# Impact of Salinity on the Socio-Environmental Life of Coastal People of Bangladesh

**Sohela Mustari[1] & A. H. M. Zehadul Karim[2]**

Department of Sociology and Anthropology, International Islamic University Malaysia, Gombak, MALAYSIA.

[1] mustari_12@yahoo.com, [2] ahmzkarim@yahoo.com

## ABSTRACT

*Based on 1st author's own participation and informal discussion with the inhabitants of coastal areas, these researchers attempt to know the impact of salinity on the socio-environmental life of coastal people. Bangladesh is a country which is slopped gently from the north to the south, where it meets the Bay of Bengal at its southern end. Because of its critical geographical location, almost every year the southern coastal areas face various kinds of natural disasters, such as cyclones, flood, soil erosion, tidal surge, sea level rise and so on. All these natural disasters bring saline water with them from the sea, which creates a new dimension of natural disaster. This Salinity is very crucial in terms of its impact on the socio-ecological life of the local people. It is destroying the natural characteristics of coastal soil and water. Moreover it is causing damage to agriculture, bio-diversity, fresh water and its resources which are absolutely degrading the quality of local people's life. This paper therefore is designed to know about the overall impact of salinity on the socio-environmental lives of coastal people.*

**Keywords:** Salinity, sustainable development, coastal areas, Bangladesh, socio-environmental life

## INTRODUCTION

Climate change is no longer the issue of the geologists, ecologists or engineers in specific; its diversified impact creates a global apprehension for all academics equally; and its devastation concerns all people from every part of the world. If we consider the ice melting problem is only a worry of the west, it will be a wrong assumption for us because its effect due to sea level rise in low lying countries like Bangladesh is thus an example of it in this context. Moreover, though climate change is a global concern now a day, all countries cannot provide same mitigation for their people due to technological incapacity and economic poverty. As a result, though the developed country succeeded so far to tackle the vulnerabilities, developing countries like Bangladesh fails to do that. In addition geographically Bangladesh is very much linked with India. However India has took some political steps to control their resources which affect a lot in the overall climate of Bangladesh. So, if the climate change goes on like this, the most victim group will be the ecosystem and if we cannot preserve our eco system, it is very easy to say that we cannot preserve ourselves as well. So, we understand that it is the right time to think about our climate and take necessary precaution in this regard and we should make cooperation among all countries and all academics.

Bangladesh coastline covers an area of around 710 kilometers on the Bay of Bengal flowing to the Indian Ocean. The ocean often threatens catastrophe for Bangladesh in the form of cyclones and tidal surge which is responsible for the sea level rise and sea level rise has various impacts on the coastal areas, such as land erosion, salinity-intrusion and loss of bio diversity. However among all these, the impact of salinity-intrusion is severe which brings a

huge vulnerability among the coastal people. So here in this paper it has been ventured to know the impact of salinity on the socio-environmental lives of coastal people who lives in the south-western coast of Bangladesh.

## THE SOURCES OF SALINITY IN BANGLADESH COASTAL AREAS

Sea level rise is the main reason behind the salinity in this area. Due to various human activities such as burning fossil fuel, deforestation, impact of "farakka" barrage as constructed by India and so on, along with global warming throughout the world is responsible for the sea level rise in this area which creates cyclones, tidal surge, flood, land erosion and more wet land and very naturally with all these disasters they bring saline water with them. Besides these natural sources there are also some manmade sources which create salinity in these areas. Such as, people for their survival cultivate shrimp which is very profitable and the saline water of this area fits for these shrimp. So the farmer of this area converted their fresh water land into saline water to cultivate it into shrimp cultivation. This is how around 60% land of this area is covered with salinity and the process is going on every day. Salinity in surface and ground water is determined by a complex combination of factors ,including river flow, tides, rainfall, estutine circulation, water, land management practices, and also sea level rise and other climatic variables". (Khan, et al., 2011.p.1)

## IMPACTS OF SALINITY ON THE COASTAL AREAS OF BANGLADESH

### Impact on Agriculture

Bangladesh is an agrarian country, having 80% of its people fully dependent on agriculture. It is estimated that, more than 30% people live in this area and their livelihood is totally dependent on nature. However more than 50% of coastal land already goes under salinity. Salinity have degrades the quality of land and limited the variety of cultivable crops. Due to sea level rise along with flood or land erosion the quality of land and fresh water decease. Sarwar and Khan (2007) mentioned that, "Sea level rise affects coastal agriculture, especially rice production in two ways. Salinity intrusion degrades soil quality which in turn reduces rice production. When the rice fields are converted into shrimp ponds, total rice production decreases accordingly". (P.2)

Not only rice but also other kinds of food grains, vegetables, and tree plantation are not possible here because of salinity. Poultry farm, cattle farm, also could not be established running at all because their food also comes from the agriculture. Sarwar (2005) said, "As Bangladesh is a dense populated country, there is no specific grazing field for cattle. Farmers get grass from their rice field. Hey is another source of fodder. Decreased rice production is decreasing fodder production resulting in fodder shortage" (P.20). As the farmer cannot provide food for their own, they avoid going for farming though cow farm is very essential for their traditional plough system of land. So as a result, people's GDP goes down because Bangladesh economy is still dependent on agriculture. So decrease of GDP means decrease in agriculture, production and cash crop also.

### Impact on Drinking Water

One of the major environmental vulnerabilities of these people has been found to extreme scarcity of drinking water, as these are full of salinity. Because of other natural disaster such as sea level rise, cyclones, flood, land erosion brings saline water from the sea and mix with the ground water. All the sources of fresh water such as river, pond, and tube well cannot provide fresh water anymore. Moreover, they need to go a long way to collect the pure drinking water which is time consuming and expensive also. As the household works are



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considered as the responsibilities for the women, to collect and go for a long way is a burden for them. So, they wait for the rain to have the natural water or drink the saline water having no alternatives.

**Impacts on Health**

Anthony and et,al(2009)in their edited book said that, "The Health of a population reflects, in reality, as the basic tenet of social and environmental living conditions. Many key determinants of human health, such as food availability, fresh water availability, physical safety and the microbiological environment, are strongly influenced by climatic conditions"(P.).Salinity creates a huge health problem in these areas. As saline water mix with ground water and unsustainable consumption of ground water, people are suffering from various kinds of health problem, such as high blood pressure, dihoreah, cholera and others. Not only through water but also through various kinds of food grain people are getting saline more than they required. Khan and others told that, "The most vulnerable groups are the pregnant woman and the children. Higher rates of (pre) eclampsia and gestational hypertension in pregnant women living in the southwestern coast of Bangladesh, compared with non coastal pregnant women, were hypothesized to be caused by saline contamination of drinking water. (Khan et al.P.3). It may causes defective new born baby which would be a very negative signal for the future of Bangladesh. Cholera sometimes spread like an epidemic after the disaster such as flood or cyclone. Lack of drinking water and over consumption of saline water. As salinity decreases the crop production, so decreases of food supply brings poverty in this area. As a result mal-nutrition, under nutrition, water borne diseases, food borne diseases and even starvation is also an obvious effect of salinity among the coastal people.

**Impact on Fisheries and Aquaculture**

Though salinity brings some convenience for shrimp cultivation but it becomes detrimental for the survivability of other fresh water fishes which affectedly become fully extinct. In these coastal areas but the other fishes that are available only for the fresh water are going to be extinct forever. Moreover "the environmental and social impacts of shrimp farming include large-scale degradation of mangroves, alteration of wetlands, land subsidence, salinization of ground water and surface water, pollution of agricultural lands and coastal waters by pond effluents and sludge, introduction of exotic species or pathogens into coastal environment, loss of wild larvae and subsequent loss of goods and services generated by natural common property resources".(Azad,et.al.2009)As coastal areas are naturally vulnerable and the survival strategies are very limited for them, so they prefer to go for shrimp cultivation which is increasing salinity more and more. "Out of the total decreased production, 77 percent was due to conversion of rice field into shrimp pond" (Sarwar, 2005).

**Impacts on Ecosystem**

As we know that the world largest mangrove forest named the Sundarban is situated in this area, but salinity has direct impact on the destruction of a huge forest areas in the Sundarban. Salinity is also responsible for the loss of bio-diversity, fisheries resources, loss of livelihood, and loss of ecosystem will happen. Increased salinity will change the habitat pattern of sundarban. The most affected species is renowned "sundari" trees, but because of too much salinity it already affected by various diseases and going to die. Sundarban is rich in various kinds of flora and fauna. Royal Bengal Tiger or the Spotted Deer is only available here but their number is decreasing because of salinity or the changed environment.

This forest is a habitat of various plants like royal Bengal tiger, vulnerable pallas, fishing eagle, masked fin foot, river terrapin, rare species of shark, wild boar, spotted deer, barking

deer, jungle cat , leopard cat, squirrels, marine turtles, crocodiles, frogs, fresh water dolphin and so on. Then this forest is also famous for some unique plants such as rare sundari, gewa, passur, fish species like peneausmonodon, macrobachium, rosenbergii, latescalcariferans so on. But if the salinity increases in this way, habitat of these species may not survive for long time. If these eco systems become vulnerable because of sea rise and salinity, Sundarban also will vanish very soon. As a result more natural disaster will happen here and pollute the overall climate of Bangladesh.

## IMPACT OF SALINITY ON THE SOCIO-ECONOMIC LIFE OF COASTAL BANGLADESH

The main impact of increasing salinity at the social level is loss of production and income. Poverty is acute here. The basic human needs are a big question for them. As their production is low and income or employment is not available, the basic needs are not achieved by them. Other hand salinity impacts include the turn down of capital value of land, damage to infrastructure, salinisation of water storage, loss of farm flora and fauna, and loss of shelter.

As coastal people's livelihood is dependent on natural resources, with salinity losses of bio diversity means, over consumption of natural resources or remains unemployed. So poverty, unemployment, illiteracy, mal-nutrition all are available within the people of this coastal areas.

## DOES SALINITY ONLY PREVAIL IN BANGLADESH OR IT IS A GLOBAL PHENOMENON?

Salinity is not a local phenomenon rather it has global linkage. Salinity has become such a severe problem which should consider essential globally. Michael and Andre quoted from Gnssemmi and told that per year the world's loss of agriculture is around 12$ million and this amount will increase every year. Globally "at least 20% of all irrigated lands are salt-affected, with some estimates being as high as 50%.Whereas the world's population continues to rise, the total land area under irrigation appears to have leveled off" (Michael and Andre, 2004). For agriculture the percent of production change the number of people at risk of hunger as a function of salinity which is a cause of ice melting, desertification, flood or any natural change. Increase in number of people at risk means more people in hunger due to climate change.

Common forms of environmental degradation include desertification, land degradation, deforestation and rising sea levels induced by global warming. Identifying the importance of these processes, the 1992 United Nations Conference on Environment and Development acknowledged four fragile ecosystems: "regions with severe deforestation, regions with severe desertification, low-lying coastal areas and "vanishing" islands in the Indian and Pacific oceans" (Astri Shurke, 1994).

Most of the countries around the world more or less have same problems due to salinity. Salt affected area of USA is the western part of the country, mainly the California, Arizona, North and South Dakota, and the coastal regions of South Texas, all these areas are mostly vulnerable in agricultural sector. However Pitman in his writings brought information from Australian report (PMSEIC 1999) estimated that salinity and water level rise causes around $US 84 million and their capital land loss was around $US 450million. Salinity causes here environmental degradation, loss of species, loss of infrastructure like roads, rails or even foundation of buildings. "Broad acre cereal crops and traditional pasture species grown in Australia do not tolerate salt and are seriously affected when salts concentrate within the root zone. Total loss of crop and pasture production occurs where groundwater's are close enough



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to the surface to discharge or concentrate salts; losses may be restricted to reduced yields where groundwater is deeper" (Australian Natural Resources Atlas Natural Resource Topics). The same report also focused on salinity's effect on their water resources. It said "The most significant off-site impact of dry land salinity is the salinisation of previously fresh rivers. This affects the supply of drinking and irrigation water, with serious economic, social and environmental consequences for rural and urban communities (e.g. in Western Australia, many of the surface water resources are already too saline for domestic use and further deterioration will challenge future supplies)".

1. In Western Australia, at least 1500 plant species will suffer from dry land salinity, with 450 of these possibly subject to extinction. Fauna species are likely to be reduced by 30%.
2. Approximately 80 important wetlands including those of national and international significance have been affected or are at risk of damage from dry land salinity in all States. Information on the full extent and degree of impacts is very sparse. In the Murray-Darling Basin, major wetlands of the Macquarie Marshes, Great Cumbung Swamp, Avoca Marshes and Chowilla Floodplain will suffer impacts from rising salinity.

Some researcher examines the technical, economic, social and institutional factors that contribute in causing salinity. "Poor water management is the primary source of irrigation induced salinity. Although this is a technical problem, it is also the product of several other factors. Poor government policies contribute to inefficient water use, and poor project planning and implementation lead to deterioration of infrastructures. The report states that the battle against salinity has to be launched in three fronts : governments have to commit to sound water management policy; country agricultural strategies should incorporate measures to promote environmentally sound production methods and; greater effort to analyze the environmental impact of projects involving water resource use should be made" (Umali, 1993)

## SUSTAINABILITY AND SALINITY

### The Meaning of Sustainability

"Maximizing the net benefits of economic development, subject to maintaining the services and quality of natural resources over time." (Pearce and Turner, 1990)

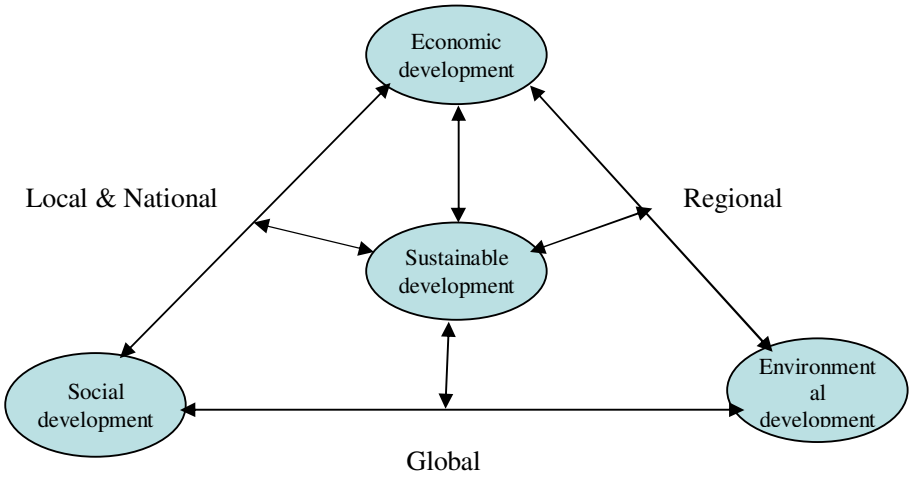
"The sustainability of natural ecosystems can be defined as the dynamic equilibrium between natural inputs and outputs, modified by external events such as climatic change and natural disasters." (Fresco and Kroonenberg, 1992)

"Sustainable development is important for making decisions that are based not only on economic conditions and trends but also on the environmental, social and institutional aspects of sustainability." (edt Nath and et al,1998. p.125). They also focused on the information of all levels for the sustainable development, such as, local, regional, national and global. All this information can increase awareness, and can detect the problems of environmental as well as, economic, social, and institutional.

### Can Salinity Bring Sustainability?

So far from this paper we can see, salinity brings massive vulnerabilities in environment such as degrades the productivity, destroys the eco system, creates health problem and so on. At the same time it generates some socio-economic problems also, such as poverty, illiteracy, structural problems, and mal-nutrition and so on. Though salinity in coastal areas can

engender some source of income such as shrimp cultivation, salt production but it hinders to make balance in terms of environment. So according to sustainability, it is quite easy to understand that salinity of coastal Bangladesh as well as all over the world is not good for the sustainable development. To protect this salinity, local, regional, national and global integration among various institute such as economic, social and environment is very essential for the survival of human.




**Model: integrative model to overcome salinity and establish sustainability**

This model intends to show that salinity should bring social, economical and environmental development individually. Moreover, salinity problem is a result of global environmental change and it attacks locally, so its mitigation should come should come from all sectors including local, national, regional or global. So this model expects an integrated relationship among all sectors to bring sustainable development.

## CONCLUSION

Salinity problem is a new phenomenon in environmental science. It does not occur with itself, rather it comes as a result of other natural disaster but its effect is so shocking that it became a major concern for the researcher than its creator disaster. Though it gives some opportunities for the people but these opportunities are not enough for sustainable development. It is more disastrous for a low lying country like Bangladesh. But none can ignore the causes and effects of salinity which may occur in any country and any time. So it is high time to pay attention on it locally and globally to bring sustainability.



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