SEAWALLS OR GREEN WALLS: SAVING THE COASTAL COMMUNITY AGAINST CYCLONES AND TSUNAMIS

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ABSTRACT

The coastal zone of Bangladesh in particular and South Asia in general, is extremely vulnerable to climate-induced disasters. Because of the conical shape of the Bay of Bengal, the coastal region of south-west Bangladesh and the Eastern Ghats of India in particular is regularly visited by cyclones and associated tidal surges. Because of the low-lying coast, the region gets inundated with water surges. Moreover, due to tsunamis, more areas are flooded causing loss of properties and human lives. In Bangladesh, the Department of Forests has undertaken massive “Green Belt” project in order to protect the coastal people from cyclonic storms. It was found that the Sundarbans, the largest mangrove forests of the world did save lives of many people and the habitat from the cyclonic storm Sidr in 2007. The forests subsequently acted as a buffer zone between the sea and the human habitat during the cyclone Aila in 2009. Besides, plantation of forests, the local community has developed some indigenous knowledge and practices in order to face the natural calamities over the generations. On the other hand, some of the developed countries, like Japan has constructed massive concrete sea walls all along the north-eastern coast to protect its inhabitants from the tsunami related disasters. The paper argues that instead of a structural solution, like sea-walls, break-water or dykes, perhaps there could be least-costly, non-structural solutions like plantation of forests and thereby raising “Green Walls” as a survival strategy based on local indigenous knowledge and practices.

Keywords: Afforestation; Bangladesh Coast; Green Wall; Sidr; Seawall; Tsunami

Introduction

Coastal community over the generations has been living with natural hazards like cyclones, tsunamis and associated tidal surges. By now they have developed some community-based adaptation practices related to these disasters. Early warning systems based on their indigenous knowledge and practices played a pivotal role in saving many lives. Since the knowledge and practices are not documented and mostly in oral form, they get lost in the process. Some of the measures (both structural and non-structural) undertaken by the coastal people of Bangladesh and Japan have been closely examined and a comparison between the two done on the basis of the respective country’s disaster preparedness programme, resilience of the people, viability and cost effectiveness of those measures.

Bangladesh Experience: Green Walls

The geographical location and climatic condition of Bangladesh are responsible for cyclone and other natural disasters. In coastal areas, afforestation is a proven cost-effective method to dissipate wave energy and reduce inundation during storm surges. Because of the conical shape of the Bay of Bengal, the coastal region of south-western Bangladesh and West Bengal and Odisha of India are periodically subjected to cyclonic storms and associated tidal surges. The location of the off-shore islands and the triangular funnel shape of the Bay of Bengal have made the coastal areas susceptible to cyclone and tidal surges. Out of 35 million people in 710 km long stretched coastal areas of Bangladesh, 7 million people live in high disaster risk. The government has made considerable success in managing natural disaster in Bangladesh. Although the loss of properties was huge during the cyclones of Sidr in 2007 and Aila in 2009, the loss of human lives were only 3,406 and 190 respectively due to effective networking and coordination between and among various levels of the Government and NGOs concerning disaster risk reduction and preparedness programs. During the earlier days, loss of lives and properties was very severe during disasters like floods and cyclones. Cyclones of 1970 and 1991 killed as many as 300,000 and 138,882 people respectively in the coast of Bangladesh (Bangladesh Met Office 1990). However, due to effective disaster management during pre-disaster, disaster and post-disaster period, loss has been substantially reduced.

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Over the years, the Sundarbans, the largest mangrove forests covering Bangladesh and India, played a protective role as a buffer zone between the storm-induced surges and the human habitat and reduced loss of lives and properties to a great extent. During the cyclonic storm Sidr in 2007, the forests faced the disasters and saved many lives. Moreover, the paradigm shift in disaster management from relief, restoration and rehabilitation to disaster risk reduction and community resilience programmes was effective in reducing the loss of lives and properties. Study showed that the impacts of coastal afforestation on inundation due to cyclone generated storm surges found to be much less (Sakib et al, 2016) Afforestation could reduce the inundated area and lessen the impacts on the human habitation. Government has adopted the Standing Orders on Disaster (SOD) 2010. The Standing Orders detailed out risk reduction; activities to be undertaken by various agencies during the warning period; during disaster and post disaster period. SOD has become a unique document for the volunteers and officials engaged in disaster management. Due to shifting from relief and rehabilitation to disaster warning and disaster risk reduction, as laid down in SOD, casualties decreased a lot. The other plans and guidelines are National Plan for Disaster Management (NPDM) 2010-2015; Bangladesh National Disaster Management Guidelines, 2015; and Disaster Management Act 2012. They have been playing a positive role in reducing disaster risk.

The age-old community based knowledge and practices of the coastal people played an effective role before and after a cyclone-induced tidal surge. The color of the clouds, temperature of the air, wind direction, movement of birds and animals were significant in understanding the degree of disasters. These signs were mainly early warning of the disasters. Cautions by the Red Crescent volunteers, taking refuge in cyclone shelters, availability of emergency dry foods and clothes are all contributing to reducing the death tolls to a great extent.

**Japan Experience: Seawalls**

In recent years, Japan has been hit by repeated tsunamis and concomitant tidal surges causing loss of lives and properties. The devastating tsunamis took place in 1933; 1960; 1968; 1994; and 2010. The great east Japan earthquake and tsunami in 2011 killed 18,500 people of the coast. Besides, loss of lives, properties were damaged, rice fields, agricultural lands, forests got inundated. Tsunami left an enormous amount of waste and debris requiring years to remove. In order to ensure safety of the coastal community from tsunami and tidal surges, a number of engineering structures, like sea walls, levees, break-water were constructed. By now, a 15 meter high 245 km of seawalls at a cost of US$ 12 billion have been constructed on the north eastern coast of Japan. It will stretch 400 km along Japan’s north coast. Seawalls not only permanently obstructing views, but also damaging the prospect of tourism, ecology and fisheries in the coast.

The paper argues that instead of a structural solution, there could have been least-costly non-structural solutions based on local indigenous knowledge and practices. Land zoning, relocation of vulnerable population to higher grounds, evacuation, massive tree plantation could have been among a number of viable options other than construction of the sea walls.

**Coastal Afforestation**

Coastal vegetation has been widely recognized as a natural method to reduce the energy of storm surges and tsunami waves. Afforestation can alter surface properties relevant to climate, generate favorable atmospheric circulations for precipitation, control groundwater, and increase evaporation. Using afforestation to induce favorable climate has been discussed over many years. It was evident during cyclone Sidr but couldn't play the desired role in reducing inundation area as the landfall location was not exactly at the Sundarbans. In a study, hypothetically one km wide mangrove forest has been considered along with the coast from the shoreline (Sakib et al, 2016). The impact of this afforestation on storm surge inundation is studied by imposing a Sidr strength cyclone to make landfall on different locations along the Bangladesh coast. A study concluded that around 30% velocity, 32 to 35 % thrust force and 11.41% inundated area are reduced due to coastal afforestation (Sakib et al, 2016). It was further revealed that loss of lives and properties lessened much due to massive presence of the forests. Afforestation along the coastal belt is the cheaper and ecologically more beneficial than any other measure to protect the coastal areas and offshore islands from cyclone and storm surges. Mangrove forests are the most productive ecosystem on the earth and they perform a variety of useful ecological, bio-physical and socio-economic functions, which bring multiple benefits to coastal populations.
Japan, on the other hand, went for a total engineering solution of tsunami related disasters. It constructed the sea walls as the only option to protect the coastal community from the wrath of tsunamis. There are a number of developing countries in the Asia Pacific region need urgent recovery plan in the face of a tsunami. It could be mentioned here that during the 2004 Asian tsunami, 2,30,000 people in 14 countries died spanning a long coast from the Aceh province in Indonesia to coastal islands in Sri Lanka, India and Thailand. Construction of seawall as a solution could be difficult for resource constraint countries in South Asia or the Pacific island nations. For them, applying their indigenous knowledge and practices, like early warning, shifting to safer ground, reading various signs in nature and wildlife could be the best options.

**Conclusion**

During the cyclonic storm, Sidr in 2007, presence of the Sundarbans and afforestation reveal the following: a) coastal afforestation plays an important role in decreasing inundation area, depth and velocity magnitude; b) reduces polder overtopping incident; c) coastal afforestation works as a buffer in reducing thrust force; d) local Indigenous knowledge and practices were found to be very handy for the coastal community; e) afforestation along the coast can play a significant role as an adaptive measure by working as a buffer against the cyclone-generated storm surge flooding. As the natural disaster hit the coastal areas every year and hence a need for the creation of greenbelts has long been recognized. Mangrove and other coastal forests can reduce wind and storm wave impact as well as current velocities. The dense forests along the coastline can protect human habitation, lives, properties, and agricultural crops from extreme weather events resulting from climate change.

Coastal greenbelts are proven ‘soft’ measure that can effectively reduce the height and energy of storm surge and strong winds associated with tropical storms (CEGIS, 2016). A contiguous greenbelt has been proposed by the CEGIS study that will extend from eastern boundary of the Sunderbans to the southwest tip of Teknaf in 37 upazilas of 9 coastal districts. Greenbelts are also a ‘green adaptation’ that helps in sequestering carbon in significant quantity. They can enhance land accretion by trapping sediments. To mitigate the risk from such climate driven coastal hazards, which may become more intense with the changing climates, a greenbelt along the coastal region of Bangladesh, India and Sri Lanka can play a significant role in rescuing the community from tsunami related disasters.

**References**


