Identifying the Factors and Effects of Sinking in the Munroe Island of Kollam District, Kerala

Saranya U

Research Scholar, Department of Geography, Sree Sankaracharya University of Sanskrit Kalady

1. Introduction

The concept of land and its usage is very different. Each and every unit of land is precious for each purpose. Today, the major problem faced by the world is the availability of residential lands. So there is a need for conserving land and Islands are no different. An island is a piece of land which is part of continent or subcontinent surrounded by water. There are so many islands in this world which faces the serious problem of sinking. Sinking is a process by which the land moves or submerged downwards due to any exogenic or endogenic activities. The islands of Indonesia, Kiribati, Palau, Solomon Islands are such types. In India, the deltaic island of Brahmaputra and Indus also faces the problem of climate change, Majuli is one of its kind. Lohachara, island in Sunderbans of India sanked and had lost in 2006. According to National Institute of Oceanography stated that the average global sea level-rise as estimated by the Intergovernmental Panel on Climate Change is 3.2 mm per year. Total land for inhabitants is low in Kerala and also inhabited island. Among the islands of Kerala, Munroe Island is one of the important islands which have its own importance and peculiarities. Munroe Island is also a sinking island due to various reasons. This paper tries to analyze the factors responsible for sinking and its effects.

Study area

Munroe Island, locally known as Munroethuruthu, located at the confluence of Ashtamudi Lake and Kallada River between 9°0’0”N to 76°35’0”E to 9°0’0” N to 76°40’0”E. As per 2011 census, Munroothuruthu has a total population of 9599, consisting of 4636 males and 4963 females. The average height of the island is 3.32 m above mean sea level. According to the study of NCESS stated that out of the 389 backwater islands 230 islands are affected with tidal influence and vulnerable along with the banks of backwaters. Munroe Island is gradually sinking due to eroded shoreline, subsiding coasts, loss of wetlands, reduced sediment deposits and sea level rise fetched by climate change. Climate change is a long term processes which affects from small to large scale but its effect firstly on a small scale

Objectives

1) To find out the factors which are responsible for sinking of Munroe Island.
2) To examine the role of such factors in sinking.

2. Materials and Methods

This paper mainly focused to analyze the sinking and its effects on the island. Rainfall, temperature and tidal data were analyzed to find out the differences in weather. The experimental report of NCESS, KSCSTE and SDM authorities were studied in detail. Both primary and secondary data were analyzed for getting the correct result. Primary methods include field survey, questionnaire and Google maps. Secondary data sources are tidal data, various reports, and newspaper reports. Simple statistical methods were used to find out the results. Using the statistical results charts and diagrams were made for better understanding of the results. Maps were prepared based on the field visit and toposheet (1:25,000, 1:50,000)

3. Results and Discussion

Munroe Island, known as Bucolic Isles is a collection of tiny 8 islets spread over 13.4 sq. km of ecologically fragile environment with network of canals, stream channels and watersheds. Munroe Island is under two types of lands, one is the already formed land area and the other is the delta formed by the Kallada River. The land is under the stress created by the destruction of mangroves, sand mining, delta destabilization caused by the Kallada river due to the construction of Thenmala dam. Another important reason is the continuous vibration caused by the passing of train. It is an island created by land reclamation from the delta formed by the Ashtamudi Lake and Kallada River and located at its confluence; hence it is vulnerable for flooding.
The following table shows the tidal coefficient data for 2018 and 2016.

<table>
<thead>
<tr>
<th>Month</th>
<th>Tidal Coefficient</th>
<th>Character</th>
<th>Tidal Coefficient</th>
<th>Character</th>
<th>Tidal Coefficient</th>
<th>Character</th>
</tr>
</thead>
<tbody>
<tr>
<td>2018</td>
<td></td>
<td>2017</td>
<td>2016</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>January</td>
<td>100</td>
<td>Very High</td>
<td>78</td>
<td>High</td>
<td>46</td>
<td>Low</td>
</tr>
<tr>
<td>February</td>
<td>105</td>
<td>Very High</td>
<td>80</td>
<td>High</td>
<td>39</td>
<td>Low</td>
</tr>
<tr>
<td>March</td>
<td>104</td>
<td>Very High</td>
<td>97</td>
<td>Very High</td>
<td>40</td>
<td>Low</td>
</tr>
<tr>
<td>April</td>
<td>100</td>
<td>Very High</td>
<td>76</td>
<td>High</td>
<td>43</td>
<td>Low</td>
</tr>
<tr>
<td>May</td>
<td>86</td>
<td>High</td>
<td>63</td>
<td>Middle</td>
<td>57</td>
<td>Middle</td>
</tr>
<tr>
<td>June</td>
<td>68</td>
<td>Middle</td>
<td>52</td>
<td>Middle</td>
<td>80</td>
<td>High</td>
</tr>
<tr>
<td>July</td>
<td>67</td>
<td>Middle</td>
<td>49</td>
<td>Low</td>
<td>80</td>
<td>High</td>
</tr>
<tr>
<td>August</td>
<td>68</td>
<td>Middle</td>
<td>42</td>
<td>Low</td>
<td>86</td>
<td>High</td>
</tr>
<tr>
<td>September</td>
<td>62</td>
<td>Low</td>
<td>48</td>
<td>Low</td>
<td>91</td>
<td>High</td>
</tr>
<tr>
<td>October</td>
<td>53</td>
<td>Middle</td>
<td>59</td>
<td>Middle</td>
<td>89</td>
<td>High</td>
</tr>
<tr>
<td>November</td>
<td>53</td>
<td>Middle</td>
<td>85</td>
<td>High</td>
<td>81</td>
<td>High</td>
</tr>
<tr>
<td>December</td>
<td>61</td>
<td>Middle</td>
<td>92</td>
<td>High</td>
<td>77</td>
<td>High</td>
</tr>
</tbody>
</table>

Source: https://tides4fishing.com/as/india/kollam

Tides mean the cycle of rising and falling of the surface of bodies of water caused by the attraction of the moon and the sun. While considering the tidal data during 2018, the data shows that from January to April the tidal coefficient is between 105 and 100 and is marked as very high with the height of the waves in between 1.1 to 0.4 m. In May it is 86 and marked high. From June to September the tidal coefficient ranges from 53 to 68 and marked as middle, but the height of the waves is only between 0.9 m to 0.2 m. The tidal data of 2017 shows that from January to April and November to December, the tidal coefficient is between 76 to 97 which is high to very high and other months tidal coefficient is ranging between 42 to 63 and is ranged from middle to low. In 2016, from June to December the tidal coefficient is high (77 to 91) and from January to May the tidal coefficient is middle to low and values varies from 39 to 57. The height of the tide is from 1.2 m to 0.1 m referenced to mean lower low water. These data shows that the water level in the island is raised, denoting the axial lowering of land mass. Munroe Island is about 3.52 m from the mean sea level due to tidal effect the land dipped to 0.5 to 1 meter. Prior to 2004 tsunami, the effects of high tide were severe only in the month of November-December during the full moon. Increased level of water affect houses causing wall moistening and flooding. The tidal variations created crevices in walls, paddy fields, coconut lagoons and mushy walkways. The tidal effect is caused by spring tide or subsidence. Spring tides coincides with high swell waves, it marks in erosion of coast and flooding. The estimated tidal surge is between 2.5 to 3 m height. So there is a possibility of structural or land subsidence on this island. Land subsidence means the sinking of the ground because of underground material movement. Natural events also cause subsidence and it has increased the vulnerability and the geological hazards.

The study by The National Centre for Earth Science Studies (NCESS), Kerala State Council for Science, Technology and Environment (KSCSTE) and the State Disaster Management Authority (SDMA) found that the problem originated from the high tides connected with spring tides. When spring tide coincides with the high tide waves it results in coastal erosion and flooding. The tidal waves rise to height by 2.5 to 3 meters. The most affected areas under sinking are Pattamthuruth, Kandramkani, Kidapram and Nenmeni. Due to this phenomenon, about 430 families left houses. Major

**Volume 8 Issue 3, March 2019**

www.ijsr.net

Licensed Under Creative Commons Attribution CC BY
concerns associated with this effect are saline water intrusion, drainage problems, reduced availability of drinking water and flooded houses.

The flooding due to high tides cause salt water intrusion in to the islands that result in sticking of salt residues to the walls and continuous accumulations lead to crevices in house walls. Panchayat officials reported that shrinking tiny islands ranging from one acre to over one hectare, were inhabited by humans. Due to the recent flood (August, 2018) water level increased and some families had to leave their home.

“The flooding of Munroethruthu happened post-tsunami. Sundarban and the Kutch region experienced flooding due to global warming. Similar effects of global warming were found in Ashtamudi Lake. The deltas and islands are more exposed to the threat of global warming and Munroethruthu is a delta of Kallada river,” Mr. V.K. Madhusoodanan, environment activist.

The Tsunami happened in the year 2004 changed the land structure of this island. This Tsunami was a result of large earthquakes in subduction zones bordering the Indian Ocean and by smaller magnitude events along the Central Indian and Carlsberg mid-oceanic ridges. The tsunami was triggered by an earthquake of magnitude 9.3 at 3.316°N, 95.854°E off the coast of Sumatra in the Indonesian Archipelago at 06:29 hrs making it the most powerful in the world in the last 40 years. The trigger causes the movement of small plates. In Kerala, the wave refraction beyond Kanyakumari causes damages. (Preliminary assessment of impact of Tsunami in selected coastal areas of India, February 2005). Thus this small movement of plates causes damage to Munro Island because the nature of the land is very fragile that at the top of the delta, there is clay up to a height of 2 meters. Below there is sandy soil, which is 2 to 6 meters thick. Under this layer, there is mixed soil comprising sand and clay up to a depth of 14 m and below this sand is presented. The low backwater elevation of Neendakara is the main reason for coastal subsidence along the Kollam coast. The height of the wave was between 2m to 5m.

A scientist from Kollam, Sainudeen Pattazhi, based on a field study, concluded that the post-tsunami tectonic shift and dam construction that affect delta formation were the reasons for the sinking which would make Munro islands disappear in a short period of time.

“In a recent phenomenon, Munroethruthu was flooded during the high tide which denotes the axial lowering of the land mass. It is not due to climate change, specifically the global warming as assessed,” Mr. Sainudeen Pattazhi

According to the questionnaire survey many people reported that sinking is due to the tsunami imposed tidal effects and the construction of Thenmala Dam. Dams indeed alter aquatic energy and river hydrology upstream and downstream affecting the water quality, quantity, breeding grounds and habitation as well. Some respondents pointed out that the trigger caused by passing of trains through the island creates vibrations affects the ground. The flood affects the physico-chemical condition of the water. The water quality of island is not good and the water quality result shows the presence of bacteriological contaminators that is coliform and e.coli. During high tide, the public water supply system stops functioning and canoes were used to carry water. Saline intrusion cause changes in the salinity level, results in the absence of plankton and it creates the reduction or vanishing of fish productions. Chemicals or other substances which are released from the disposal of remains of plastic or other non-biodegradable items in to the soil and water results solid wastes. That leads to some series general and health issues. Elements such as chloride, sulphate, nitrate, phosphate, calcium, magnesium, sodium, potassium, iron, and ammonium are the chemical parameters that were identified from the water samples. One shocking fact is that , out of the total 12 wards, each wards have one cancer patients and its number is increasing and the location of these households are near to the water bodies.

About 70 % of the delta of Munro is formed by the Kallada River through deposition. The people of the island depends on different types of aquaculture including prawn farming, but the sinking which resulted in excess salt intrusion inhibited the growth of prawns. The numbers of shrimps in the farms are reduced due to the increasing amount of salinity and it also affects the paddy cultivation. The high saline content is not good for the agricultural and aquaculture activities. Once the entire Kallada River used to flow into Ashtamudi Lake, now half of its water is diverted to the Dam at Thenmala. This resulted in the destabilization of delta and accentuated the encroachment into the lake bed as well over the past two decades. This phenomenon directly affects the Ashtamudi Lake to shrink to half of its original size because the lake is fed by Kallada River, its major source (Help foundation).

Other reason that strongly supports the sinking of the island is illegal and unscientific sand mining around the island and in the lagoon. Sand mining causes direct bank erosion and degradation of river. Instream mining lowers the stream bottom, which may lead to bank erosion. Depletion of sand in the streambed and along coastal areas causes deepening of rivers and estuaries, and enlargement of river mouths and coastal inlets. It leads to saline-water intrusion from the nearby sea. The effect of mining is compounded by the effect of sea level rise. Any volume of sand exported from streambeds and coastal areas is a loss to the system. The degradation of wetlands in the island is another factor that results to delta destabilization and coastal subsidence. Absence of Mangroves adds the impacts of destruction. There has been 85% reduction in mangrove area during 1967-2016. Mangrove regeneration has been affected owing to diverse range of anthropogenic pressures as loss of habitat, cattle grazing, coconut husk retting, and harvest for medicine, timber and pollution. Mangrove plantations have the power to reduce flooding and it also help in breeding of fishes. The main important characteristic of the mangrove is that it can hold the silt and helps in the accumulations.

4. Conclusion

Munro Island is gradually sinking: within 15 to 20 years this pristine land will be vanished in to water. The above facts reveals the factors that influencing sinking are tidal
effects, plate movement due to Tsunami, construction of dam, human interventions such as mining. The impact of sinking is high. Salt water intrusion, flooding, poor water quality and increasing number of empty houses are all results of sinking.

5. Acknowledgement

The author is thankful to the Department of Science and Technology for providing support and facilities for conducting the study.

References

[1] An expert team from the ThangalKunjuMusaliar College of Engineering, Kollam. The team headed by Prof. GouriAntharjanam, and consisting of Prof. Sunil Kumar, Prof. Sirajudeen, Prof. Sruthi. R. Krishnan, Prof. Amal Azad and Prof. Udayakumar
[7] Neelima Parvathi, Posted By : Sabitakaushal, Posted Date : Thu, 2016-08-11 13:40
[9] Preliminary assessment of impact ofTsunami in selected coastalareas of India, Compiled byDepartment of Ocean DevelopmentIntegrated Coastal and Marine Area Management, Project DirectorateChennai, February 2005
[14] https://downtoearth.org.in
[16] https://www.deccanchronicle.com
[17] https://www.indiawaterportal.org
[18] https://www.newsable.asianetnews.com/south/munroe_island_sinking_or_rising_sea
[21] https://www.threeissues.sdsu.edu/three_issues_sandingfacts01.html

Volume 8 Issue 3, March 2019
www.ijsr.net
Licensed Under Creative Commons Attribution CC BY