



# ASSESSMENT OF CASUALTY AND ECONOMIC LOSS BY THE HIT OF DISASTER: A COMPARATIVE STUDY ON MANIPUR GRAM PANCHAYAT, SANDESKHALI-II BLOCK, NORTH 24 PARGANAS AND KUMIRMARI GRAM PANCHAYAT, GOSABA BLOCK, SOUTH 24 PARGANAS, WEST BENGAL

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**ABSTRACT:** A disastrous hit of an extreme weather event paralyses the normal life and retards the economic progress. The tropical cyclone Aila occurred almost a decade ago but its distressing memory still persist among the affected people. In this study an attempt has been made to assess the economic loss along with casualties and change in income and occupational pattern in two Gram Pachayats- Manipur and Kumirmari and measures to prevent and reduce damages have been suggested.

**Key words:** casualty and economic loss, change in income and occupation, spatial variation in economic loss, responsible factors for economic loss.

## Introduction:

Recent decades had experience increase in frequency and intensity of extreme weather events. Damages by human induced and non-weather related events are far lower than that of weather related extreme events.

Districts of coastal zone of West Bengal, being situated at the north-west angle of the Bay of Bengal, are exposed to cyclonic storms, which are often accompanied by heavy rainfall and sometimes by storm surges. These

weather related events causing varied degree of damage to life and property in the region. Most of the people of this region, especially inhabitants of the Sunderban region, are not economically stable and they compelled to live in vulnerable coastal zone. As a result, they are frequently been hit by cyclones. Sometimes, these extreme weather events make them environmental refugee.

Considering damage amount of recently occurred events, cyclone Aila is worst damaging event. This cyclonic system formed over south eastern part of Bay of Bengal on 23<sup>rd</sup> May, 2009 and intensified up to severe cyclonic storm and crossed over the West Bengal coast, near Sagar Island on 25<sup>th</sup> May, 2009. After the land fall the system continued with a intensity of cyclonic storm for 15 hours. Maximum sustained wind speed was 112km/hour near place of landfall on the day of coastal hit. With it extreme heavy rain occurred over southern part of Gangetic West Bengal on 25<sup>th</sup> and 26<sup>th</sup> May. More than 2 meters storm surge confined the Sundarban area. The study area was devastated on 25<sup>th</sup> May 2009. A vast area was inundated and caused huge human death and economic loss. Even after a long time, the onset of the event is still painful to people of massively devastated areas; they are trying to coming back to their earlier self.

North 24 Parganas and South 24 Parganas districts are worst effected districts. Highest monetary loss and human death are experienced by Gosaba block of South 24 Parganas (economic loss- Rs.13928 lakh rupees, casualty-20) and Sandeskkali-II block of North 24 Parganas (economic loss-Rs.6119 lakh rupees, casualty-45). Kumirmari gram panchayat of Gosaba block (economic loss-Rs.877 lakh rupees, casualty-4) and Monipur gram panchayat under Sandeshkhali-II block (economic loss-Rs.698 lakh rupees, casualty-23) are areas of highest gram panchayat level monetary loss and human death. Hence, in this paper, an attempt has been made *to assess casualty and economic loss by hit of disaster in two Gram Pachayats- Manipur and Kumirmari and suggest measures to prevent and reduce damages.*

### **Study area:**

Monipur Gram Panchayat (G.P.) is situated (22°15' N. to 22°19'45.93" N. and 88°53' E to 88°56'15" E) in Sandeshkhali-II block (Figure: 1) and consists (21.06 sq.km.) of 3 mouzas namely Atapur, Manipur and Joygopalpur. Kumirmari Gram Panchayat (25.2 sq.km) is situated (Figure: 2) at the south eastern corner (22°10' N to 22°14' N; and 88°54' E-88°58'E) of Gosaba block (Figure: 3, Figure: 4).

### **Methodology:**

At first detailed literature survey has been conducted. Base map of the study area is prepared. Secondary data are collected from various government departments. Along with it an intensive primary data is collected using appropriate questionnaire schedule from the area, worst affected by extreme weather event.

10% of total households (census, 2011) are identified from two gram panchayats using stratified random sampling technique and survey was carried out during 2014-2015. Further division of sample is done on proportion of settlement area for river side part and inner part for comparison of damage. For this, road parallel to river bank is taken as boundary between river side part and inner part. Mouza wise numbers of households are also considered.

Table 1- Sample size selection

Mouza	Settlement area in %			No. of house hold	10% of house hold	Sample size	
	River side	Inner part	Total			River side	Inner
Atapur	100	0	100	1262	127	127	0
Manipur	50.98	49.02	100	1930	193	99	94
Joygopalpur	24.83	75.17	100	2031	203	51	152
<b>Manipur G.P.</b>				<b>5223</b>	<b>523</b>	<b>277</b>	<b>246</b>
<b>Kumirmari G.P.</b>	61.84	38.16	100	4344	<b>435</b>	<b>269</b>	<b>166</b>

Source-computed from land use map and Census of India

Comparison in monthly income between before Aila and after Aila is done by Pared sample t –test. Comparison in damages between river side part and inner part is tested by Independent samples t test for normal data and Mann Whitney U test for non normal data. Normality of data is tested with Shapiro-Wilk test. For the identification of dominant factors (factor loading greater than 0.60.) responsible for economic loss, Principal Component Analysis (PCA) with varimax rotation is used (KMO score is being >0.6 and Bartlett’s test of sphericity is being significant). With it, multiple regression (step wise) analysis is applied to know the relationship between economic loss and dominant factors, derived from Principal Component Analysis. Selected dependent variables are inundated area under fish production (F1), inundated area under agricultural production (F2), number of affected animals (F3), listening to forecast (F4), house type (F5), inundation duration of arable land (F6), saline water height in the room (F7), inundation duration of settlement are (F8) and distance from river (F9), infected duration of fish producing area (F10) and assets of household (F11). For house type, listening to forecast and asset score value is assigned in a manner, so that higher the score greater the possibility of damage.

## **Result and Discussion:**

**Socio economic condition:** Total population of Manipur G.P. is 2101 (male- 55%, female-45 %) from 523 households. About 45% of total population remains below poverty level. At Kumirmari G.P., 1742 persons (male- 51%, female-49%) live in 435 households. About 88% of total population is identified below poverty level. Backwardness of population exists (Manipur-82.77%, G.P.-93.57%).

Water logging condition of settlement area sustained for two weeks to two months during high tide.

**Casualty and Economic loss-** Alia has snatched 23 valuable human lives (male-12, female-10) from Manipur and 4 ((male-2, female-2) from Kumirmari by drowning. Injury to 104 persons from Manipur G.P. and 86 persons of Kumirmari G.P. were enlisted.

Total direct monetary loss of Manipur is estimated 2.33 crore rupees (Rs.44, 551/house hold) and in Kumirmari monetary loss is 2.05 crore rupees (Rs.47, 126/house hold). People of Manipur and Kumirmari have economically lagged behind for 10 and 11 years respectively. Saline water captured 1.12 sq.km and 1.58 sq.km arable land in Manipur and Kumirmari respectively. Huge number of livestock population (Manipur-1677, Kumirmari-2267) and hen/duck/poultry birds (Manipur-1414,Kumirmari-2150) were died. In Manipur about 0.24 sq.km area under fishing 'bhery' and 0.09 sq.km area of sweet pond and in Kumirmari 0.06 sq.km area under fishing 'bhery' and 0.09 sq.km area of sweet ponds became infected. By the hit of Aila 561 houses in Manipur and 456 houses in Kumirmari were destroyed or damaged. For the construction of 'ring bandh' and 'concrete bandh' 0.01sq.km and 0.17 sq.km land loss is witnessed in Manipur and Kumirmari respectively. Estimated asset lost in both the two Gram Panchayats are as follows:

Table 2 – Damage in terms of money (Lakh Rupees)

Gram Panchayat	Agricultural loss(Rs.)	Live stock loss(Rs.)	Fish loss(Rs.)	House damage(Rs.)	Land loss(Rs.)	Asset loss(Rs.)
Manipur	21.51	98.1	28.65	65.7	9.8	9.6
Kumirmari	33.61	86.06	23.86	47.8	6.7	6.67

Source-Computed from primary data

After Aila some social problems were increased such as pilferage, poverty, increase in AIDS affected persons and school dropout. But post Aila rehabilitation work has improved drinking water facility and road condition.

**Comparison between before Aila (2008) and after Aila (2010) situation-** Before Aila, monthly average income of Manipur was Rs. 6,244 /-per family which was reduced to Rs.4,552/- after Aila. Such drop in income is statistically significant (t value of paired samples test=20.409, p=0.000). Significant ( $\chi^2 = 3061.153$ , p=0.000) change in occupation is observed. Agricultural labour, cultivator and fishing land owners were completely disappeared. Increase in migration to outside Bengal for construction work (890%), persons engage in business (108%), daily labour (192%), is observed. Fall in monthly average income of Kumirmari is also significant (t value of paired samples test=17.913, p=0.000). Before Aila, it was Rs. 4,982/-per family which has reduced after Aila to Rs.2, 804/-. Significant occupational change ( $\chi^2 = 3061.153$ , p=0.000) is observed. Disappearance of agricultural labour, cultivator, fishing land owners and fishing from river is noticed. Fishing along river bank (384%) and collection from forest (160%) has increased significantly.

**Comparison of Damages between river side area and inner area:** In Manipur assessed mean value of total damage and individual house damage, agricultural loss, fish damage, land loss is high to the people of river side part but livestock damage and asset loss is more to the people of inner part. This mean level difference is significant in case of only fish damage (U=1354.0, p=0.000). In case of Kumirmari, mean level house damage,

agricultural loss, land loss is high near river but fish loss, livestock damage, asset loss and total monetary loss is more to the people of inner part. This mean level difference is significant in case of house damage ( $U=20100.5$ ,  $p=0.039$ ), agricultural loss ( $U=.1906.0$ ,  $p=0.003$ ), asset damage ( $U=2554.5$ ,  $p=0.016$ ). [Fig.5&6]

### Factors responsible for Economic Loss-

In case of Manipur G.P., 8 variables (F1, F2, F3, F6, F7, F8, F9, F10) are identified by first four components (Cumulatively 68.114% of total variance). Multiple regressions (step wise) signifies four variables responsible for economic loss of households; which are inundated area under fish production (F1), inundated area under agricultural production (F2), number of affected animals (F3), and inundation duration of arable land (F6). For Kumirmari G.P., PCA reveals that except number of affected animals (F3) all the 10 variables have been identified by 4 components (cumulatively 64.823% of total variance).  $R^2$  and adjusted  $R^2$  value of step wise regression identifies 3 significant variables responsible for economic loss of households which are inundated area under agricultural production (F2), infected duration of fish producing area (F10) and inundation duration of arable land (F6).

**Damage reducing strategies-** Most of the respondents think if the height of the base of their house raised and proper maintenance of structure is done then the damage by forth coming disaster will be reduced. Some other suggestions are proper protection of river bank, storage of rice and documents at safe height, maintenance of sluice gate and canal, awareness increasing programme. Villagers have also mentioned some ways of enhancing awareness like wall painting to write do's and don'ts, acting short drama at market place, advice at classroom and formation of local awareness committee.

### Conclusion:

With spatial and temporal variation of rainfall, temperature and wind speed, occurrences of extreme weather events are increasing. Simultaneously, economic loss and casualty by them are also increasing. Aila is most destructive event in recent past and has caused economic loss along with change in occupation. At Manipur migration to outside Bengal for construction work was major trend and at Kumirmari fishing from river has increased. Monthly income significantly dropped in both Gram Panchayats. River side part of Manipur and inner part of Kumirmari faced more damage. Significant factors for damage at Manipur Gram Panchayat are Inundated area under fish production (F1), Inundated area under agricultural production (F2), Number of affected animals (F3), Inundation duration of arable land (F6). Significant factors for damage at Kumirmari Gram Panchayat are Inundated area under agricultural production (F2), Infected duration of fish producing area (F10), Inundation duration of arable land (F6). Increasing awareness and structural mitigation measures will reduce damage and casualty by forth coming disaster.

## References:

- India Meteorological Department (2010): Cyclonic disturbances over the north Indian Ocean during 2009: A report , Issue no. Cyclonic warning No. 5/2010,pp.39-55.
- Kar, N.S. and Bandyopadhyay,S. (2015) : Tropical Storm Aila in Gosaba block of Indian Sundarban : Remote Sensing based Assessment of Impact and Recovery, Geographical Review of India, 77 (I), pp. 40-54
- Kutubuddin, H.M. (2013): Impact of Natural Calamities on Agriculture, Reclaimed land of Sundarban. Volume –I, acb publishing, Kolkata
- Mistiri, A.( 2002) :Labour Mitigation as a Response Strategy due to Aila (cyclone) in Sundarban Region of India : A case study from village Chargheri, 24 Pgs (N), West Bengal, India, in Maiti, M (eds.) in Social Dimension of Hazard Management , acb publishing, Kolkata
- Mukhopadhyya, A (2009): Cyclone Aila and the Sundarbans: An Enquiry in to the Disaster and Politics of Aid and Relief, Mahanirban Calcultta Research Group, Kolkata.
- Ratna, M.S. (2015): Natural Disaster- The major Environmental Challenge in South Asia: An Overview, Geographical Review of India, 77 (4) pp. 310-320.

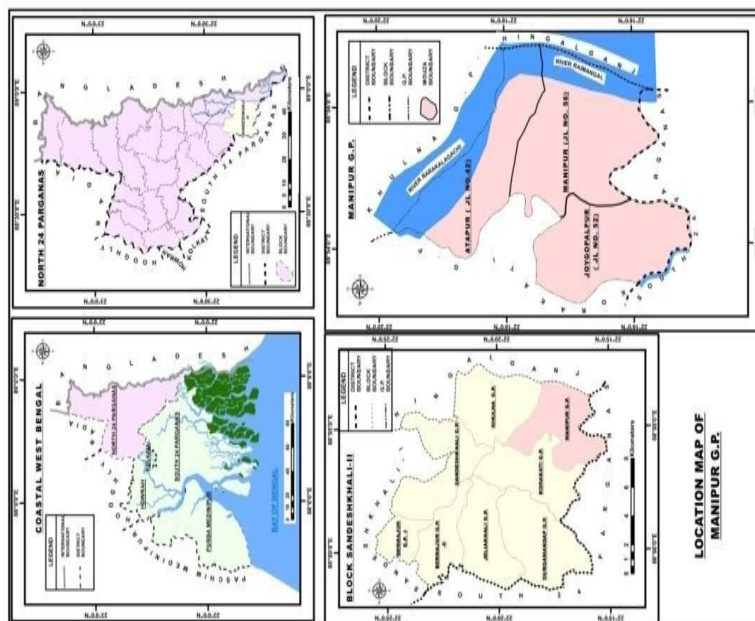
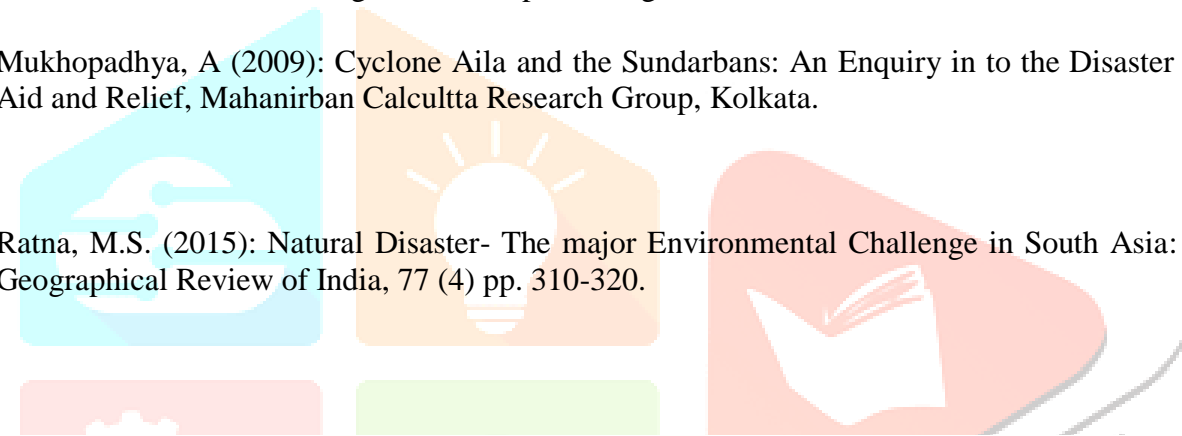


Figure 1: Location map of Manipur Gram Panchayat

Source: NRDMS



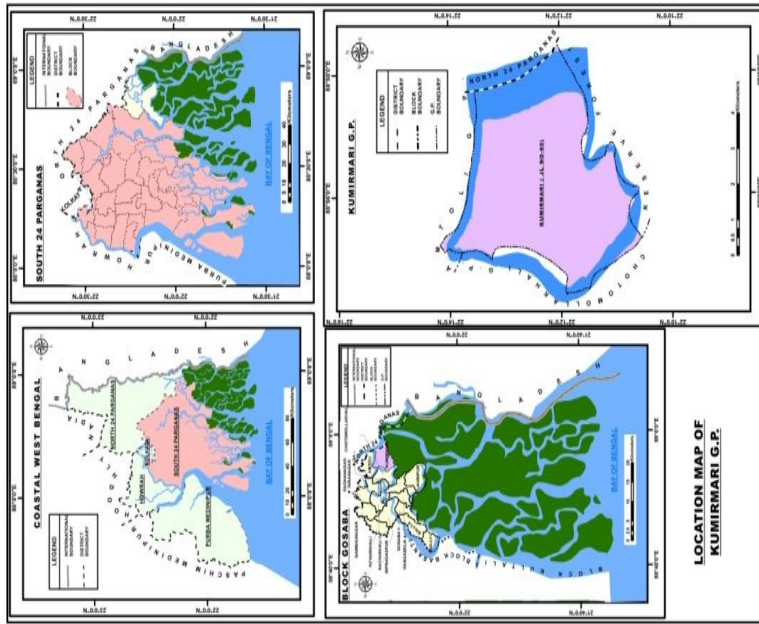


Figure 2: Location map of Kumirmari Gram Panchayat

Source: NRDMS

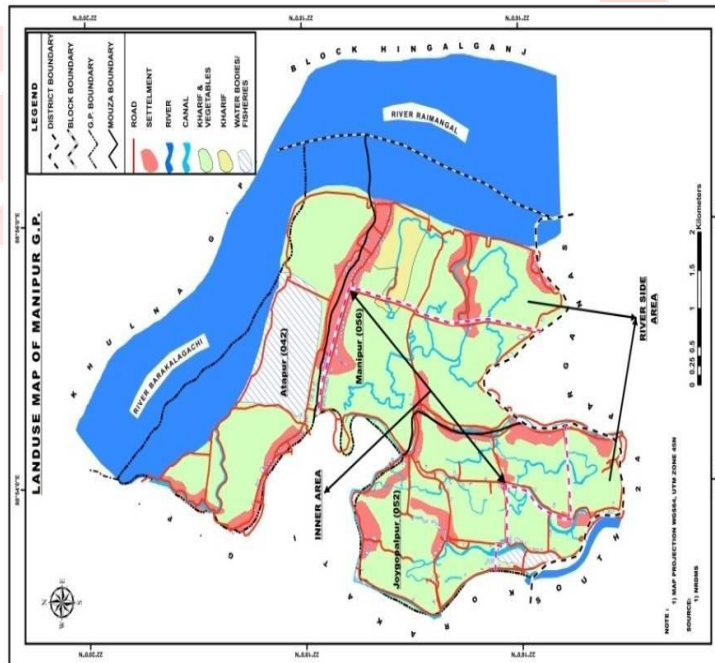
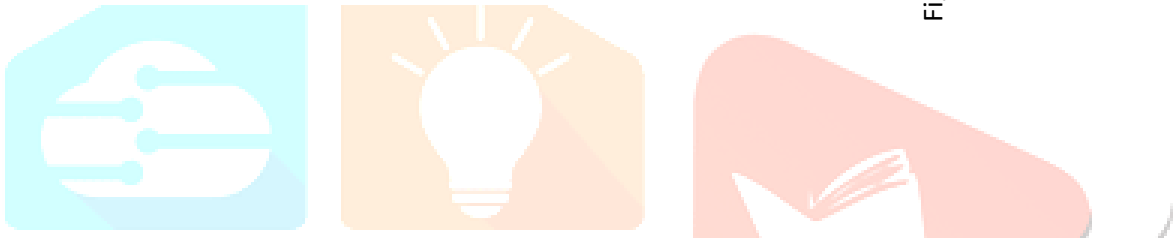


Figure 3: Land use and land cover map Manipur Gram Panchayat

Source: NRDMS

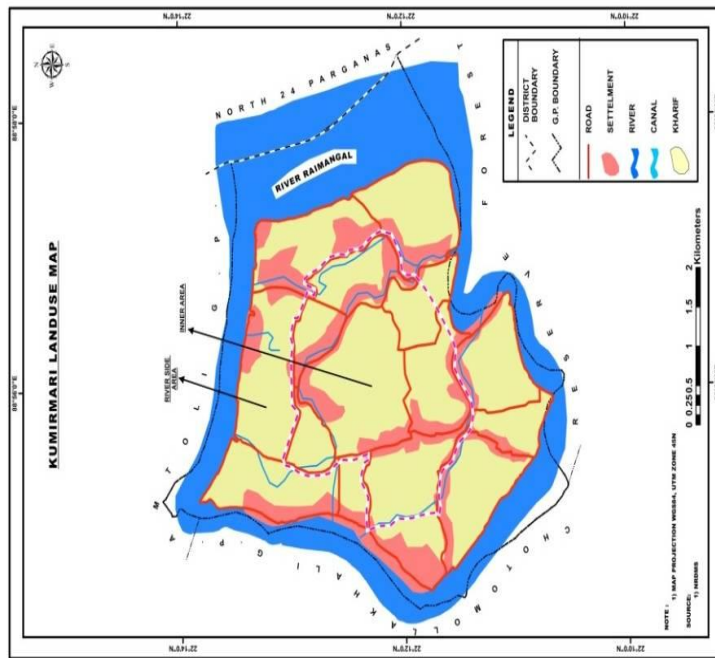


Figure 4: Land use and land cover map of Kumirmari Gram Panchayat

Source : NRDMS

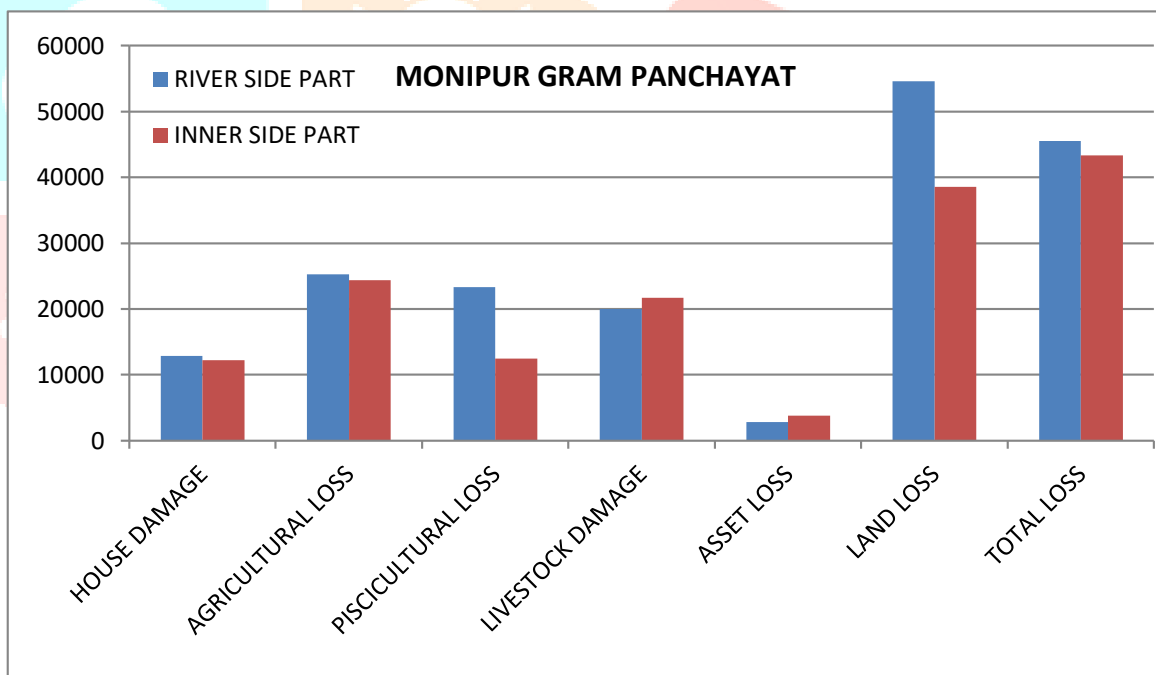


Figure -5 : Mean Level Comparison of economic loss between River Side Part and Inner Part of Manipur Gram Panchayat.



Source: Computed from primary data

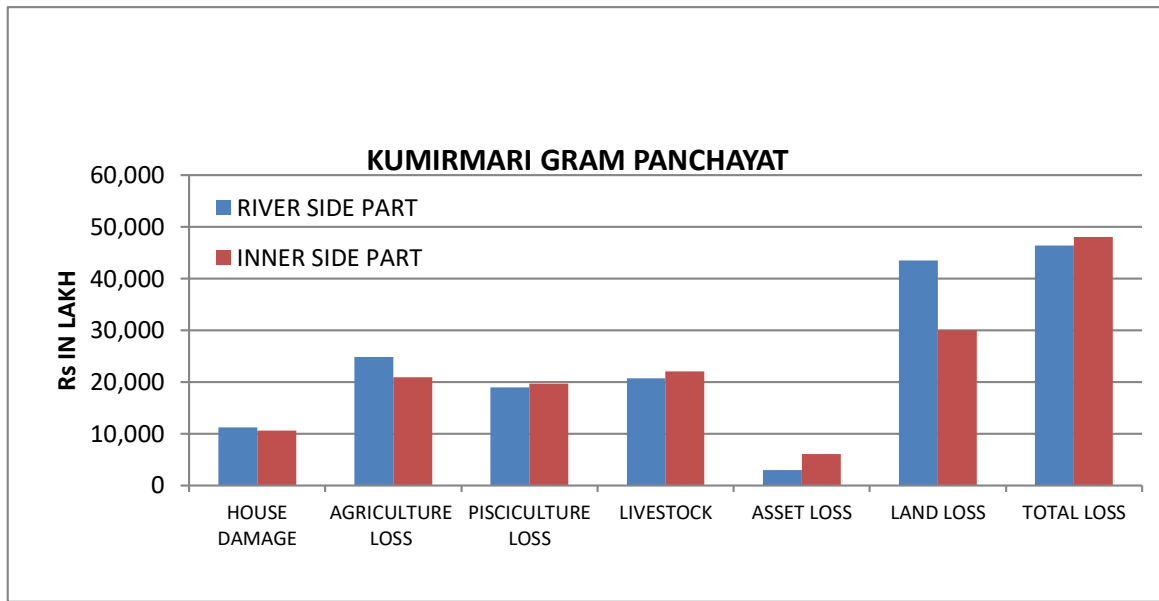


Figure - 6: Mean Level Comparison of economic loss between River Side Part and Inner Part of Kumirmari Gram Panchayat

Source: Computed from primary data

