACT**

The national policy of developing countries is fundamentally suffered for climate change related research of animal health impacts, lack of policy alteration in emergency situations and lack of scenario research for impacts on ecosystem, distant animal health forecast, disease spread and migration. This study brings together the climate change issue and impacts on animal health and economy and it's affecting factors to propose more effective strategies to control this social issue. Here, we emphasize prioritizing policy approaches of knowing how preferences and climate may change in the distant future and selection of policy alternatives over which impacts are most relevant. The sound effective policy can be developed in the developing economy when there is an inter-linkage within each principal component such as on (a) national priorities, (b) specific research on climatic animal health impacts, (c) scenario research of climate change in distant future, (d) alternative policy alteration in natural disaster and emergency and (e) global outbreak of animal health impacts. This study attempts to investigate the inter-linkage of these indications and the possible planning lacking and concern focusing on climate change on animal health factors. The experiences from this study can be used for climate change related animal health impacts and potential economic policy in developing countries.

**Key words:** Climate change, impact, animal health, affecting factor, policy, developing countries

### **INTRODUCTION**

The danger of climate change is virtually invisible but may be more dangerous than the others harming events put together. The scientific evident of climate change impacts is irresponsible and lots of references nowadays are existed including well-known IPCC report (IPCC, 2007). Climate change which results from increased Greenhouse Gases (GHGs) in the atmosphere is the greatest environmental threat of this century and way forward for future. Since sixteenth century, rapid industrialization and utilization of power generation accounts for about major part of the human-induced warming effect (Al-Amin *et al.*, 2010). Greenhouse Gases (GHGs) concentration in the atmosphere had risen one third since the industrial revolution and are set to increasing rate which

had varied less than 1°C since the dawn of civilization are projected to rise 2-4°C over the next century (IPCC, 2007). Scientists forecast that such rapid transform causes major and rigorous damage to the economic and environmental systems upon which mankind depends for its endurance (Al-Amin *et al.*, 2010). A new dimension has added in the recent climate change issue is the animal health as animal health and human health is directly and indirectly tied to climate change issues. Climatic changes also have a negative impact on all animals but particularly livestock which is associated with certain activities that directly contribute to climate change (Gale *et al.*, 2009).

However, there are some questions raises on this issue, such as how large this impact is? What about the diseases respond to climate change? Will as many recede as spread? Is it possible that the most significant diseases in health or economic terms could be resilient to climate change, such that its overall influence on our health and wellbeing could be relatively minor importance? To answer these questions, we must need to assess future disease realistically and must consider the effects of climate change on animal health deeply (McIntyre *et al.*, 2010). According to recent research findings, it is also well evident that ecosystem, animal health and economic impacts are tied to climate change (Slennig, 2010; McIntyre *et al.*, 2010; Gale *et al.*, 2009). As ecosystems are altered due to climate change effects, the relationship to those systems is changed as well. Current health events driven by weather include African Rift Valley fever outbreaks which can be predicted based on Indian Ocean weather some weeks to months before the outbreaks. Similarly, recent Bluetongue and Hantavirus movements into and across Europe as a result of warmer habitats for vectors and effects are due to expanding range of fungus-induced destruction of amphibians (Slennig, 2010). These are all the direct and indirect effects of climate change issue.

We should note that the early consequences of global climate change are well evident now a days but the future impacts on ecosystem and animal's health is much less well understood. The evidence of increasing frequency of extreme weather events (i.e., climate change effects) of geographic changes in vector-borne disease (bluetongue and hantaviruses emerging in northern Europe, dengue virus expanding in central and northern America) and of altered animal behavioral response's warrants action to make valid choices on practitioners and decision makers about global climate change and what is the impact is the way forward (Slennig, 2010). Unfortunately, the scientific community has a relatively poor understanding of current effectors and making it problematic to describe the current situation following on the climate change issues. However, the threats are real and fast approaching, especially in the third world economy. Worldwide environmentalists and scientific communities are looking at the mechanisms to embark upon the issue on technical foundation, institutional issue and operational barrier but less well comprehended until recently.

The time has now fast approaching to consider the relatively poor understanding of current effectors of climate change and what is the economic impact of animal health is the way forward. Therefore, we feel a sound study required for enhanced impacts of climate change on animal health and systematic surveillance programs, whether is obvious but sometime putting such program into place is intimidating. Here, we try to fill the gap considering on the issues on the technical, institutional and operational barrier. We propose more effective vibrant strategies to control this social issue and attempts to investigate the possible planning lacking focusing on climate change on animal health in the developing countries, in particular.

## MATERIALS AND METHODS

**Framework for effective strategies:** Our goal of this study to bring together climate change issue on animal health and it's affecting factors to propose more effective vibrant strategies to handle the social issue. As we are considering the possible planning lacking and rising concern focusing on climate change impacts on animal health in the developing countries, it is therefore, imperative to see both as potential causes and victims on developing climate change policies and programmes. We also must bear in mind that policies and programmes to minimize the impact animal production has on the environment should not be at the expense of animals caregiver's welfare. Climate change effects are quite complex and vary from region to region. However, there are some uncertainties on this issue but it was known that those communities and regions which depend on rural agriculture is the most vulnerable to climate change (IPCC, 2007).

Climate change as a source of warmer and wetter weather increases the risk and occurrence of animal diseases, as a specific disease vectors year-round. Certain parasitic diseases may also become more prevalent for wetter weather. This may contribute to an increase in disease spread, including zoonotic diseases. The subsequent presence of diseases, including parasites or viral infection such as Bluetongue Disease, for example, was once only a threat in central Africa, now affects cattle and sheep in the whole of Europe and the economic loss is huge (Epstein and Mills, 2005). The outbreaks of some diseases such as Foot and Mouth Disease and Avian Influenza affect large numbers of animals worldwide, especially in Europe and contribute to further degradation of the environment and surrounding communities' health and livelihood. Therefore, the effects of climate change on the spread of animal diseases since the millennium is the focus point worldwide as those impacts are associated with certain activities that directly due to climate change (McIntyre *et al.*, 2010).

The other major issue on climate change is the effects of climate change on farms animals and the effectors that depend upon normal economic development. Therefore, we need to see the enhanced impact of climate change on farm's animal health. Here, we try to fill the gap considering those issues more intensely. Climate change not only impacts the health and welfare of animals but also people who depend on them. The increased manmade climate change effects such as the use of chemical-based agricultural inputs, artificial fertilizers, pesticides and herbicides and their impact on soil and water quality likely exacerbate the effects of climate change by further degrading other ecosystems (i.e., coral reefs and rivers basin, decreasing the land's ability) which is studied earlier by Rosset (1999). It is much easier for farmers in developed countries to endure a climatic setback than those in developing economies such as Malawi, where 80% of the population lives in rural areas and approximately 40% of the economy is supported by rain-fed agriculture (Menin, 2007).

On the other hand, warmer weather in the sub-Saharan Africa is drying up the grazing areas those effect farm animals and wildlife dependant on access to grazing areas for food (IPCC, 2007). Therefore, resources must be prepared available for change of negative impacts of climate change. In Fig. 1, we underline the animal health's affecting factors for climate change issue such as (a) effects of climate change on the spread and emergence of animal diseases (b) effects of climate change on farm animals and their caregivers and effects of farm animal agriculture on climate change. These factors are essential in proposing more effective and dynamic strategies on the social issue. Harming the animal health and well-being of animals directly compromises to the society and economy that connections are linked in the Fig. 1.

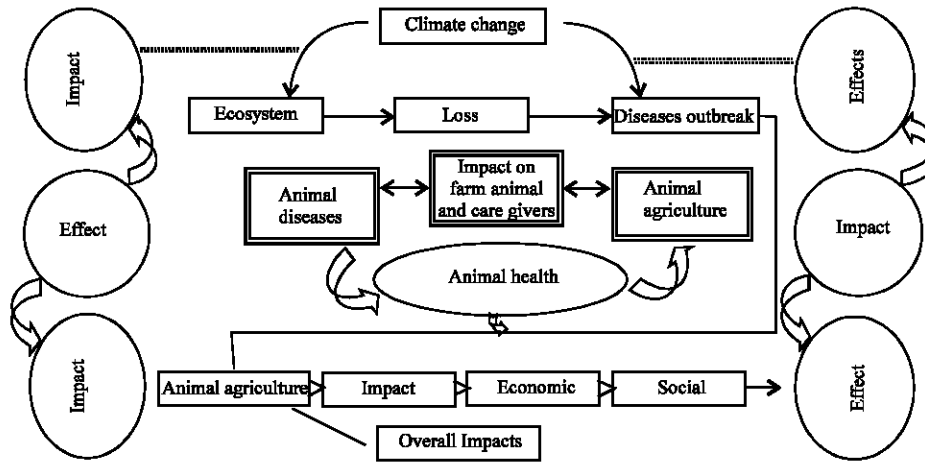


Fig. 1: Relationship between climate change, animal health and economic impact

## DISCUSSION

**Policy recommendation:** As our aim in this study to propose effective policy to control this social issue, therefore, we attempt to investigate the possible planning lacking within the framework of Fig. 1, focusing on climate change on animal health and animal agriculture in the developing countries, in particular. The two components are notionally to be clear for any prioritizing policy approaches to this social issue in the poorer economies: (1) evaluate policy concern for prioritizing needs within the framework of knowing how preferences and climate may change in the distant future and (2) selection of policy alternatives over which impacts are most relevant to long-term policy option. To bear in mind of prioritizing policy approaches, in Fig. 2, we have shown the framework for the more effective policy strategy in the developing countries as the economics of these countries are more dependent on animal agriculture. The sound effective policy strategy can be developed in any developing economy when there will be an inter-linkage with each principal component in Fig. 2, such as on (a) national priorities, (b) specific research on climate change and impacts on animal health, (c) scenario research as climate change need to be inferred in the distant future, (d) alternative policy option in case of emergency or natural disaster and (e) global outbreak of animal health impacts in the regional economics.

The basic lacking of possible planning strategies on climate change issues of animal health and animal agriculture in the developing countries are the coordination of national priorities. There are lots of lacks of harmonization within the national priorities of growth policy, proper economic evaluation and future way forward (Abdelhak *et al.*, 2011; Zarra-Nezhad and Hosainpour, 2011; Qureshi *et al.*, 2010; Hung-Wen and Ching-Fang, 2010; Ali *et al.*, 2010; Rabia *et al.*, 2009). Here the story is not end, the major dis-harmonization can find on the national plan following on the long-term goal and vision (Fig. 2). Especially, developing country's national policy suffers for climate change related animal health impact researches, alternation policy option (Sepehrdoust, 2009). There is a huge policy lacking on alternation policy option on emergency situations, scenario research analyses on distant animal health forecast and finally, regional impacts for global climate change on ecosystem, disease spreads migration (McIntyre *et al.*, 2010).

Following on the very recent research findings such as Attitalla (2011), Rezaie (2011), Slenning (2010), McIntyre *et al.* (2010), Nazrun *et al.* (2010), Gale *et al.* (2009), Ostfeld (2009), Randolph

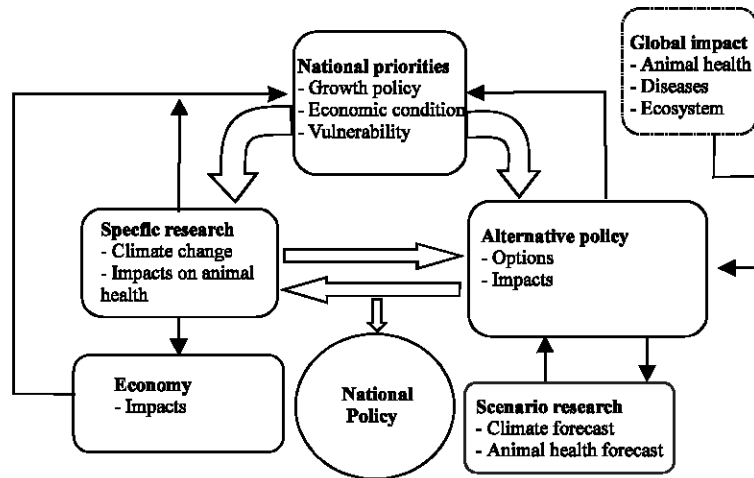


Fig. 2: Framework for effective policy strategies

(2009), Yacob *et al.* (2009), Aydinalp and Cresser (2008), De La Rocque *et al.* (2008), Martin *et al.* (2008), Pinto *et al.* (2008), Khorshid (2008), Menin (2007), King *et al.* (2006), Anderson *et al.* (2004), Curriero *et al.* (2001) and Rosset (1999); we find some soft of difficulties in the way forward. We do not have sufficient climatological or ecological information to make accurate localized estimates of disease risks for climate change issues and climate and epidemiological models often carry assumptions that do not scale or transfer to other regions. Certain arthropods are competent disease vectors which is well-characterized regionally (i.e., Western Europe) but the same arthropods not as competent in other regions. However, with such a lack of basic data, any conclusions drawn are speculative on the level bes but the situation is not hopeless. Some groups have successfully analyzed diseases of humans, livestock and wildlife by scrupulously collecting long-term data, isolating climate effects, using sophisticated models and including effects on vectors and reservoirs and the findings are well evident in the related literature (McIntyre *et al.*, 2010; Gale *et al.*, 2009; Menin, 2007; Rosset, 1999).

However, with some limitations, this study recognized the effects of climate change on the spread and emergence of animal diseases and effects of climate change on farm animals in the framework for effective strategies. Here, this study identified the climate change issue on animal health and it's affecting factors and gap of policy knowledge of considering those issues. Any study in the developing economies must recognize the framework for effective strategies that any appropriate policy required two components, firstly, the proper evaluation of policy apprehension (i.e., option 1) and secondly, the availability of alternative policy options (i.e., option 2) on the emergency or natural disaster situation. These two components must be inter-linkaged within appropriate policy option, otherwise any policy option using only 1 or 2 would be partial and their effects would also be partial for long term planning and the outcomes may be unsuccessful.

In this study, we also gather logical extrapolations on the issue what recently raised. It is evident that climate change is likely become more variable with more extreme events. This variability alters ecosystem and unstable conditions promote animal health losses and may arises new characteristics and vulnerabilities as is expected in near future. Evolved balances between disease agents, vectors and hosts very likely to change which is already way forward and these changes increase unexpected incidence. Now the time has come to rethink of the distant possible

occurrences and policy makers need country specific proper long-term policy options and recommendations following on the current and future scenarios. Therefore, we feel necessary to contribute to our capability on the impact of climate change on animal health and systematic surveillance recommendation where is obvious and putting such programs into place is approachable. We should place the effective recommendations on the issue on effects of climate change on the spread and emergence of animal diseases such as (a) develop a comprehensive plan to deal with the migration of disease for climate change (b) improve bio-security at animal production sites that safeguard animal welfare (c) develop positive animal welfare contingency plans to control zoonoses caused by climate change (d) appropriate control measure where appropriate in regions where disease is endemic (e) develop sustainable adaptation techniques and farming strategies in collaboration with farmers, agriculture extension agents farm animal welfare experts and (f) integrate veterinarians and animal protection experts in disaster assessment teams and conduct joint disaster training exercises on related issues.

## CONCLUSION

The global climate change threats are real and fast approaching. There are may be some disagreements on the different future scenarios but the reality of impacts is well accepted and well understood. What is done in the next few years may be decisive, whether for the good or the ill of all? To make valid choices, however, practitioners and decision makers must understand what the distant impact of climate change and reality is. In this study, we discussed on this issue and following on the recent scientific evidence. We extended relative theoretical framework for effective policy strategies and finally made a number of relevant recommendations. We state our extensive ideas about the impacts of climate change on animal health on the way forward for an enhanced policy options. We also showed the relationship between climate change, animal health and economic impact based on the recent climate change studies and propose some policy strategies to direct this social issue. However, developing economies have lots of limitations but should focus on which would be more effective to investigate the possible planning lacking focusing on climate change on animal health and animal agriculture, in particular. We fully agreed on the issues of global climate change and implications for the disease emergence by the study of Slenning (2010). The author truly recognizes the effect and impact of distant climate change inference, as early in an outbreak our information is may be limited and often inaccurate and sometime making it difficult to find the right path along the decision tree toward control the issue. However, the late information of an outbreak is may be voluminous. The irony is that in the early situation, where uncertainty is highest, that we must make our most important decisions regardless of disputes. The same is true on climate change and its future effects on animal health-doubt and uncertainty are no excuse to a put off response to the future. Otherwise, the time line will be over to embark upon the issue and we must embrace implications.

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