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Contents

Role of Private Sector in Post Cyclone Rehabilitation and Restoration in Bangladesh

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Md. Abubakkor Siddik,
Dr. Md. Moniruzzaman & Md. Abdul Malak

Abstract

The attempt of the study was to assess the role of private sector in post cyclone rehabilitation and restoration in Bangladesh. Majherchar Island of Bagerhat District in Bangladesh has been selected as study area.The research is based on primary and secondary data and information. It is revealed that different household and community facilities have been destroyed and damaged due to cyclone Sidr in the study area on 15 November 2007. After Sidr, affected households were given family shelter, solar home system, rain water harvesting system, improved latrine and livelihood equipment through village transformation project of British Business Group. Besides, primary school, existing cyclone shelter and embankment were repaired. Further,one cyclone shelter, mosque and small river port was built in there. Although, several limitations are found in the provided components however, the dwellers are found happy because of having necessary facilities. Therefore, the study suggests that rehabilitation and restoration activities should be done through one hand approach.

Keywords: *Cyclone Sidr, Rehabilitation, Restoration, Sustainability*

Introduction

Bangladesh is identified as fifth among 171 extreme exposure and high vulnerable countries of the world (UNU-EHS, 2016) and first among 162 countries on the basis of the number of people exposed to cyclone, flood and storm surge (UNISDR, 2011). The magnitude, intensity and frequency of natural hazards in the deltaic Bangladesh have increased in past few decades (Biswas, 2011). Cyclone is one of the most devastative natural hazards in the coastal areas of Bangladesh and other tropical countries (Ahamed et al., 2012; Hoque et al., 2016). About 2.6 million people drowned due to storm surge in last two hundred years (Nicholls, 2003). The country, Bangladesh, experiences a cyclone almost annually and a severe cyclone every three-year (Haque, 1997; Ali, 1999; Islam, 2006; Dasgupta et al., 2010; Moniruzzaman et al., 2013a). Approximately 53 percent cyclones struck in Bangladesh that claimed more than five thousand lives (Khalequzzaman, 1989; GoB, 2008). Cyclone Sidr formed in the central Bay of Bengal and hit the coastal regions of Bangladesh accompanied 240 km/hour wind speed on 15 November 2007. About 5.5 to 6.0 m storm surge was recorded at the outfall of the River Balaeshwar. Sidr is the most severe and destructive disaster in the country in last 15 years (GoB, 2008; Tithi, 2010; Siddik and Moniruzzaman, 2013) and one of ten strongest cyclones that hit Bangladesh from 1876 to 2007 (Hasegawa, 2008). A total of 2.3 million households including livelihood of 8.9 million people were affected. Moreover, it claimed 3,406 lives and caused US$ 1,675 million damage and loss (GoB, 2008; SDMC, 2008).

Although people are unable to stop cyclone, earthquake, tornado, tsunami and many other natural hazards as well as keep them under control but have been trying to recognize them since antiquity (Islam, 2006). Government and non-government organizations (NGOs) support disaster pretentious communities with a common interest (Sarkar, 2009). Tithi (2010) stated that numbers of development partners/humanitarian agencies get involve in recovery and reconstruction programs after a disaster. Moniruzzaman (2012) found fund allocation and

Md. Abubakkor Siddik, Department of Land Record and Transformation, Faculty of Land Management and Administration, Patuakhali Science and Technology University, Dumki, Patuakhali-8602, Bangladesh. Email: siddikjnu98@gmail.com

Dr. Md. Moniruzzaman, Dept. of Geography and Environment, Jagannath University, Dhaka-1100, Bangladesh. Email: mdmoniruzzaman_bd@yahoo.com

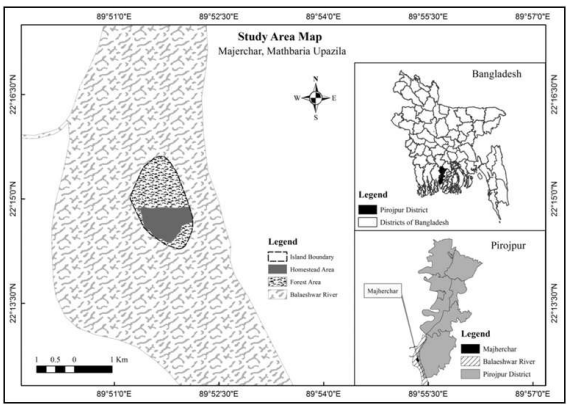
Md. Abdul Malak, University of Wollongong, Australia and Assistant Professor, Dept. of Geography and Environment, Jagannath University, Dhaka-1100, Bangladesh. Email: mam716@uowmail.edu.au

priorities were determined by the implementing agencies and no close supervision and coordination among the projects. Therefore, the chaotic recovery and reconstruction works executed by the donor agencies and their partner community based organizations (CBOs) and NGOs. After any cyclonic event, several NGOs/development partners/agencies work along with the government in a specific coastal area. For example,38 NGOs/development partners/agencies were participated in the recovery and reconstruction activities in Sarankhola Upazila, Bagerhat after cyclone Sidr (Moniruzzaman, 2012) and seven NGOs/development partners/agencies in Dacope Upazila, Khulna after cyclone Aila (UN-JMARF, 2010). In addition to that, in the same administrative area different agencies provided different sorts of family shelters such as brick-Corrugated Iron (CI) sheet, wood-CI sheet, cemented floor with wood-CI sheet, engle-bamboo-CI sheet, wood- CI sheet-reinforced concrete column (RCC) pillar etc. after cyclone Sidr (Siddik, 2012; Moniruzzaman et al., 2013b). But, we rarely found any comprehensive recovery and reconstruction activities after any cyclonic disaster.

First time in Bangladesh, a comprehensive rehabilitation and restoration project has been completed through private sector initiatives after cyclone Sidr. The British Business Group (BBG) is an association of 54 UK companies. Following cyclone Sidr the group decided to undertake a transformation project to benefit a community. Majherchar Island was identified and selected after discussing with the Government of Bangladesh. The BBG along with long-established and well known NGO "Friendship" carried out Village Transformation (VT) Project with a vision to "Build Back Better" without any other interventions (ATCP, 2010). Thus, the present study intended to understand the nature of assistance made by the BBG and people's perception about the assistance.

Methodology

Majherchar Island of Pirojpur district has been selected as the study area considering landfall, severity, affected population and impacts of cyclone Sidr as well as private sector or one hand rehabilitation and restoration initiatives. It is located in $22^0$14'15" north to $22^0$15'35" north latitudes and $89^0$51'15" east to $89^0$52'05" east longitudes (Figure 1). The Island is bounded by the Balaeshwar River having an area of 1,000 acres including about 25 percent habited and cultivable area and 75 percent forest area (Forest Office-Majherchar, 2013).



Source: Author's own compilation

Figure 1.Location of the Study Area

The research is made based on primary and secondary data and information. Primary data sources were basically questionnaire survey and official documents. A total of 127 households were selected and surveyed while total household was more than 200 in the study area. Selected households are those where British Business Group provided their intervention after cyclone Sidr. Spatial position of the sample households and cyclone shelters were taken through Global Positioning System (GPS) and ArcGIS was used to prepare study area map and measure the distance of households from the cyclone shelters. In addition to primary data, secondary data were collected through desktop research and literature review covering impacts of cyclone Sidr, recovery and reconstruction assistance by the development partner issues. Major sources of literature were books, journals, theses, reports and internet sources.

Results and Discussion

Cyclone Sidr hit Majherchar Island with about 16 feet high waves. It killed four lives and lots of livestock, damaged and destroyed family shelters, home

lighting equipment, drinking water supply and human waste disposal systems, livelihood equipment, community centres, roads and embankment.

Family Shelter: Family shelter is the first priority of the disaster affected households in recovery process (Moniruzzaman et al., 2014). Among the studied families, almost 90 percent main houses (here referred as family shelter) were fully and 10 percent were partially damaged due to cyclone Sidr. The study revealed that all the affected households were given a family shelter having one room or two rooms by the village transformation (VT) project of BBG. Each room consists of 235 square feet. Walls of house was made of sand cement hollow blocks that strengthened by incorporation of reinforcing bars and roof made of ferro-cement sheets which were cast on-site using stone-dust, sand, cement and wire mesh. The ferro-cement sheeting roof is more suitable for living because these materials do not conduct heat. All the respondents opined that BBG family shelter is more strong compared to previous shelter and they are happy because they have a roof over their head. The study found that four/two shed in design and *katcha* (CI sheet with timber post) in pattern family shelter was the traditional shelter in the study area. Although 79 percent of provided houses are using as main family shelter at present but the beneficiaries are not fully satisfied with design. Amongst them, 71.7 percent families had changed their house design and mostly (90.1 percent) has incorporated veranda along the room. Moreover, almost 65 percent of households repaired their BBG family shelter and spent Bangladeshi Taka (BDT) 254.1 thousand (BDT 3060/household, min. BDT 300 andmax. BDT 40 thousands). In addition to the household survey, the researchers have observed the present condition of the provided BBG family shelters. Table 1 shows present condition of BBG provided family shelters. It is visualized from the table that rainwater penetration is common in all houses. The dwellers identified 'low slope' as the main cause of penetrating rainwater. On the other hand, floor and wall of the maximum houses either has cracked or damaged. But, doors and windows are almost good in condition.

Table 1. Present Condition of BBG Family Shelters (value inside the bracket shows the %)

Condition (N=127)	*Floor*	*Wall*	*Door*	*Window*	*Plinth*	*Roof*
– Good	52 (40.9)	37 (29.1)	120 (94.5)	122 (96.1)	67 (52.8)	
– Crack	44 (34.7)	72 (56.7)	2 (1.6)	-	57 (44.9)	-
– Rainwater intrusion	-	-	-	-	-	127 (100.0)
– Other Damage	31 (24.4)	18 (14.2)	5 (3.9)	5 (3.9)	3 (2.4)	-

Home Lighting: All the surveyed households had used home hurricane lantern and /or oil lamp as their home lighting equipment before Sidr. About 32 percent (49 out of 153 numbers) hurricane lantern and 52.8 percent (94 out of 178 numbers) oil lamp have lost during cyclonic devastation. After Sidr, all the affected households were provided with solar system having capacity to produce 40 watts electricity and 20 years life span.The char dwellers are happy that they have been enjoying light after sunset. But, they are worried too, because they are supposed to repair the solar panels spending BDT 121.91 thousands within last five years from handed over.

Drinking Water Supply: Pond and river water were the main drinking water sources in the study area. These sources were seriously disrupted because of saline and loaded with debris deposited by the storm surge water in 2007. It was the key reasons for deterioration of water quality in the other parts in the coastal area of Bangladesh (Siddik et al., 2014). In addition, the research found absence of fresh water tube-well in the study area. Hence, the villagers did not have supply of fresh drinking water. Rainwater is used as a safe source of drinking water in many coastal areas in developing countries (Jubayer, 2015). It is generally saline and arsenic free and also safe if

hygiene is maintained during harvesting (Biswas and Mandal, 2014). Considering the facts, each household was provided with a plastic water tank of 1,000 litres from the BBG in order to harvest rain water and use year round. The water system was established with thefamily shelters has not only ensured safe drinking water but also the convenience of having a water supply at each households. The study revealed, about 84.3 percent households are using these plastic water tank for their drinking water purpose and rest households sold the water tank for meeting their daily needs. The beneficiaries strongly expressed their happiness because they have fresh drinking water sources. But, most of them claimed that its management is not easy because cleanliness of roof is critical to maintain. Moreover, plastic water tank needs cleaning and disinfections every year.

Human Waste Disposal System: Sanitation system of the char dwellers is not different compared to the other coastal parts of the country. Before cyclone Sidr, *katcha* (earthen) or ring slab with/without roof latrine was the character of human waste disposal system in the study area. But, all the sanitation structures were destroyed by the storm water surge during cyclone Sidr. After Sidr, all the surveyed households got a sanitary latrine that established alongside the household premises. The latrine made of Corrugated Galvanised Iron(CGI) sheet, Ring-slab and CGI sheet roof. But, the provided human waste disposal systems were partially damaged later due to the effects of multi-hazards in the study area. After the intervention, about 23 percent families repaired their sanitation structures and they spent a total BDT 5.9 thousands.

Livestock: The study area had a plenty of livestock resources. Figure2 shows that cyclone Sidr claimed numbers of cows, goats, hen and duck death. Selling milk was one of major source of income of the char dwellers in before Sidr.

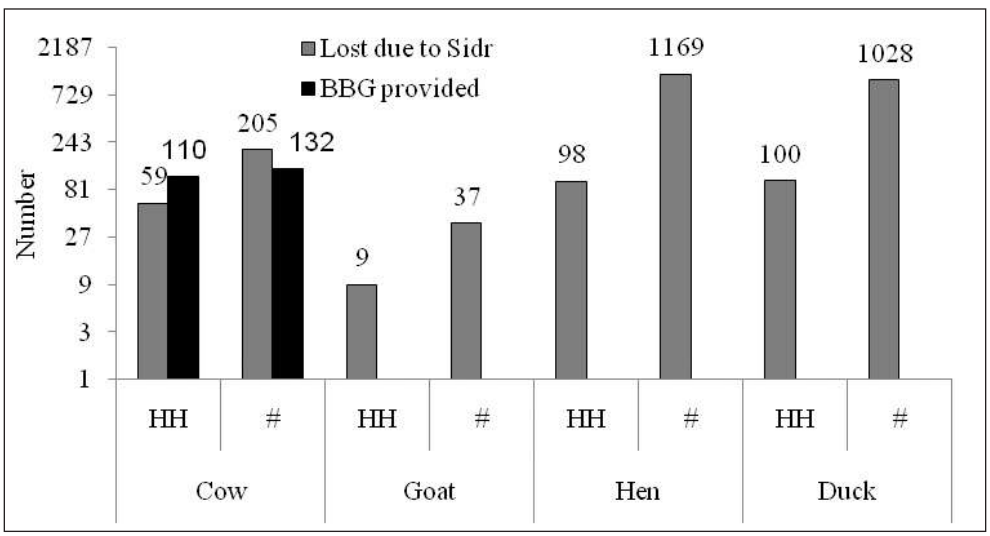


Figure2. Livestock Scenario at Pre-disaster and Post-intervention

After the cyclone this sector has suffered severe setbacks. Therefore, as per community requirement livestock including buffaloes and milking cows were given to 110 surveyed families. It is need to mention that the char dwellers graze their cows in public forests and cows are not even used to plough the land. They do not spend additional money for nursing them but collect milk in time. The present study also found that although about 64.4 percent of provided livestock has been sold by the beneficiaries due to family needs such as food supply, treatment, buy fishing net, buy cultivable land, need money to go to abroad, arrange daughter marriage ceremony etc. but beneficiaries are highly satisfied after getting livestock from the VT project.

Livelihood Equipment: Fishing was one of the main sources of income of the char dwellers and their primary livelihood equipment were boat, trawler and fishing net. A total 11 boats were fully and 3 boats partially damaged due to direct destruction of cyclone Sidr. In addition to that, one trawler of a family was fully damaged and 352 kg fishing net of 18 families was lost owing to this natural calamity. One of the primary objectives of the village transformation project was to restore the livelihood of the villagers and make them economically independent. Livelihood restoration steps were taken based on the villagers' requirements. Among the surveyed families, 8 households got two boats and each boat was given to four fishermen families. But, the beneficiaries sold their share to othershare holder. So, two families are holding boat ownership at present. Moreover, fish and fish-fry fauna was distributed by VT project to be released into the ponds. Likewise, agricultural support including seeds and fertilizers were distributed and trainings were given on better crop management techniques.

Construction/Renovation of Community Service Centre: In spite of early warning systems, coastal embankments and other measures, cyclone shelters contributed in reducing number of deaths during cyclone in Bangladesh. Before Sidr, there was only 1,500 cyclone shelters exist in the coastal areas of Bangladesh and each was capable to accommodate up to 5000 people (Haque et al., 2011). In pre-Sidr situation, there was only one cyclone shelter (CS) present in the study area which could provide shelter for about 300 persons. This CS was constructed by Bangladesh Red Crescent Society (BDRCS). During BBG project period, the CS was repaired and another cyclone shelter was built. Newly build BBG cyclone shelter may provide shelter for about 300 people. It is a multipurpose cyclone shelter. Main features of the new public shelter are location for a secondary school, have space for establishing a clinic, create a chance of starting a community centre, enable use of solar panels, enable storage of emergency food and water stocks and include extensive water harvesting and storage.

According to cyclone shelter construction, maintenance and management policy (2011) cyclone shelter should be established within 1.5 km distance, so that vulnerable community people can go there quickly during disaster (MoDMR, 2012). Before Sidr, average distance of households from the BDRCS CS was 437m. This average distance was decreased after BBG intervention. At present, average distance of BDRCS CS is 335m and newly built BBG CS is 227m from the service households. Therefore, in one hand all the households of the study area are under cyclone shelter facility and on the other hand they have CS availability within their walking distance. In addition, a mosque was reconstructed and a primary school was repaired from the project fund. The char dwellers are highly satisfied with the repaired and constructed CS as well as mosque.

Embankment and Transportation: The study area bounded by around 2.75 km earthen and 1 km cemented embankment. The embankment was either fully or partially damaged due to cyclone Sidr. After the event, BBG had repaired and/or raised the embankment around 3 feet. In addition, 3 culverts are also built on the embankment. Moreover, a new boat *ghat* (small river port) was built with a strikingly designed arch. The *ghat* is now a congregation point for the villagers as well as very impressive entry point to the island. It is also revealed that the condition of embankment is very poor in terms of sustainability. Tidal surges and other storms easily can affect the earthen portion of the embankment. Moreover, maximum portion of cemented embankment is now partially damaged due to regular tidal flooding.

Conclusions and Recommendations

Cyclones hit the coastal regions of Bangladesh almost every year. Majherchar is one of the most affected Islands due to Sidr. All households of the Island were severely affected and all the sectors including housing, home lighting, drinking water, human waste disposal system, livelihood equipment, cyclone shelter and transportation and embankment were seriously disrupted owing to cyclone Sidr. After the event, the 'British Business Group' along with well-known NGO 'Friendship' carried out a model restoration project in the Island. Although all the components are not functioning and/or the community arises question about their sustainability, but they are happy because of having roof over their head, drinking water and latrine facility, solar system and enjoy light at

night,nearest cyclone shelter and access to transport facilities. Following recommendations are made based on the research findings:

1. Recovery and reconstruction activities should be done through one hand approach considering community needs for the safeguard of the community people who are in critical situation.

2. Sustainability and functionality of each recovery and reconstruction component should be ensured.

3. Traditional and cyclone resistance house design should be considered for future disaster risk reduction.

4. Family shelter should be at least two-room based for maintaining security of female members as well as smoothness of movement.

5. Availability of the harvested rainwater, operation, storage and maintenance of rainwater harvesting and ensuring water quality to meet the drinking water standard are the important issues that must be addressed properly.

6. Solar system is a sustainable and environmentally sound home lighting system which should be applied in any other geographic area.

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Geo-morphosite Assessment for the Geo-tourism Purposes of Odisha Coastal Destinations

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Ashis Kr. Paul,
Soumita Guha & Amrit Kamila

Abstract

Areas of geological and geo-morphological significance may act natural heritage environment for attractive geo tourism sites along the coastal District of Odisha state. Such tourism sites are not well explored and not properly maintained due to poor understanding of their natural heritage significance in tourism attraction. The present paper reveals the geo-morphosite assessment for those geo tourism sites of coastal Odisha to highlight their prospects and quality and to rejuvenate the tourism process.

The weightage ranks are estimated by considering the scientific and intrinsic values, educational values, economical values, conservation values and added values for geo site ratings of tourism destinations of the coastal districts in the work. Total eighteen geo sites are rated by present method and on the basis of estimated scores they are again characterized into high, moderate, low and very low intensity of geo diversity values. Among them, thirteen geo sites are included within moderate and low category intensity of geo diversity and remaining two and three are identified as high and low category geo sites of the coastal zones.

The promotion of geo tourism development should be considered on the basis of geo site rating scores for achieving success in a new of tourism processes of the prospective region.

Keywords: *Geo-morpho-site assessment, Geo-site ratings, Geo-tourism destinations, intrinsic values, Conservation values, Added values.*

Introduction

Geo-diversity and geo-heritage are major resources of the coastal districts for geo-tourism development in Odisha State fringed with Bay of Bengal.Geo-heritage of the coastal landscapes is represented by various geo-sites and geo-morphosites of the coastal destinations. Geo-sites of the existing coastal landscapes are evolved through the history of the earth system processes and bear significant scientific values for prosperous tourism destinations development. However, geo-morphosites are used in wider perspectives and they include some added values like economic, aesthetic and cultural significance forgeo-tourism expansion along the coastal belt. Areas of geological and geo-morphological significance are assessed by following the value addition methods of Lucie Kubalikova (2013) in this part of the research work.The valuation of the coastal landscape

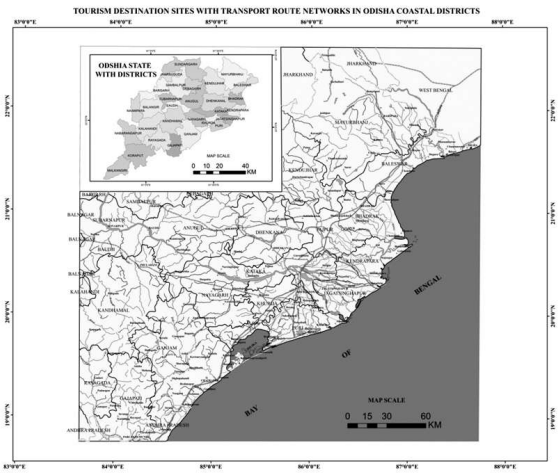

Figure 1: Location map of Odisha coastal belt destinations

Ashis Kr. Paul, Department of Geography and Environment Management, Vidyasagar University, Midnapore-721102, W. B., India, Email: akpaul_geo2007@yahoo.co.in
Soumita Guha, Department of Geography and Environment Management, Vidyasagar University, Midnapore-721102, W. B., India
Amrit Kamila, Departmentof Remote Sensing & GIS Vidyasagar University, Midnapore-721102, W. B., India

destinations provide ideal tool and appropriate use of geo-heritage is also possible by the assessment of value addition methods (Fig. 1).

The concept of geo-diversity was introduced in Australia during the early part of 1990's and significantly defined as "Earth features and systems with their diversity" by several researchers and little bit of extended dimension (Sharples, 1993; 1995; Dixon, 1996; Australian Heritage Commission, 2002; Sharples, 2002).

According to their ideas the geo-diversity was also included "The range or diversity of geological as bedrock, geo-morphological as landform and soil features, assemblages, systems and processes" particularly by Australian Heritage Commission (1996, 2002). The broader definition of geo-diversity was also proposed by Gray (2004) with analysis and discussion of various approaches. Geo-diversity was assessed by its natural range of diversity like geological characters with rocks, minerals, fossils, geo-morphological characters with shapes, forms and processes of the lands and soil features, as well as their various assemblages, relationships, number of properties, description or interpretation and respective systems. "Geomorphodiversity" was also termed by Pannizza (2009) which included the landforms, processes with subset of geo-diversity.

- The values are categorized as intrinsic value or scientific value (Pannizza 2001, 2009);
- Cultural value related to geo-mythology (Vitalians, 2007), historical with archaeological aspects of ancient settlements and also related to spiritual and various religious aspects (Gray, 2004);
- Aesthetic value generated with beauty of geo-diversity and psychological impact on human beings as referred by Gray,(2004); Pereira,(2006) etc. researchers;
- Economic and functional value of landscapes assessed by the use of mineral resources and utilization of Landscapes (Gray, 2004); as well as geo-diversity wise heritage for geo-touristic and geo-educational awareness (Reynard et. Al, 2003; Pralong, 2003; Panizza and Piacente, 2008);
- Research and educational value is added with the landscapes by considering the genesis of life and landforms, stage of landscape as well as the climate and palaeo-geographic reconstructions (Gray,2004; Panizza, 2001).

As much as 14 areas of destination corridors are already existing in the coastal belt of Odisha at present existing in the costal belt of Odisha at present. Coastal tourism in Odisha is rich in diversity because of its natural physiographic diversity and past heritage of the coastal landscapes (Table 1 & Fig. 2).

Table 1: Typology of Tourism Destinations in Odisha Coast

Tourism Destination	*Coastal District*	*Types of attractions*
Bichitrapur, Talsari, Udaipur	Balasore District	Mangrove Forest, Back water, Subarnarekha R., Sandy beach, Boating
Chandaneswar-Bhusundeswar	Balasore District	Temples, Coastal villages, Natures
Dogra-choumukh	Balasore District	Wide sandy beach, fishing Hr., Temple, Mangrove Forest
Chandipur-Balaramguri-Panchalingeswar	Balasore District	Sandy beach, Shallow and Wide Tidal flat, Fishing Hr., Temple, Natures (Hills)
Chandbali, Dhamra port, Kalidiania Island	Bhadrak District	Mangrove Forests, River Cruise, Boating, Port and Fishing Hr.
Dungmole-Ekkakula Gahirmata	Kendrapara District	Mangrove Forests, River cruise, Boating, Wild life, Seabeach

Tourism Destination	*Coastal District*	*Types of attractions*
Paradip – Devi R.	Jagatsinghpur District	Sandy Sea beach, Port, Urban Area, River Cruise, Fishing Hr., Mangrove Forests
Puri-Konark-Chandrabhaga	Puri District	Sandy Sea Beach, Temple Arts, Cultural events, Sand Art, Puri urban Centre, Fishing Hr.
Balikhand	Puri District	Water sports, Wild life, Eco parks, Temples
Brahmagiri-Mirjapur-Manikpatna- Gobindapatna	Puri District	Old Mouth of Chilika, Archaeological sites, Ancient ports, Temples, Water Sports, Boating, Other Heritage Sites
Satapada-Chilika Spit	Puri District	Wild life, Boating, Water Sports, New Mouth of Chilika, sandy Sea Beach, Islands Fishing Hr.
Barkul-Nalban-Kalijai Islands	Khurda District	Wildlife, Water sports, Recreation, Boating, Temples, Natures
Rambha-Ghantashila-Potagarh	Khurda District	Wildlife, Recreation, Boating, Watersports, Natures, Heritage Sites, Ancient Port, Sandy sea beach
Gopalpur-on-sea	Ganjam District	Old Port, Sandy Sea beach, Bluish sea, Larger Sand dunes, Natures, Fishing Villages

Figure 2: the entry point of Bhitarkanika reserve forest

Materials and Methods

The criteria for assessment of geo-morphosites was proposed by University of Modena, Italy (Coratza and Giusti, 2005); University of Cantaberia, Spain (Bruschi and Cendrero, 2005); University of Valladilid, Spain (Serrano and Gonzalez-Trueba, 2005); University of Aegean (Zouros, 2005, 2007); Pralong (2005); University of Minho, Portugal (Percira, 2007, 2010); University of Lausanne, Swizerland (Reynard et al., 2007). The final criteria are proposed on the basis of suitability of method to assess the geo-sites, and geo-morphosites for geo-tourism development along the coastal Landscapes of Odisha State (Table 2 and Fig. 4).

Table 2: Method for the Geo-site and Geo-morphosite assessment for the Geo-tourism purposes of coastal destinations, Odisha state.

Scientific and intrinsic values	
integrity	0 - totally destroyed site,
	0.5 - disturbed site, but with visible abiotic features,
	1 - site without any destruction
rarity (number of similar sites)	0 - more than 5 sites,
	0.5 - 2-5 similar sites,
	1 - the only site within the area of interest
diversity (number of different partial features and processes within the geosite or geomorphosite)	0 - only one visible feature/processes,
	0.5 - 2-4 visible features/processes,
	1 - more than 5 visible features/processes
scientific knowledge	0 - unknown site,
	0.5 - scientific papers on national level,
	1 - high knowledge of the site, monographic studies about the site

Educational values	
representativeness and visibility/clarity of the features/ processes	0 - low representativeness/clarity of the form and process,
	0.5 - medium representativeness, especially for scientists,
	1 - high representativeness of the form and process, also for the laic public
exemplarity, pedagogical use	0 - very low exemplarity and pedagogical use of the form and process, 0.5 - existing exemplarity, but with limited pedagogical use,
	1 - high exemplarity and high potential for pedagogical use, goedidactics and geotourism
existing educational products	0 - no products,
	0.5 - leaflets, maps, web pages,
	1 - info panel, information at the site
actual use of a site for educational purposes (excursions, guided tours)	0 - no educative use of the site,
	0.5 - site as a part of specialized excursions (students),
	1 - guided tours for public

Ecomonical values	
accessibility	0 - more than 1000 m from the parking place,
	0.5 - less than 1000 m from the parking place,
	1 - more than 1000 m from the stop of public transport
presence of tourist infrastructure	0 - more than 10 km from the site existing tourist facilities,
	0.5 - 5 – 10 km tourist facilities,
	1 - less than 5 km tourist facilities
local products	0 - no local products related to a site,
	0.5 - some products,
	1 - emblematic site for some local products

Conservation values	
actual threats and risks	0 - high both natural and atrophic risks,
	0.5 - existing risks that can disturb the site,
	1 - low risks and almost no threats
potential threats and risks	0 - high both natural and athrophic risks,
	0.5 - existing risks that can disturb the site,
	1 - low risks and almost no threats
current status of a site	0 - continuing destruction of the site,
	0.5 - the site destroyed, but now with management measures for avoid the destruction,
	1 - no destruction
legislative protection	0 - no legislative protection,
	0.5 - existing proposal for legislative protection,
	1 - existing legislative protection (Natural monument, Natural reservation…)

Added values	
cultural values: presence of historical/archaeological/ religious aspects related to the site	0 - no cultural features,
	0.5 - existing cultural features but without strong relation to abiotic features,
	1 - existing cultural features with the strong relations to abiotic features
ecological values	0 - not important,
	0.5 - existing influence but not so important,
	1 - important influence of the geomorphologic feature on the ecologic feature
aesthetic values: number of colours; structure of the space, viewpoints	0 - one color,
	0.25 - 2-3 colors,
	0.5 - more than 3 colors;
	0 - only one pattern,
	0.25 - two or three patterns clearly distinguishable,
	0.5 - more than 3 patterns;
	0 - none,
	0.25 - 1-2,
	0.5 - 3 and more

Figure 3:Potagarh heritage site on the bank of Rushikulya River

Source: (Adopted from Lucie Kubalikova, 2013;Czech Journal of Tourism, 2(2), 80-104, DOI:10.2478/cjot-2013-0005).

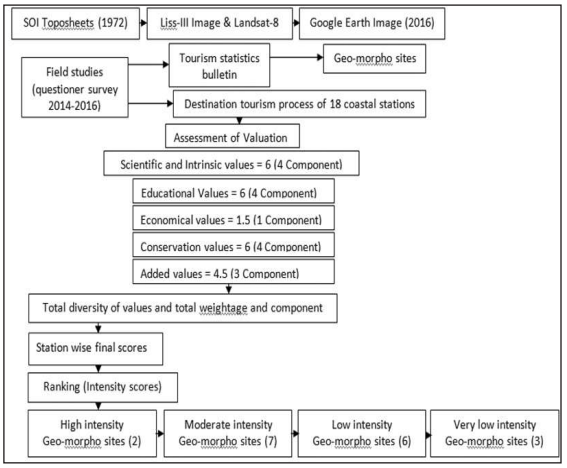

Figure 4: Methodological flow chart for estimation of geo-morpho site assessment in gei-tourism

The rating scores are estimated for each destination site on the basis of five primary values and sixteen secondary's values of geo-morphosite significances for the coastal belt of Odisha state in the present work (Fig. 3).

Results and Discussion

Geo-site Rating of Tourism Destinations of the coastal belt of Odisha State:Following the above method of Geo-site estimations the coastal destination sites are calculated for the result of Geo-site and Geo-morphosite values (Table 3, 4 & Fig. 5 and 6).

Table 3: Method of calculation of Geo- site rating of Coastal Destination.

STATIONS	Scientific & Intrinsic Values					Educational values					Economical values					Conservation values						Added values		
	Integrity	Rarity	Diversity	S. Knowledge	Total Score	R.ness and	Exemplarity	Existing	Actual use	Total score	Accessibility	P. of tourist	L. Products	Total score	Actual threats	P. threats and	Current Status	Legislative	Total score	Current Values	Ecological es	Aesthetic values	Total score	TOTAL
Chandipur-on-sea	.5	1.0	0.5	0.5	2.5	1.0	1.0	1.0	0.5	3.5	0.5	0.5	0.5	1.5	0.5	0	0.5	1.0	2.0	0.5	1.0	0.75	2.25	11.7
Bhitarkonika	0.5	0.5	1.0	1.0	3.0	1.0	1.0	1.0	1.5	4.5	1.0	0.5	0	1.5	1.0	0.5	0.5	1.0	3.0	1.0	1.0	1.5	3.5	15.
Chandbali	0.5	0	0	0	0.5	0.5	0.5	0	0	1.0	0.5	0.5	0	1.0	0.5	0.5	1.0	0	2.0	0	0.5	0.7	1.2	5.7
Bichitrapur	1.0	0.5	1.0	0.5	3.0	1.0	1.0	0.5	0.5	3.0	0.5	0	0	0.5	1.0	1.0	0.5	1.0	3.5	0	1.0	1.5	2.5	12.
Potagarh	0	0.5	0.5	0.5	1.5	0.5	0.5	0.5	1.5	2.0	1.0	0	0	1.0	0.5	1.0	0.5	0	2.0	1.0	0.5	0.7	2.2	8.7
Rambha	1.0	0.5	0.5	0.5	2.5	0.5	0.5	0.5	1.5	3.0	1.0	0.5	0	1.5	1.0	1.0	1.0	1.0	4.0	0	1.5	1.0	2.5	13.
Barkul	1.0	0.5	0.5	0.5	2.5	0.5	0.5	0.5	1.5	3.0	0.5	0.5	0	1.0	1.0	1.0	1.0	1.0	4.0	0	1.5	0.7	2.2	12.
Gopalpur-on-sea	0.5	0.5	0.5	1.0	2.5	1.0	1.0	1.0	1.5	4.5	1.0	1.0	0.5	2.5	0.5	1.5	0.5	1.0	3.5	0.5	1.5	1.0	3.0	16.0
Konark-Chandrabhaga	0	0	1.0	1.0	2.0	1.0	1.0	1.0	1.5	4.5	1.0	1.0	1.0	3.0	1.0	1.0	1.5	1.0	4.5	1.0	1.0	1.5	3.5	17.52
Satopada	1.0	0.5	0.5	1.0	3.0	1.5	0.5	1.0	1.0	4.0	1.0	0.5	0.5	2.0	1.0	1.0	1.0	1.0	4.0	0	1.0	0.7	1.7	14.
Mirjapur	1.0	0.5	1.0	0	2.5	1.5	0.5	0	1.5	3.5	0.5	0	0.5	1.0	1.0	0	1.0	1.0	3.0	0.5	1.0	0.7	2.2	12.
Manikpatna	0	0.5	1.0	1.0	2.5	1.0	1.0	1.0	0.5	3.5	0.5	0.5	0.5	1.5	1.0	1.0	0.5	1.0	3.5	1.0	1.0	0.7	2.7	13.
Talsari-udaipur	1.0	0.5	0.5	0.5	2.5	1.0	1.5	0.5	1.5	4.5	0.5	0.5	0.5	1.5	0.5	0.5	0.5	1.0	2.5	0	1.5	1.0	2.25	13.2
Chandaneswar-Bhusundeswar	0.5	0.5	0.5	0.5	2.0	0	0.5	0.5	0.5	1.5	0.5	0.5	0	1.0	1.0	1.0	1.0	0	3.0	0.5	0.5	0.75	1.75	9.25
Dogara-Chowmukh	1.0	0.5	0.5	0	2.0	0.5	1.0	0	0.5	2.0	1.0	0.5	0.5	2.0	1.0	1.0	1.0	1.0	4.0	0	1.5	0.75	2.5	12.5
Basudevpur-Dhamara	1.0	0.5	0.5	0	2.0	0	0	0.5	0	0.5	0.5	1.0	0.5	2.0	1.0	1.0	1.0	1.0	4.0	0.5	0.5	0.75	1.75	10.2
Puri	0.5	1.0	1.0	1.0	3.5	1.5	1.0	1.5	1.5	5.5	1.0	1.5	1.5	4.0	1.5	1.5	0.5	1.0	4.5	1.0	1.0	1.5	3.5	21.
Balukhand	1.0	0.5	1.0	1.0	3.5	0.5	1.0	0.5	0.5	2.5	0.5	1.0	1.5	2.0	1.5	1.0	0.5	1.0	4.5	0.5	1.0	1.0	2.5	15.

Table 4: Geo-morphosite selection scores and intensity for the coastal destination sites.

Rank	*Stations*	*Intensity*	*Scores*
R1	Puri	High	21
R2	Konark- Chandbali		17.5
R3	Gopalpur-on-sea	Medium	16.0
R4	Bhitorkonika		15.5
R5	Balukhand		15.0
R6	Satopada		14.75
R7	Manikpatna		13.75
R8	Rambha		13.50
R9	Talsari-Udaipur		13.25
R10	Barkul	Low	12.75
R11	Dogara-Chowmukh		12.50
R12	Mirjapur		12.25
R13	Bichitrapur		12.00
R14	Chandipur-on-sea		11.75
R15	Basudevpur-Dhamara		10.25
R16	Chandaneswar-Bhusundeswar	Very Low	9.25
R17	Potagarh		8.75
R18	Chandbali		5.75

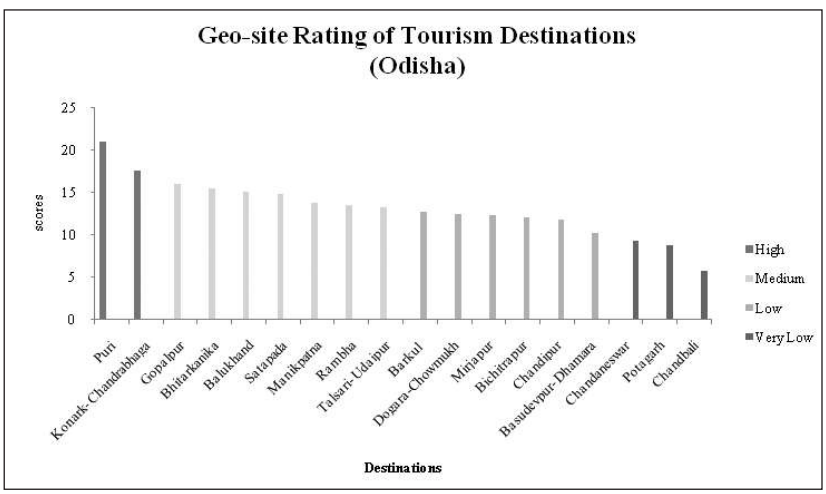

Figure 5: Geomorphosites assessment of Coastal destination, Odisha state

Figure 6: Holocene dune geomorphology with the remains of archeological tools from the erosive bank of Chilika Lagoon (Near Manik Patna)

Recommendations

The geo-morphosite significance for its geo-site rating scores, Puri and Konark-Chandrabhaga occupy major destinations for Odisha coastal zone environment. For their limitation of carrying capacities the two areas should be judged as fragile in consideration of dune and wetland habitats lying in parallel to the shoreline. Conservation practices are needed for specific compartments of these two destination sites to sustain the coastal tourism in such fragile environment through the understanding of their heritage values with geo-tourism potentialities (Fig. 7).

Three other destination sites (i.e. Chandanesar-Bhusundeswar, Potagarh and Chandbali) of the coastal belt having estimated geo-site rating scores (below 10.0) of very low intensity need to improve their geomorphosite significance. All the three sites have similar locational character of river bank is situation at Rushikulya River (Potagarh), Baitarani River (Chandbali), and Subarnarekha River (Chandanesar-Bhusundeswar) in the form of ancient shipping ports with gradual reduction of past glory of marine trades and commerce. Improvement of their accessibility, setting up the educative display boards for informations about the places of historical glory, and raising the values of their river bank morphosite characters should be the priority for promoting attractions to the tourists at present.

The estimated geo-site rating scores (13.50 to 16.00, 10.25-13.25) of moderate and low intensities for coastal destinations reveal the potentialities of geo-tourism in the shore face. Only understanding of their geo-morphological significances by administrators, managers and individuals can help to rejuvenate the dying stage of tourism cycle of above destinations.

Major Findings

The estimated result of geo-morphosite selection scores are categorized into four classesintensity for identification and promotion of Geo-tourism in the coastal belt of Odisha state. They are categorized into High, Medium, Low and Very Low intensity scores. The coastal destinations of Puri, Konark-Chandrabhaga deserved the High intensity scores (21 and 17.5) for

the promotion of geo-tourism development; and seven other sites of the coastal districts belong to the medium intensity scores of Geo-tourism prosperity (13.25-16.00). The areas under Low and Very Low intensity scores are not suitable for the promotion of geo-tourism prospect. Other types of tourism have developed in the remaining destinations of the coastal belt.

Conclusions

There are various forms of tourism in the coastal belt of Odisha state other than the form of geo-heritage significance of destinations to attract tourists from different corners of the country and abroad at present. The natural geo-heritage of the landscapes is assessed in term of geo-morphosite assessment values for each destination in the present work. The study has identified four categories geo-site intensity scores for 18 destinations in Odisha coastal belt that can highlight their potentialities and shortcomings for extension of opportunities to improve in future by tourism administrations.

Geo-tourism expansion by understanding the geo-heritage significance and geo-morphosite value addition in the above method will boost up the tourism process in a sustainable manner in the fragile coastal environment. The geo-diversity values are estimated as highest for Puri and Konark-Chandrabhaga destinations by the study. Alteration of land forms and coastal habitats up to certain extent can be allowed to expand the tourism development only in the backshores for the two attractive destinations.

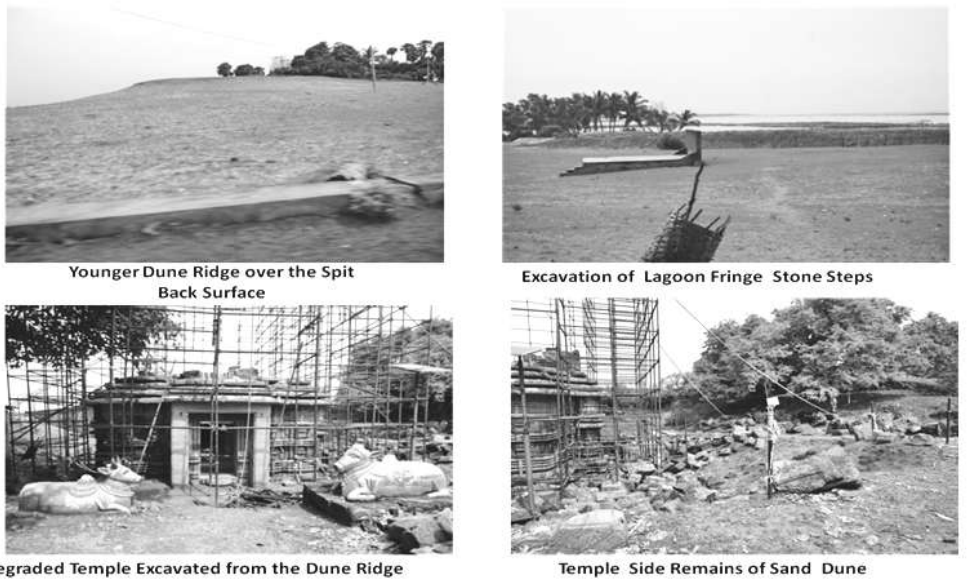

Figure 7: Temple Excavation site of Manikpatana (Bhabakundaleswar) at the lake fringe of Chilika lagoon

Figure 8: Tourists survey with the set of questioner schedule at Mirzapur-Manikpatna near Chilika Lake and in Bichitrapur mangrove eco-tourism destination sites.

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A Study on Socio-Economic Conditions of Migrant Construction Workers in Bhubaneswar

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Sourobh Roy
& Arzoo Abha

Abstract

Liberalization of economy has indeed opened up the opportunities for the whole world in various segments of the corporate sector. They provide valuable service to the society. The Informal Sector is an important sector for the development of Indian Economy. Rapid urbanization has been an integral part of the developing economies during past couple of decades. This process has motivated the rural people to come to the cities in search of employment. This rural-urban migration has made phenomenal increase in urban population and urban workforce as well. In most Indian cities, the urban poor survive by working in the Informal Sectors. The main thrust of the study is to examine the demographic and socio-economic profile of street vendors and hawkers in the college square area of Bhubaneswar City. This study is mainly based on primary survey. A sample of 400 migrant construction workers has been collected with the help of a structured questionnaire and data has been collected by personal interview.

Keywords: *Informal Sector, Permanent Migrants and Seasonal Migrants*

Introduction

Urbanization has played a pivotal role in the process of economic development in a country. A large part of urban growth in the less developed countries has been linked with the agrarian economy. The Growth rates in agricultural production and income have generally been noted too low and unstable, across regions in under-developed country over the past decade and result in lack of livelihood opportunities in rural areas. This has led to out-migration of poor from backward rural areas to urban area in search of bread and butter. Most of these people are absorbed to engage in Urban Informal Economy. This led to the rise in poverty, growth of slums and social deprivation in large cities which act as major obstacle for development in less developed region.

The process of urbanization provides extremely limited space and resources for the poor people. Only resource that the poor can access to improve their economic condition is education and skills. The skill and education in the labour market is leading to a wage premium on skilled jobs. However, it reveals that there are increasing disparities and urban informal workers are least able to access the coveted jobs. Thus, the self-employed workers in the urban scenario face specific problems of access to credit, markets and also face various hidden costs that reduce their net income.

Objectives of the Study:

The main thrust of the study is to analyze the socio-economic condition of migrant-construction workers in urban informal sector, taking Bhubaneswar as a case study. The objectives are as follows:

1. To examine the demographic and socio economic profile of migrant construction workers in Bhubaneswar.
2. To identify the problems of migrant construction workers in Bhubaneswar in terms of employment, income and living conditions.

Hypotheses of the study:

The hypothesis of the study is to analyze the migrant-construction worker in urban informal sector

Sourobh Roy, Department of Applied Geography, School of Regional Studies and Earth Sciences, Ravenshaw University, Cuttack, Odisha, India.
Arzoo Abha, Cuttack Municipal Corporation, Odisha, India.

taking Bhubaneswar as a case study which is as follows:

1. Construction workers engaged in Informal Sector are mainly, the Inter-District and Intra-District migrants.

2. The number of male construction worker is more than the female construction workers in the study area.

Database and Methodology

The present study is based both on primary as well as secondary source of data. The main sources of secondary data are as follows:-

Primary Data Sources

This study is mainly based on primary survey and therefore the socio-demographic and economic profile of the migrant construction worker in Bhubaneswar has been discussed using data generated by primary survey. Primary survey becomes essential due to lack of published and reliable data on the characteristic and economic parameters of the Informal Sector. Though NSSO provides some data on Informal Sector, an analysis of the socio-economic and demographic correlates of migrants workers in construction require data generated in field survey. Of all activities under Informal Sector, construction work has become very important activity in large and metropolitan cities. Bhubaneswar, as the capital city and one of the smart cities in India has become the center of attraction for many unemployed aspirant. So, construction work has become an important economic activity in the city. Construction work in the city is classified into two types: (i) residential construction and (ii) non residential construction. As it is obvious, the Non-Residential construction works include various forms catering to the need of Heavy Industries, Railway Bridges, Fly-over, Highways, Water treatment plants, Institutional and Commercial Centre.

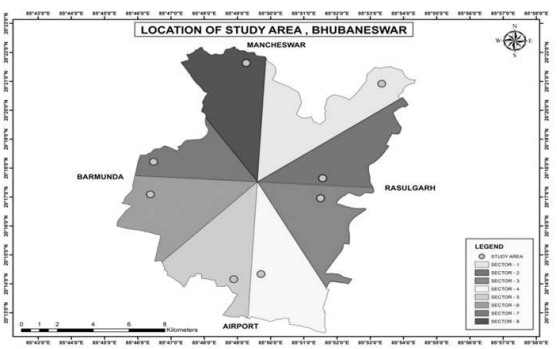

Fig. 1: Location of Study Area

For the selection of construction sites, the city has been divided into eight sectors with the help of two setsof orthogonal lines. The orthogonal lines are drawn accordingly to the distribution of construction sites. So each of the sites eight sectors have roughly, equal number of construction sites. From each of these sectors, two construction sites were selected arbitrarily giving equal representation to residential and non-residential or commercial construction site. A sample of 50 migrant workersfrom each construction site has been selected. Data were collected using interview method personally using a well structured questionnaire. Prior to the final collection of data a pilot survey was conducted. The results of which has form on the basis of finalization of questionnaire.The main analysis has been depending on various statistical techniques percentages, maps, bars, charts and diagrams.

Demographic Aspects

The Administrative Jurisdiction of the BMC spreads over an extent of 135 sq. km. The entire Municipal area is divided into 47 administrative divisions called 'Wards'. The city had a population of 843402 in 2011, with a growth rate of 29.27 percent during the period 2001-2011. It was observed that the city always had a population growth rate higher than that of the State. As per 2011 Census the density of the Bhubaneswar City is 6228.4 persons per sq. km. The Sex Ratio of the city is 890 and the child sex ratio is 904 whereas the literacy rate is 91.87 percent. The male literacy rate is 94.66 percent and female literacy rate is 88.73 percent. The percentage share of Scheduled Caste population and Scheduled Tribe population is 8.27 percent and 5.04 percent. The total slum population of Bhubaneswar City is 19.5 percent. The Workforce participation rate is 35.55 percent.

In the present study a sample size of 400 workers has been taken who are engaged as Construction Worker in Bhubaneswar City. These 400 workers or interviewer constitutes 2308 populations out of which male

population constitutes 53.4 percent and female population constitutes 46.6 percent. The Sex-Ratio of the study is 873 which is less than the National Average. The Child Sex Ratio is 917. Sex Ratio is found to be less may be due to the presence of seasonal workers constitutes 33 percent of the population. Generally Seasonal workers are those who have migrated without family for a short span of time. They use to leave their family members at their native place and come to the cities for working as a construction worker.

In the present study, Migrants can be mainly classified into two type, seasonal migrant and permanent migrant. Seasonal Migration is those migrant during different season for different business purpose. For example, Seasonal Migrants are those people who come to the cities to work in the non-agricultural season. During summer they come for three months i.e. March, April and May and again go back to their native place for cultivation. These workers are mainly work as labourer in this sector. Seasonal Migrants are the workers who migrate without their family.

Tab. -1: Percentage Share of Migrants to the Total Population, Sex-Wise

	Total		*Male*		*Female*	
Migrants	*Abs. Pop.*	*(In %)*	*Abs. Pop.*	*(In %)*	*Abs. Pop.*	*(In %)*
Total	2308	100.0	1232	53.4	1076	46.6
Seasonal	868	37.6	484	21.0	384	16.6
Permanent	1440	62.4	748	32.4	692	30.0

Source: Primary Survey

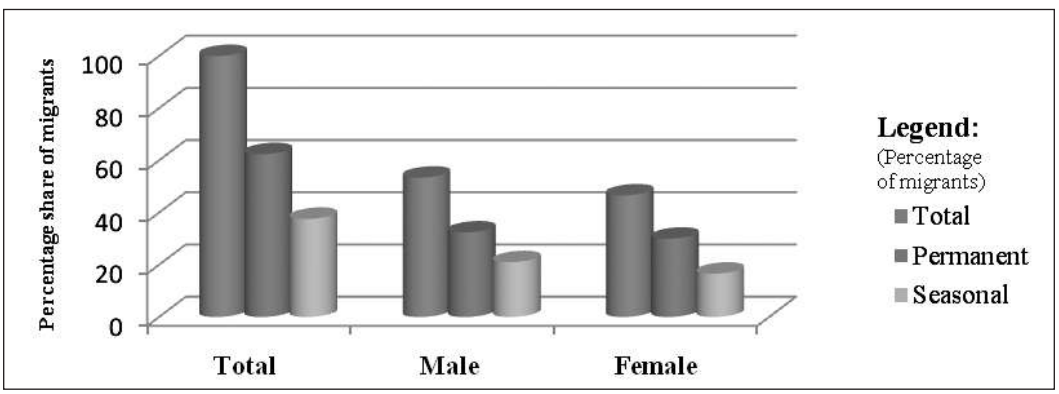

Fig. -1: Percentage Share of Migrants to the Total Population, Sex-Wise

The above table depicts that the percentage share of seasonal and permanent migrants, sex-wise. The table shows that percentage share of male migration is more than the female. It is revealed that the percentage share of permanent migrants 62.4 percent is more than the seasonal migrants which is 37.6 percents only. It is also observed that the percentage of male migrants in higher than the female migrants both in case of seasonal as well as permanent migrants. It is because the workers engaged in the Construction Sites are those who have migrated without family. They use to leave there family members at their home town and come to this place to sell the items as per requirement. Therefore the male percentage of migrants is 53.4 percent whereas the women migrant is 46.4 percent. Male percentage of both the Seasonal and Permanent Migrant is 21 and 32.4 percent is higher than the women Seasonal and Permanent Migrant which is 16.6 and 30 percent respectively.

Tab.2: Percentage Share of Migrants, State-Wise.

State-Wise	*Migrants*						
	No. of HH.	*Total*		*Males*		*Females*	
		Abs. Pop.	*(In %)*	*Abs. Pop.*	*(In %)*	*Abs. Pop.*	*(In %)*
W.B.	44	272	11.8	160	6.9	112	4.9
U.P.	16	84	3.6	48	2.1	36	1.5
Bihar	36	300	13.0	156	6.8	144	6.2
A.P.	40	200	8.6	84	3.6	116	5.0
Odisha	264	1452	63.0	784	34.0	668	29.0
Total	400	2308	100.0	1232	53.4	1076	46.6

Source: Primary Survey

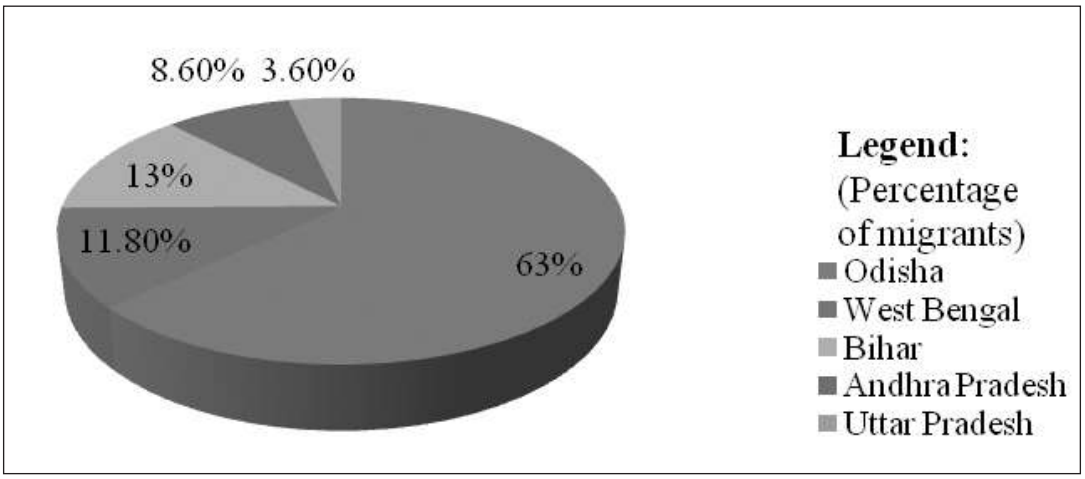

Fig.2: Percentage Share of Migrants, State-Wise.

In the study area the migration forms to be more from neighboring states i.e. Bihar, U.P. Andhra Pradesh West Bengal and within the state i.e. Odisha. Odisha shares highest share of migrants of 63 percent whereas 13 percent of workers belongs to Bihar, 11.8 percent workers migrate from West Bengal, 8.6 percent of the workers migrate from Andhra Pradesh and 3.6 percent of worker migrates from Uttar Pradesh. Out of total migration percentage share of Inter-State migration is 37.1 percent while the rest 62.9 percent is Intra-State migration. The study depicts that the people from the neighboring states like Bihar, West Bengal, Andhra Pradesh, and Uttar Pradesh have been migrated to Bhubaneswar City in search of job. The migration from the state Bihar and West Bengal is the most compare to other two States like Andhra Pradesh and Uttar Pradesh. Comparatively the intra-state migration is more rather than inter-state because other major state, like Kolkata, Vishakhapatnam, Raipur and Hyderabad attract more construction worker than Bhubaneswar. But the Workers from Odisha prefer Bhubaneswar compare to other major city.

Tab.3: Percentage Share of Inter District Migrant to Bhubaneswar, Districts-Wise.

Districts	Migrants						
	No. of HH.	Total		Males		Females	
		Abs. Pop.	(In %)	Abs. Pop.	(In %)	Abs. Pop.	(In %)
Gajapati	20	136	5.9	68	2.9	68	2.9
Nayagarh	24	112	4.9	64	2.8	48	2.1
Jagatsingpur	24	120	5.2	60	2.6	60	2.6
Jajpur	16	92	4.0	48	2.1	44	1.9
Cuttack	60	372	15.9	188	8.2	180	7.8
Khorda	88	456	19.8	272	11.8	184	8.1
Others	32	164	7.3	84	3.6	84	3.6
Total	264	1452	63.0	784	34.0	668	29.0

Source: Primary Survey

Fig.3: Percentage Share of Inter District Migrant to Bhubaneswar, Districts-Wise.

Source: Primary Survey

If we look at the over-all picture of migration in the study area. The study area experience migration from different districts of Odisha like Khorda, Cuttack, Gajapati, Jagatsingpur, Nayagarh, Jajpur, etc. 19.80 percent of workers are from Khorda, 15.9 percent workers are from Cuttack, 5.9 percent workers are from Gajapati, 5.2 percent workers from Jagatsinghpur, 4.9 percent workers from Nayagarh, 4 percent workers from Jajpur, and rest of the 7.3 percent are from other diatricts. Khorda shares the highest number of percentage of Construction Worker followed by Khorda, Cuttack, Gajapati, Jagatsingpur, Nayagarh, Jajpur, etc. The Ravenstein's Law of Migration is applicable for the inter-district migration. It has been observed in the study that the people from the neighboring districts have migrated more than the others districts of Odisha.

Tab. 4: Age Sex Structure of the Family Members

Age Sex Structure	*Population*					
	Total		*Males*		*Females*	
	Abs. Pop.	*(In %)*	*Abs. Pop.*	*(In %)*	*Abs. Pop.*	*(In %)*
0-4	164	7.0	56	2.4	108	4.6
5-9	136	5.9	56	2.4	80	3.5
10-14	164	7.1	84	3.6	80	3.5
15-19	172	7.5	92	4.0	80	3.5
20-24	308	13.4	160	7.0	148	6.4
25-29	386	16.7	246	10.7	140	6.0
30-34	196	8.5	116	5.0	80	3.5
35-39	196	8.5	108	4.7	88	3.8
40-44	124	5.4	72	3.1	52	2.3
45-49	102	4.5	50	2.2	52	2.3
50-54	92	4.0	28	1.2	64	2.8
55-59	128	5.5	80	3.5	48	2.0
60 & Above	140	6.0	84	3.6	56	2.4
Total	2308	100.0	1232	53.4	1076	46.6

Source: Primary Survey

From the above table of age-sex structure it have been noticed that the concentration of males are more in 25-29 age group. But in the case of female the concentration is more between 20-24 age groups. The working age group is more compared to the children and the old age group. Therefore we can say that dependency ratio is moderate, neither too high nor too low. There had been an exception in the age group of 60 and above where we can find out that there sudden increase in population. It is because of the classification criteria of the age-group.

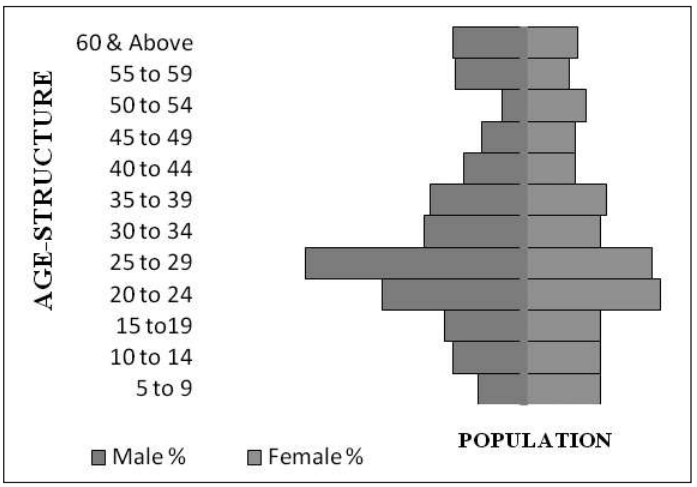

Fig. 4: Age Sex Structure of the Family Members

Social Aspects

Social indicators are defined as statistical measures that describe social trends and conditions impacting on human well-being. The social indicators cover the full range of issues that matter for individual, community and societal well-being. The social indicators are levels of poverty, religion, education levels, caste, etc. Out of 400 samples of migrant construction workers in Bhubaneswar 340 samples are males whereas rests of the 60 sample are women.

Tab.5: Percentage Share of Households, Religion-Wise

Types of Religion	Migrants						
	No. of HH.	Total		Males		Females	
		Abs. Pop.	(In %)	Abs. Pop.	(In %)	Abs. Pop.	(In %)
HINDU	340	1960	84.9	1032	44.7	928	40.2
MUSLIM	48	280	12.1	160	6.9	120	5.2
SIKH	12	68	03	40	1.8	28	1.2
TOTAL	400	2308	100.0	1232	53.4	1076	46.6

Source: Primary Survey

From the above table the Hindu religion constitutes of 84.9 percent of population, followed by Sikhs and Muslims which are 12.1 and 3 percent respectively. Most of population belongs to Hindu, in which male comprises of 53.4 percent and female comprises of 46.6 percent.

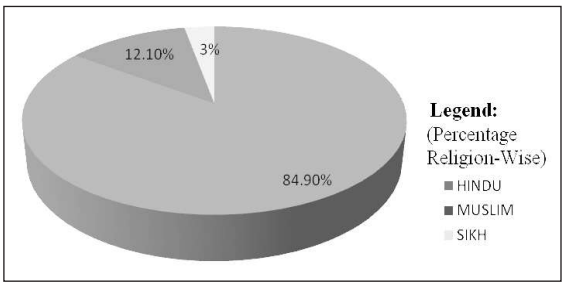

Fig.5: Percentage Share of Households, Religion-Wise

Tab.6: Percentage Share of Households, Caste-Wise

Castes	Migrants						
	No. of HH.	Total		Males		Females	
		Abs. Pop.	(In %)	Abs. Pop.	(In %)	Abs. Pop.	(In %)
General	172	1068	46.3	596	25.8	472	20.5
S.C.	72	400	17.3	220	9.5	180	7.8
S.T.	56	324	14	152	6.6	172	7.4
OBC	100	516	22.4	264	11.5	252	10.9
TOTAL	400	2308	100.0	1232	53.4	1076	46.6

Source: Primary Survey

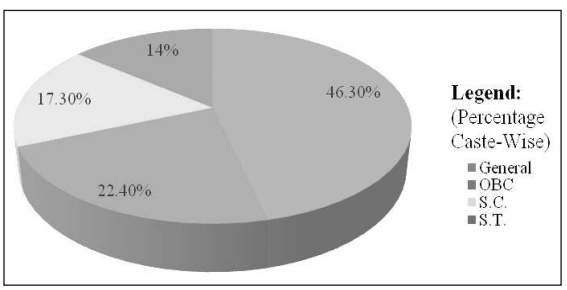

Fig.6: Percentage Share of Households, Caste-Wise

As per the collected data, General Category constitutes 46.3 percent, 17.3 percent belongs to SC, 14 percent belong to ST and remaining 22.4 percent are OBC. The percentage share of different category of the people is well distributed.

Tab.7: Levels of Education of the Family Members, Sex Wise

Levels Of Education	*Total*		*Males*		*Females*	
	Abs. No.	*(In %)*	*Abs. No.*	*(In %)*	*Abs. No.*	*(In %)*
Illiterate	852	39.3	356	16.4	496	22.9
Less than Class 5	148	6.8	48	2.2	100	4.6
Class 5 to Class 7	316	14.6	184	8.5	132	6.1
Class 8 to Class 10	588	27	420	19.3	168	7.7
Above Class 10	268	12.3	168	7.7	100	4.6
Total	2172	100	1176	54.1	996	45.9

Source: Primary Survey

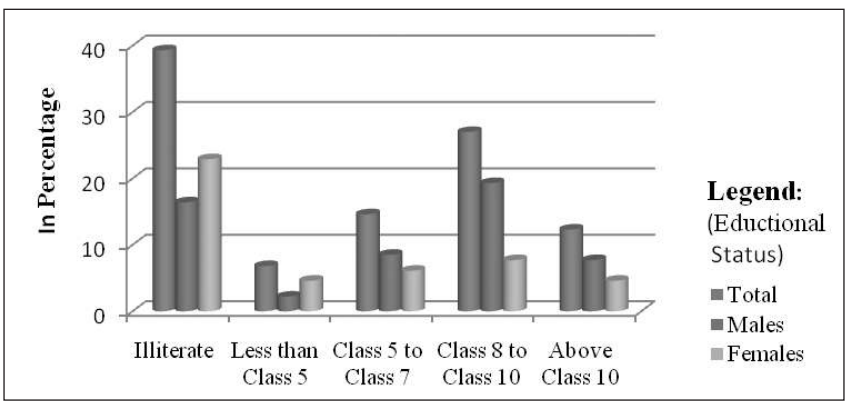

Fig.7: Levels of Education of the Family Members, Sex Wise

From the above table the education among migrant construction worker in Bhubaneswar is generally low. Out of total, around 39.3 percent of workers are illiterate, 6.8 percent of the vendors have only primary level of education, 14.6 percent of population has upper primary level of education, 27 percent of population studied up to matric and only 12.3 percent of population has studied up to high secondary level and above. It is also revealed from the above tables that most of the female section of the society is illiterate i.e. 22.9 percent whereas male illiterate is 16.4 percent. In all the levels of education it found that male population is having more education than female except in the primary level. In primary education male comprises of 2.2 percent and female comprises of 4.6 percent. Other than that from class 5 to class 7 male literacy-rates is 8.5 while the female literacy-rate is 6.1 percent. In the next level of education the study reveals that 19.3 percent of male population has studies till matric while 7.7 percent of female studied till matric. Similarly in the higher secondary level the literacy rate among the male is 7.7 percent while in female it is 4.6 percent only.

Economic Aspects

Total population in the study area is 2308, out of which only 992 are working population. Work Force Participation Rate (WFPR) of the 400 samples in the study area is 42.98 percent.Male Work Force Participation Rate (MWFPR) refers to the ratio between the total number of male workers to total male population is expressed in percentages. Migrant construction workers are mainly male worker in the study area. The total male population found to be 1232, out of which 876 are working populations and which constitutes the male workforce participation

rate as 71.1 percent of male workers to the total population. The total number of female population in the study area is 1076, out of which the female workforce is 116. So, the Female Workforce Participation Rate (FWFPR) is low i.e. 10.8 percent. In the study area 652 of dependent population found to be from the age group of 0 to 15 years and above 59 years in contrast to independent population from the 15 to 59 years of age group found to be 1656. The Dependency Ratio is 39.4 percent of total populations. Analysis clearly reveals that dependency ratio of the study area is found low which is good. But most of the population in the study area stops their education after matric because they want to join the family business and provide income and a way of livelihood to their family. It will provide smile to their family.

The migrant construction workers in the informal sector are versatile and dynamic sector, which includes a variety of economic activities. The Informal Sector is seen in our daily life including daily labour, mason, electrician, plumbers, etc. In the study area variety of migrant construction worker are like daily labour, mason, electrician, plumber, carpenter, painter, marble-cutters, etc. The average working hours of the workers in the study area examined and found to be 9 hours per day approximately.

Tab.8: Worker with Types of Occupation and Average Working Hour

Types Of Workers	*Total Workers*		*Males*		*Females*		*Average Working Hours Per Day (In Hrs.)*
	Abs. Pop.	*(In %)*	*Abs. Pop.*	*(In %)*	*Abs. Pop.*	*(In %)*	
Labour	148	37	88	22	60	15	8.43
Mason	60	15	60	15	-	-	8.60
Electrician	36	09	36	09	-	-	8.77
Carpenter	28	07	28	07	-	-	10.42
Plumber	24	06	24	06	-	-	8.66
Painter	44	11	44	11	-	-	9.00
Others	60	15	60	15	-	-	9.60
Total	400	100	340	85	60	15	9.07

Source: Primary Survey

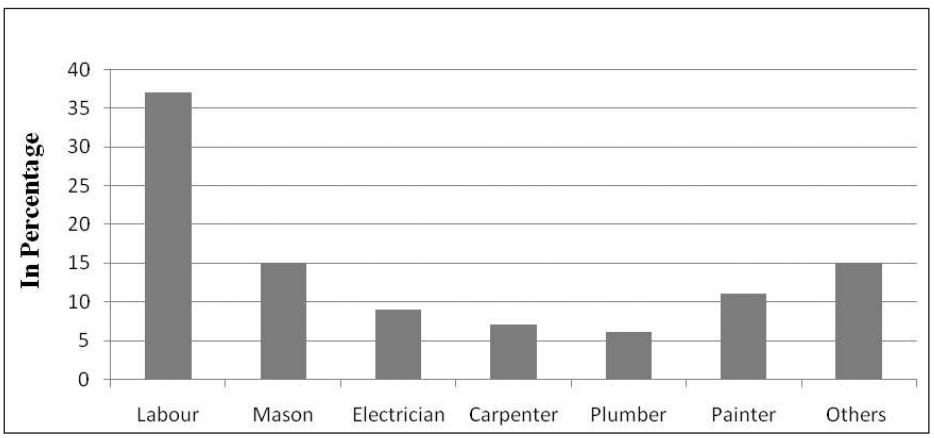

Fig.8: Worker with Types of Occupation

The above table reflects the types of occupation, numbers of workers and their working hour per day. Finding revels that 37 percent of the workers are daily labour and their working hours are 08 per day, followed by Mason which has 15 percent and they works for 8 hours per day. 9 percents of the workers are engaged as electrician and they work for 10 hours per day whereas 7 percents of workers are Carpenter and their working hour is 10 hours per day. Plumbers comprises of 6 percent of total worker and they work for 7 hours per day, 11 percent of the workers are engaged as a painter and the total working hours is found to be 8 hours. The rest of the workers like welders, tiles workers, fabrication etc comprises of 15 percent of the total workers and they works for 9 hours in an average. The average working hours for all the workers is 8.57 hours. This proves that the workers from the informal sector

The construction worker comes to the city in search of jobs. But involving in the formal sector is a very difficult because of high competition. These workers lack experience as well as high educational qualification. So forcefully they have to join the work in informal sector which is very easy to entry. The income provide livelihood to their family. In Bhubaneswar the daily wages are same for each group. But wages changes from group to group. The migrant workers get their salary from the contractor when they go back to their home at the end of the month or at the end of three months. It varies from worker to worker. But the worker like plumber, electrician, painter, etc gets their payment at the end of their contract or some of them also get their payment at the end of the weeks. The volume and terms of trade of this construction workers depends on timing of their work and their families typically relies on daily wages as their primary source of household income. The Informal Sector provides low and irregular wages for the occupants. Still they work hard for their livelihood.

Tab.9: Income Status of the Respondents

Class Interval of Monthly Income (in Rs.)	*Number of Individual Workers*	*Number of House-Holds*
4000-7999	96	20
8000-11999	248	48
12000 – 15999	40	72
16000 & ABOVE	16	260
Total	400	400

Source: Primary Survey

The above table presents the individual and family income of workers engaged in Informal Sector. 96 samples of worker come under the individual income range of rupees 4,000-7,999 whereas 248 workers are categorized under individual income range of rupees 8,000 to 11,999. On the other hand 40 workers come under individual income range of rupees 12,000 to 15,999 and 16 workers come under the range of 16,000 and above. Finding shows that majority of individual income of the workers in the study area is mostly earning between the ranges of rupees 8,000 to 11,999 of individual income because most of the construction worker. But if we consider the family income 20 samples represent the family income range between the rupees 4000-7,999, the next 48 samples represent the range of rupees 8000-11,999 while the next 72 samples represent the range of rupees 12,000-15,999 and the last range 16,000 and above comprises of 260 sample. The most of the family income sample represent the group the range of 16000 and above. This prove that though there income is low still but workforce in the family is more that is why 260 house-

hold have the total family income which is more than 16000 and above.

Miscellaneous Aspects

The percentage share of house-hold using the tap water is more compare to well and tube-well. The population using tap water is 68 percent, whereas the population using well and tube well is 4.3 and 27.7 percent respectively. Most of the sources of tab water are either provided by municipality or by company. The water is in not safe for drinking water because they directly consume the water. They don't use any method of filtration to the water. So there is a chance of facing the health problem like jaundice, diarrhea, hepatitis b, etc. From the above table it can be revealed that the percentage share of house-hold is using the sources of electricity provide more by the Municipality compare to Company. Municipality provides 61.3 percent of the electricity whereas 38.7 percent of electricity is provided by Company. In the study area most of the house-hold uses LPG i.e. 39.2 percent, whereas kerosene stove is used by 30.5 percent, wood is used by 21.1 percent and electric heater is used by 9.2 percent.

Conclusion

Most of the people engaged in Construction Work have permanently settle in most of the nearby the nearby slum or any low cost residential area. They have brought their family members from their native place and make them engaged in the different other jobs. Some of the bachelor workers are also provided with tents or asbestos house. Generally, the male prefer to this sector but female are only used as a labour. This kind of job is very laborious because heavy weight has to carry form one place to another.

The social security initiatives of the Centre, State and NGO's implemented during the past indicated that the needs are much more than the supports provided and the efforts must be targeted and vast enough to cover the growing Construction Workers. It is argued that the major security needs of the informal workers are food security, nutritional security, health security, housing security, employment security, income security, life and accident security, and old age security. In sum, the study calls for a Comprehensive, Universal and Integrated Social Security System for the Construction Workers in India.

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Gender Disparity in Elementary Education in Odisha: A Comparative Study of Khordha and Bolangir Town

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Anuradha Singh, Prof. Md. Izhar Hassan & Sourobh Roy

Abstract

Education is a powerful instrument for overcoming inequalities, promoting human development, accelerating social transformation and achieving economic progress. Among all the stages of education Elementary education is an important phase in child's education as it lays foundation for learning and development later on in life. Elementary education is an important phase in child's education as it lays foundation for learning and development later on in life. With the formulation of National Policy Education, India has initiated a wide range of programmes for achieving the goal of Universal Elementary Education through several schematic and programme interventions. The Sarva Shiksha Abhiyan is being implemented as India's main programme for universalizing elementary education. Although a bundle of policies and programmes have been initiated in Odisha but still elementary education status has not reached up to the mark.

In this background, the present paper makes an attempt to compare the status of girl's elementary education to the boys in Khordha town which ranks first in terms of development and in Bolangir town which belongs to one of the least developed districts of the state. It also presents a comparative scenario of factors determining girl's elementary education in the study areas. This study is mainly based on primary survey based on random sampling. A sample of 100 households and one elementary school has been collected with the help of a structured questionnaire. Data has been collected by personal interview method out of which 50 samples are collected from Khordha and Bolangir Town each.

Keywords: *Gender Disparity, NPE, SSA, UEE, etc.*

Introduction

Every country has made progress in improving girl's capabilities but inequalities continue to exist between the two genders. Developing countries including India have displayed many faces of gender disparities in the field of education, employment and health. Education is the most powerful instrument for overcoming inequalities, promoting human development, accelerating social transformation and achieving economic progress. It is rightly considered as a stepping stone to, and hence a pre requisite for, building capabilities of human beings. It goes without saying that education is the most important driving force for the progress and development of a nation. Education bestows on the recipients a disposition for life-long acquisition of knowledge, values, attitudes, competence and skills. It has been rightly said that without education, man is a splendid slave.

Education plays a vital role in shaping the lives of citizens, so that they can contribute in the developmental process of a nation. This initial education is called as '*Elementary Education'* which comprises the period from when a student enters school, generally at the age of around 5 or 6, until the student moves to middle or secondary school, at the age of around 12 or 13. It is a centralsegment in child's education as it lays foundation for learning and development in his / her later phase of life. It is the cornerstone of social development and forms a principal means of improving the welfare of individuals. Therefore, elementary education forms the groundwork for gaining fundamental knowledge

Anuradha Singh, Department of Applied Geography, School of Regional Studies and Earth Sciences, Ravenshaw University, Cuttack, Odisha, India.

Prof. Md. Izhar Hassan, Department of Geography, Maharshi Dayanand University, Rohtak, Haryana, India.

Sourobh Roy, Department of Applied Geography, School of Regional Studies and Earth Sciences, Ravenshaw University, Cuttack, Odisha, India.

without which the dream of a child will become unfeasible.

The destiny of world is molded and fashioned through its education and in this the education of girls has a special importance. There are several factors which acts like barriers in educating a girl child which are multi-faceted and interrelated to each other. They are synthesized into socio-economic-cultural practices and conditions; school-environment or school-related conditions; political and institutional policy practices of governments etc. Parental apathy towards girl's education is the root cause behind her educational backwardness. Recent works based on general surveys and sector-specific research reveal that educating females bring about various benefits, including improvement to family health, lower infant mortality rates, greater family wage-earning power, and the intellectual development of the family and the community. However, there are cascade of challenges putting hurdle in obtaining education some of the challenges that females face in obtaining education are the same for males but in the case of females, the challenges get more difficult because of esoteric customs and patriarchal biases. Studies on the gender equity in education have underlined poverty, cultural practices, poor school infrastructure, low quality, natural disaster, and conflicts as barriers to girl's education (see for instance Herz and Sperling, 2004:46; Huisman et al, 2010:11).

A lots of policies and programmes has been introduced by the Government of India in different corners of the country for correction of gender imbalance like National Programme for Education of girls at Elementary levels of education (NPEGEL), Convention on Elimination of all forms of discrimination against Women(CEDAW), Kasturba Gandhi BalikaVidyalaya (KGBV), Education for All (EFA), Scheme for free education for girl child at elementary level, Sarva Shikshya Abhiyan (SSA) etc.

A number of studies on the nature, dimension and pattern of inequalities in the context of girls education in India have been undertaken by scholars during recent years such as Ramotra (2000); Valeskar (2005); Mohanty and Tripathy (2005); Mohanty and Trilochan (2005); Kingdon (2005); Kuriakose and Iyer (2012); Tamang (2012); Jitendra and Sangeeta (2013) and Crampton (2009). They reveal that the decision to attend school depends on number factors like gender ofthe potential student, household income, parent's education, and ethnic background. Hamid (1993) in his study on determinants of girl's education uses cross-tabulation of distribution of households sending their children to school against various variables of interest such as household income, household head's profession, education and gender. Sathar and Lloyd (1994) find that girl child with educated parents and higher household consumption level attend primary school, though their chances in rural areas are improved with availability of only Government schools within a distance of one kilometer from the place of residence. According to Valeskar (2005) travel to school and book costs are important influences on the decision to start schooling of girl child.

Odisha, being one of the most backward states of the country is characterized by a wide gap between boys and girls in terms of education and other benefits. In spite of the various constitutional safeguards and all the different schemes by the state government, educational level of the girl child is found to be much lower than that of the rest of the society. Apparently, this is the outcome of interplay between various factors like socio-economic status, school environment, parental attitude, their interest to give education to their children, their awareness regarding education etc. The educational scenario of Odisha has also undergone a qualitative improvement over the years by encouraging enrolment and retention of a child in elementary education. The present study takes a stock of gender parity in elementary education in Odisha.

Objectives of the Study

The objectives of the study are as follows:

- To examine the status of girl's elementary education in Khurdha and Bolangir Town.
- To compare the status of girl's education and infrastructure facilities available at the selected Government elementary school of the study area.
- To identify the main determinants of girl's education at elementary level in the study areaon the basis of selected socio-economic attributes.

Hypotheses of the Study

With reference to the objectives mentioned above,

this study is primarily based on following hypothesis:

- Better infrastructure facilities for girls in the schools leads to higher enrolment and retention of girls in education and thereby leading to gender parity.
- Family background including parent's education and income levels has a strong impact on girl's educational achievement in elementary level of education.

Database and Methodology

The study is mainly based on primary survey. The primary survey was conducted to examine the status of girl's elementary education to the boys in Khurdha and Bolangir town and also to compare the status of girl's education and infrastructure facilities at Government elementary school of the study area. In order to identify the key determinants of girl's education at elementary stage of education, samples of 50 household has been collected by applying interview method. Prior to the final collection of data a pilot survey was conducted, the results of which has formed the basis of finalization of questionnaire. One school from Khordhaand Bolangir Town has also been surveyed. The name of the selected elementary school in Khordha Town is Kudiary Nodal U.P Bidyalaya and in Bolangir Town is Thikadarpara Govt. U.P School. Observation method also helped in collecting data related to the infrastructure facilities available at school.

Study Area

According to 2011 Census of India, the total population of Odisha is 41,947,358 of which 21,201,678 (50.54 percents) are males and 20,747,680 (49.46 percents) are females. The sex-ratio of Odisha is 978 in 2011. The density of Odisha is 269 persons per sq. km. The state has a birth rate of 23.2 per 1000 people per year. The Infant Mortality Rate of 67 per 1000 live-births and Maternal Mortality Rate is 358 per 1,000,000 live-births.

Khordha is a municipality area in Khordha districts in the Indian State of Odisha. Khordha Town is located at. It has an average elevation of 75 m (246 ft). As per 2011 India Census Khordha Town had a population of 59,034. Bolangir is located at. It has an average elevation of 383 metres (800 feet) above sea level. As of 2011 Census of India, Bolangir had a population of 98,238. Males constitute 50,582 of the population and females 47,656. Communicative language of Bolangir is Kosli and for education and official purpose English, Hindi and Odiaare mostly used.

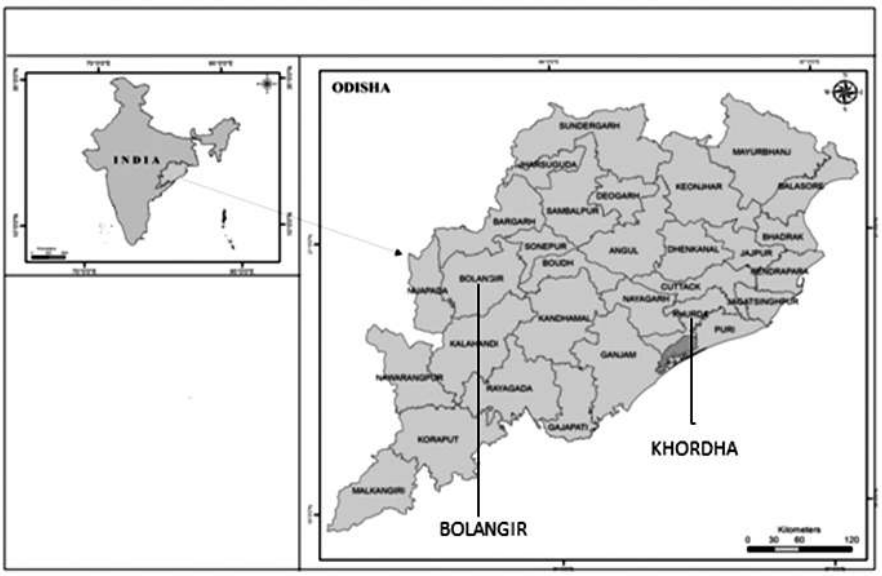

Fig. 1: Location of the Study area

Fig. 2: Location of Khorda Town

Fig. 3: Location of Bolangir Town

Table 1: Status of Girl's Elementary Education in School:

Districts	*No. of Students*			*No. of Teachers*			*No. of Drop -Out Students*			*Distance of School*
	Tot.	*Boys*	*Girls*	*Tot.*	*Male*	*Female*	*Tot.*	*Boys*	*Girls*	
Khordha Town	340	165	175	08	02	06	08	06	02	1Km
(In %)	100	48.5	51.5	100	25	75	100	75	25	
Bolangir Town	210	120	90	03	00	03	25	04	21	5Km
(In %)	100	57	43	100	00	100	100	16	84	

Source: Primary Survey

Table No. 1, states that the total number of students in the Kudiyari Nodal U.P school, Khordha Town are 340 students for the session 2018-19, out of which 48.5 percents are boys and rest of the 51.5 percent of students are girls. In the Khordha Town girls students are found to be dominating. The probable cause behind the less number of boys' student is that boys are mostly sent to the private owned schools. This proves that the disparity still exists in Indian society. But still girls are getting chance to get education and gender disparity ratio in the elementary level of education in Khordha Town is low, whereas in the educational scenario in the school of Bolangir, it is found to have 210 number of students, out of which 57 percent are boys and 43 percent are girls. In Bolangir Town the gender disparity in elementary education is found to be high. Girls are mainly engaged in household activities. Gender stereotype seems to be a dominant factor in determining girl's education in Bolangir Town.

Dropout is a major barrier for educational attainment of a child. The total number of drop- out for the session 2018-19 is 75 percent for boys whereas only 25 percent of girls dropped out in Kudiyari Nodal U.P School, Khordha Town. The most probable cause for more drop-out of boys in Khurdha Town is that boys are sent to the private school, whereas in the Tikadarpara Govt. U.P School, Bolangir Town, the total number of drop-out for boys are only 16 percent and for girls it accounts 84 percent for the session 2018 -19. The scenario shows the existence of gender disparity in Bolangir Town by having maximum numbers of drop out. Girls are dropped out from school and trained in household activities.

Availability of teacher in the school plays a crucial role in getting admission of child to the school. In the Kudiyari Nodal U.P School, Khordha, the total numbers of male teachers available are only 2 and female teachers are 6, whereas there are only 3 teachers available in the Tikadarpara Govt. U.P School, Bolangir and all are the female teachers. More number of teachers in Kudiyari Nodal U.P School, Khordhais one of the most important factor for higher strength of students in the school.

Distance of the School from the place of residence plays a pivotal role in determining educational attainment of a child especially girls are mainly affected. In Khordha Town the average distance of school is 1 Km from the place of residence whereas in Bolangir Town the distance of school is 5 km. This may be the key factor of determining girl's educationand leading to low educational attainment in Bolangir Town.

Table 2: Status of infrastructure facility in the school

School Details	*No. of Classrooms*	*Toilet*			*Boundary Wall*
		Boys	*Girls*	*Common*	
Kudiyari Govt. U.P School	07	01	01	00	Yes
Tikadarpara Govt. U.P.School	04	00	00	01	No

Source: Primary Survey

The Table number 2 represents the availability of infrastructure facilities in the school. There are seven classrooms with adequate number of chairs and desks in Kudiyari Nodal U.P. Bidyalaya, Khordha. According to the strength of the school the classrooms are sufficient, the black boards in the class are in good condition. Electricity connection is regular and fan is available in all the classrooms. The school is surrounded by boundary walls and provides security from outside disturbance. The source of the drinking water in the school is tube well and found to be in working condition. The school also provides separate toilet facilities for boys and girls. Whereas in Tikardarpara Govt. U.P.School, Bolangirthe infrastructure facilities found to be just opposite of the previous school in Khordha Town. There are only four classrooms in the school. Due to the shortage of classroom, the classes are conducted outside as well. The electricity connection is provided to the school but it is mostly remain load shedding in the school. The electric points are broken and not repaired since long time. In the scorching heat of the sun, students have to sit without fan inside the classroom. The black board seems to be in a terrible condition, which also needs repairing. School doesn't have chair and desk for the student. Students sit on the floor with or without their personal mat.

Table 3: Factors determining Girl's Education at elementary level

Determinants of Girls Education		
Factors	*Khordha Town (in %)*	*Bolangir Town (in %)*
Family Income and Poverty	34	44
Gender Stereotype	00	06
Distance of School	10	20
Child Labour	12	04
Separate Toilet	14	20
Parents Education	30	06

Source: Primary Survey

Girl's education in Indian society is determined by a bundle of socio- economic factors like family income and poverty, gender stereotype, distance of school, child labour, parent's education and separate toilet facility for girl.

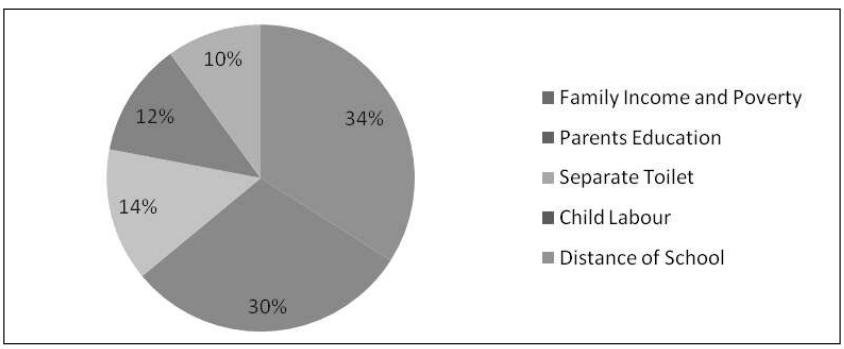

Fig. 4: Determinants of girls' education at elementary level in Khorda town (in %)
Source: Primary Survey

Out of 50 house-holds in Khordha Town (Fig.1), 34 percent of household finds family income and poverty to be the key factor in determining elementary education of a girl. 10 percent of household finds distance of school as factor, 12 percent of household finds child labour as a factor, 14 percent of household agree separate toilet facility for girls and 30 percent of household find parent's education as major determinants of girl's education at Elementary Level.

Whereas, in Bolangir Town(fig.2) 44 percent of household finds family income and poverty to be the main factor determining girls education 6 percent of the house-hold consider Gender stereotype as a factor, 20 percent of the household find distance of the school as a factor, 4 percent household finds child labour as a factor, 20 percent household find separate girls toilet as a factor, and 6 percent finds parents education to be the key factor which determines girls education at elementary level.

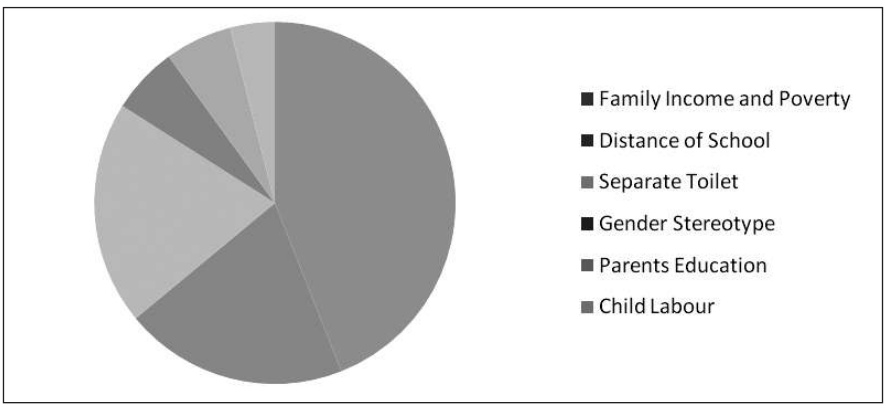

Fig. 5: Determinants of girls' education at elementary level in Bolangir town (in %)
Source: Primary Survey

Conclusion

From the fore going analysis we have observed that various initiatives takes by the Government to achieve Universalization of Elementary Education (UEE) in Odisha, vast disparities has been observed in terms of status of elementary education and gender disparities. In the present study we found a high level of difference in study areas (Khordha and Bolangir Town) in terms of girl's education and infrastructure facilities available in the school. Parent's perception also varies between two study areas. Khordha Town is performing much better in girl's elementary education than Bolangir Town.

It is thus evident from the study that crucial areas requiring interventions are: reducing poverty, school infrastructure, income generation for adults, revitalizing the education system, prevention of engagement of children in work (child labour) and bringing gender equity. Status of girls should be uplifted by introducing specific interventions varying from region to region based on specific needs of a region. Sensitizing the parents through programmes can create a demand for education among the families for their daughters. Gender equality should be conceptualized as an integral part of the development process.

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An Assessment of People Below Poverty Line of Howrah Municipal Corporation

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Nibedita Betal, Dr. Sumana Roy & Prof. Kabir Mohan Sethy

Abstract

Finding poor was a very complex subject. Collection of information was itself a challenge. The selection of the topic was mainly done because it was a challenging work to do. The work has been done on four wards of Howrah Municipal Corporation. Choosing of this particular study area was based on corruption, facilities given to the poor and some socio-economic features. Total BPL population of the study area was 11168 and the target group surveyed was 173 which is 1.54%. It was a Purposive Sampling because only the BPL card holders were surveyed. After the survey and analysing the data it has been seen that the state of the poor of the study area was not good. The facilities they were given were improper. Studying this paper one would understand the real condition of BPL facilities and how it was vary from the real information.

Keywords: *Below Poverty, Inequality, Multi-dimensional*

Introduction

According to the *World Bank (2000)* "poverty is pronounced deprivation in well-being." The history of BPL (Below Poverty Line) came into consideration since 19th century. The first effort to identify poor was done by Dada Bhai Naoroji. His remarkable writing "Poverty and Un-British Rule in India" depicted the condition of poor in India.

World Bank has described that the poverty line can be determined by the PPP (Purchasing Power Parity) of a country. The national poverty line was about $1/day/person. In 2005 it was $1.25/day/person and since 2001 it was $1.90/day/person.

In India BPL (Below Poverty Line) in determined by the Planning commissions. Two committee were set up by the planning commission they are The *Tendulkar Committee (2005)* and The *Rangarajan Committee (May, 2012)*. According to the Tendulkar Committee the urban poverty line/per day/person is Rs.32 and the rural poverty per day/person is Rs.27. Likewise Rangarajan Committee delineate the amount Rs.47.00 and Rs.32 in urban and rural areas respectively.

The first BPL survey was done in the year of 1992 which mainly emphasised on the income of the family. The 2nd survey was done in 1997 where the criteria changed from income to consumption. The 3rd survey in the year 2002 indicated the SBR (Score Based Ranking) of the house hold and the quality of line. The last BPL survey was done in the year of 2011 and the criteria was taken as Rs.30-/ for difficult terrain and Rs.20/- per household (family size of 5).

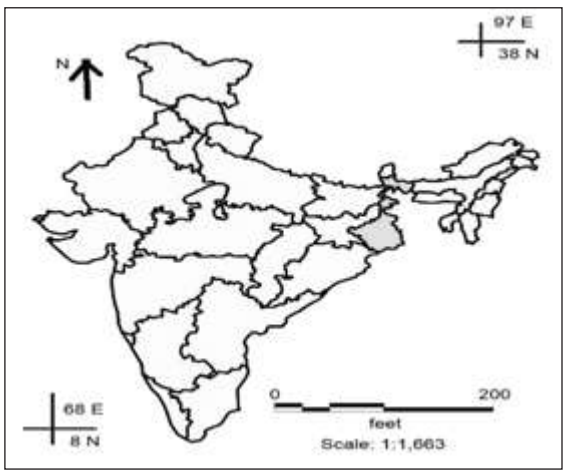

Fig. 1: Location of the Study area

Nibedita Betal, P.G. Department of Geography, Utkal University, Vani Vihar, Bhubaneswar.
Email: 44anibedita@gmail.com
Dr. Sumana Roy, Department of Geography, Vidyasagar College, Calcutta.
Prof. Kabir Mohan Sethy, P.G. Department of Geography, Utkal University, Vani Vihar, Bhubaneswar.

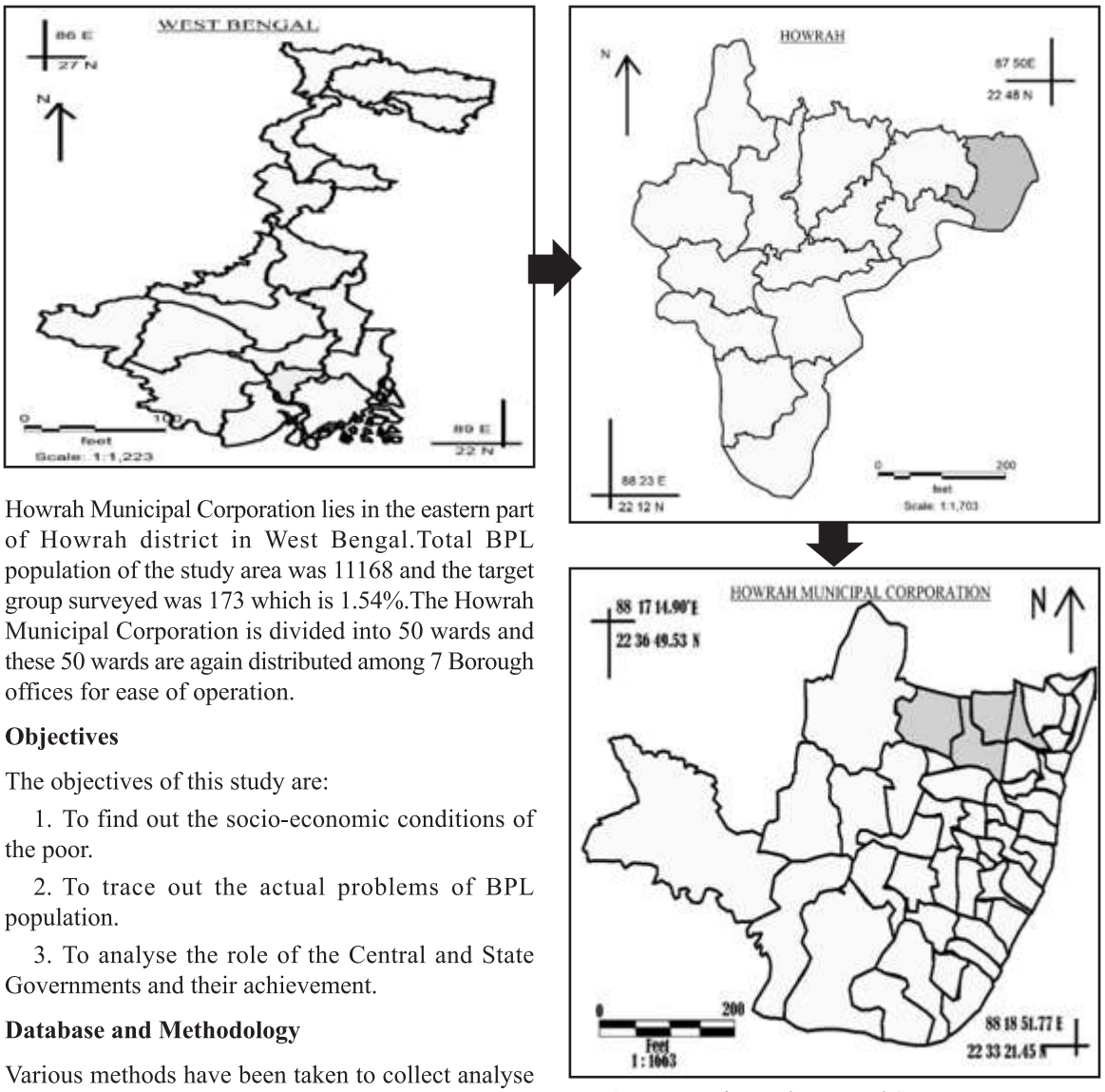

Fig. 2: Location of Howrah Municipal Corporation

Howrah Municipal Corporation lies in the eastern part of Howrah district in West Bengal.Total BPL population of the study area was 11168 and the target group surveyed was 173 which is 1.54%.The Howrah Municipal Corporation is divided into 50 wards and these 50 wards are again distributed among 7 Borough offices for ease of operation.

Objectives

The objectives of this study are:

1. To find out the socio-economic conditions of the poor.

2. To trace out the actual problems of BPL population.

3. To analyse the role of the Central and State Governments and their achievement.

Database and Methodology

Various methods have been taken to collect analyse the information and primary and secondary data. Certainly there are three major steps of the methodology. They are as follows:

Pre field: This project is done under the area of Howrah Municipal Area (ward no 6, 7, 8, and 9). The ward map and the municipality map is collected from both Howrah Municipal Corporation and borough-iv. Most importantly the information about the number of people holding BPL card was given by the Rationing Officer. Free medical facilities is given to the poor people, so few health data is also collected from Urban Primary Health Centre. The doctors were very helpful. NULM (National Urban Livelihood Mission) department of corporation also help to collect few important data regarding the facilities given to the poor.

During field: To have the real information about the BPL card holding people primary survey has been done from the ward number 6,7,8,9. People were really helpful. They did not hesitate to give any kind of data. It took almost 10 days to collect all the data.

Post field: The analytical processes has gone through by various statistical, cartographic and descriptive analysis. Various measures have been taken to examine the information. Many soft wares like MapInfo, SPSS and EXCEL helped to assess the information.

Analysis and discussion

Actual situation of the Below Poverty Line people in West Bengal

The population of West Bengal is 90.32 million (2012).According to Ministry of Social Justice and Empowerment the percentage of population Below the Poverty Line is 28.6 in rural and 24.7 in urban areas of West Bengal.

Table 1: BPL Populatin of West Bengal

District	*Total No.of families*	*Total No.of BPL families*	*%of BPL families*
Bankura	535766	227626	42.48
Birbhum	542536	238873	44.02
Burdwan	915758	240276	(L)6.24
CoochBehar	475119	218542	(H)46.01
Darjeeling	97335	52147	44.97
D.Dinajpur	262984	114529	43.54
Howrah	483945	155739	32.18
Hooghly	672672	195630	29.08
Jalpaiguri	601635	215840	35.87
Malda	562908	218505	38.81
Murshidabad	1067570	466644	43.31
Nadia	779336	266721	34.22
North 24 PGS	825401	311277	37.7
Purulia	452092	197381	43.65
Purba Medinipur	702071	188778	26.89
Paschim Medinipur	10,58,290	347945	32.88
South 24 PGS	1042863	388033	37.21
Siliguri	84,380	32,233	38.2
Uttar Dinajpur	427281	175104	40.98
TOTAL	1,15,89,942	4251823	

Source: BPL Survey (2002) Department Of Panchayat and Rural Development of India

YEAR WISE COMPARISON OF BPL POPULATION BETWEEN INDIA AND WEST BENGAL

The position of West Bengal in terms of incidence of poverty has improved relative to other states since the 1970s. The rate of poverty increases in west Bengal since pre independence. Poverty causes due to several problematic issues in a society line poor economic growth, poor health family planning etc.

West Bengal suffers for these severe issues so that the no of poverty in West Bengal is still very high. According to this diagram the rate of poverty in continuously decreeing since 1973 to 2000. Here the

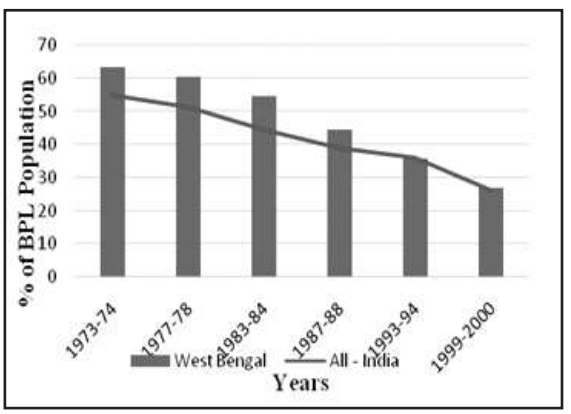

Fig. 3: BPL Population in India and West Bengal
Source: Agricultural Research Data Book (2002)

comparison between India and west Bengal shows that the in the year of 1973 the percentage of poor in West Bengal was higher than the India's average. But by the years it started decreasing. In the year 2000 the poverty in west Bengal is lower than the India's average which is a positive indicator to the state.

Distribution of BPL Population

Occupational

This study examined low pay and inequalities in employment among the people of ward 6, 7, 8 and 9 in HMC. The focus was on the role of occupational choices. Poverty comes from the lower wage rate. Further it is related to the type of jobs and it further affected by the educational level. The lower educational level leads to get lower wage rate. As per the primary survey, it has been seen that the educational level in this four wards are not so high. There are people who are perusing higher education but the rate is very low as it has been shown before. The illiteracy rate is low but the rate of people of proper knowledgeable education is really low.

Table 2: Distribution of BPL Population

Service	*Business*	*Labour*	*Others*		
			Housewives	*Student*	*Child*
39.02439024	4.87804878	17.07317073	26.82926829	12.19512195	0
23.91304348	2.173913043	23.91304348	19.56521739	23.91304348	6.52173913
38.46153846	5.128205128	10.25641026	25.64102564	17.94871795	2.564102564
38.29787234	0	12.76595745	31.91489362	14.89361702	2.127659574

Source: Primary Survey (2017)

Educational

This data shows the educational level in different wards. The literacy rate is high in all wards. Ward 6 and Ward 7 have 100% of the literacy rate.

But all of them are educated in primary education. As per the diagram the Rate of higher education like post-graduation is very low. The level of education after post-graduation like PhD MPhil is absent that indicates moderate educational qualification in this area. It is major hindrance to join in tertiary or secondary Sector and it is a cause of the higher rate of BPL in this region.

Who are the real poor?

It is estimated by the government of India that the people earned under Rs.32/day considered as a por. But in this study area it has found that the people has income greater than Rs. 10000/ month but still has the BPL card and avail all the facilities that they don't deserve to have.

Income Status of the Study area

According to the data in each ward there are few people who has the income greater than Rs. 10000. It is one type of corruption that has not been possible without the negligence of the Government. Ward 7 has the lowest rate of corruption and ward 6 has the highest.

Although ward 6 has the higher rate of poor. This type of corruption may lead to this poverty gap.

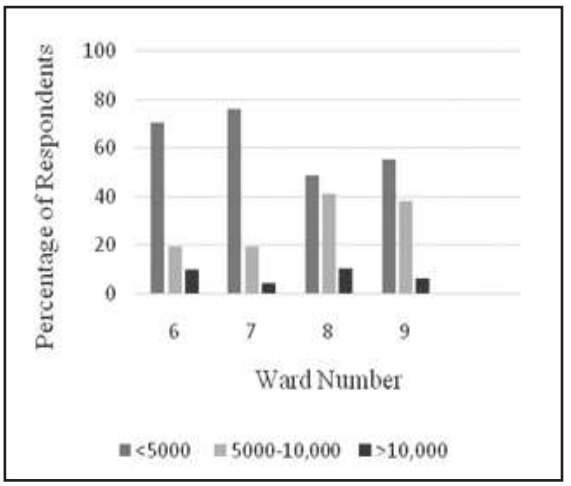

Fig. 4: Different income groups

Source: Primary Survey (2017)

Poverty gap

Poverty gap is the mean shortfall of the total population from the poverty line (counting the non-poor as having zero shortfall) expressed as a percentage of the poverty line. This measure reflects the depth of poverty.

The indicator is often described as measuring the per capita amount of resources needed to eliminate poverty.

Considering the individual income Poverty Gap has been measured in four wards that has been the study area.

Poverty Gap is highest in ward 7 and lowest in ward 8.

And the severity poverty gap index shows that it is lower in ward 8 and higher in ward 7. So there are more in equality of income in ward 7 rather than other wards.

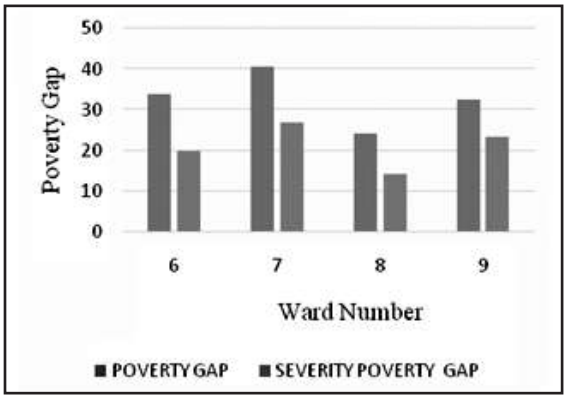

Fig. 5: Poverty gap
Source: Primary Survey (2017)

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Available facilities

The people under Below Poverty Line avail some facilities by the Government of India. The concept of BPL card first came into consideration since 1970's. The people who cannot meet their basic needs are called Below Poverty Line people and to give them support Government of India taken many schemes on those people to alleviate poverty form the country. Mainly to give them food security the scheme of BPL card started. Apart from this few medical and financial facilities are also given to the poor. West Bengal Food & Supplies Department was set up on 1943. It monitors functioning of different directories under implement of different orders like:

The Major Objective of the Department

1. Guarantee food security for the vulnerable and poor.
2. Deliver Higher Quality of Service to citizen via PDS.
3. Empower citizens in PDS and Food security.

The Prime Functions of the Department are –

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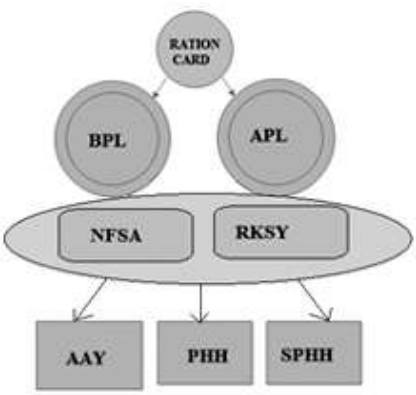

Fig. 6: Types of ration card
Source: Www.Wbpds.Gov.In

There are several types of cards some are central governmental and some are state governmental. All of then consists few categories and different types of facilities.

Ration card is divides into this categories. The State Government had attempted to launch a State Food Security Scheme to provide benefit of subsidized food-grains to the ordinary residents of the State.

Types of facilities

Not only the fooding facilities Government of India give those target group financial and medical and few other helps like help them to build hose and build free toilets etc.

People of the study area were asked which type of facilities you avail? On the basis of this attributes it has been seen that in each ward 100% people has the food security. And the rate started decreasing in the case of medical, financial and other helps. Only few people from each ward have the other facilities like (house building and free toilet). This indicates that the target group in this area are quiet neglected by the government in the case of giving financial and other helps.

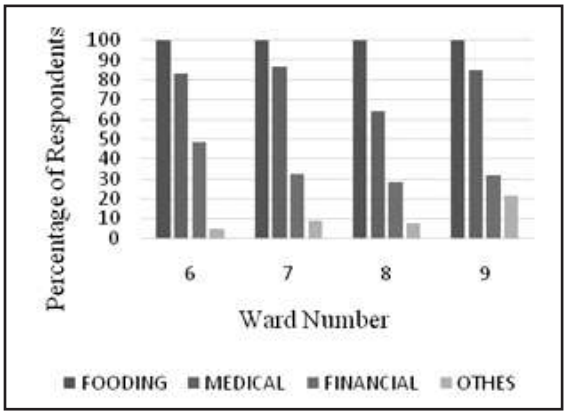

Fig. 7: Types of facilities
Source: Primary Survey (2017)

Satisfaction index of different facilities:

There are several facilities that are given to the people of the study area. To know they are successful or not satisfactory index has been done.Weightage mean has been calculated on the foodng, medical, financial, other facilities and ontotal satisfaction level. To know the weightage mean target group were asked how the fooding facilities are. Three options were given (good, moderate and bad) 3, 2 and 1 weightage value is given to good moderate and bad respectively.

All the parameters that are stated above are taken here. And the weightage mean in this case is 14.0985.

Again ward 8 is in a bad condition. Ward 9 is in quiet good situation. Most of the improvements needed in ward 8.

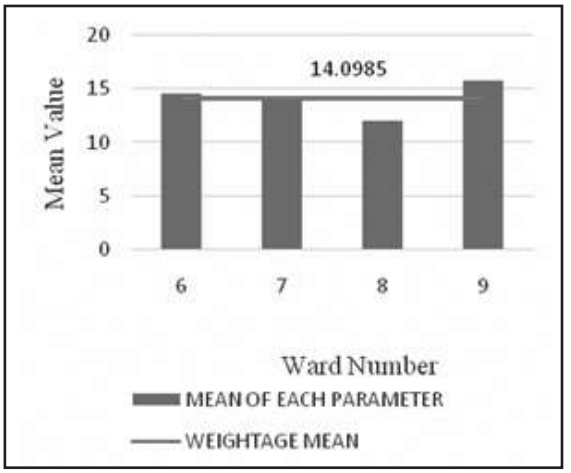

Fig. 8: Satisfication Index of all facilities
Source: Primary Survey (2017)

Policy and opportunities

Jawahar Gram Samriddhi Yojana (JGSY)
Integrated Rural Development Programme (IRDP)
Pradhan Mantri Awas Yojana (PMAY)
National Old Age Pension Scheme (NOAPS)
Swarna Jayanti Gram Swarozgar Yojana (SGSY)
Sampoorna Gramin Rozgar Yojana (SGRY)
Swarna Jayanti Shahari Rozgar Yojana (SSRY)

Findings

This paper was based on the real condition of the people of Below Poverty Line.

1. Condition of the poor's in the study area: The survey has been done on the study area and different aspects has been taken to depict the actual scenario. After the survey it can be concluded that the worst situation is seen in the ward 6, where most of the

people are neglected from all the facilities. On the other hand the comparative better situation is seen in the ward 8.

2. This concept of poverty is very fishy: The identification of poor is a very complicated problem. The developing country like India has huge population. Among them identification of real poor is quite tough.

3. Real poor: Government has given several schemes and facilities to the poor but they are not getting all these because of the presence of some corrupted people. In this paper also it has been described in chapter III that in every ward there are some people who has the income greater than Rs. 10,000, still they avail the poverty facilities given by the Government of India.

4. Inadequacy of proper data: While the secondary data was collected, in different sectors like "Health Department" and "Education Department" said that is was quiet difficult to provide data as poverty data. Because there is no such data is collected as the data of poor.

5. The poor people don't even know their facilities: While primary survey was going on the respondents has been said that they only know about the BPL card. There are many Gov. Schemes that are proved to the poor but they are not aware of those facilities. That is why they can't avail that.

Conclusion

"Almost half of the population of the world lives in rural regions and mostly in a state of poverty. Such inequalities in human development have been one of the primary reasons for unrest and, in some parts of the world"- Abdul Kalam. If it is noticed minutely the saying of Mr. Kalam has a very deep meaning. According to the International Monetary Fund, World Economic Outlook Database, October 2016 said that India ranks 126 in terms of per capita income. The country like India suffers from poverty due to both internal and external reasons. If Marxian concept is developed countries are the 'HAVES" and developing countries are "HAVE NOT" so, the developed country always try to dominate those countries both economically and socially. And the issues like corruption, political imbalances, and social degradation are the causes which helps to increase the rate of poverty. Poverty is something which drag a society or a country to a very low level. To eradicate poverty the people should aware of various thing related to the society or country. Only then poverty can be diminish and "A POVERTY FREE NATION" can be build.

Abbreviations and acronyms

1. BPL: Below Poverty Line
2. HMC: Howrah Municipal Corporation
3. KMC: Kolkata Municipal Corporation
4. WWW: World Wide Web
5. NULM: National Urban Livelihood Mission
6. JGSY: Jawahar Gram Samriddhi Yojana
7. IRDP: Integrated Rural Development Programme
8. NAREGA: National Rural Employment Guarantee Act
9. PMAY: Pradhan Mantri Awas Yojana
10. NOAPS: National Old Age Pension Scheme
11. SGSY: Swarna Jayanti Gram Swarozgar Yojana
12. SGRY: Sampoorna Gramin Rozgar Yojana
13. SSRY: Swarna Jayanti Shahari Rozgar Yojana
14. NATMO : National Thematic Mapping and Organisation
15. NFSA -National Food Security Act
16. RKSY - Rajya Khadaya Suraksha Yojana
17. AAY - Antyodaya Yojana
18. PHH - Priority Household
19. SPHH - Priority Household with Sugar

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The Emerging Uncertainty of Dew Endowed Sugarcane Cultivation in the Foothills of Ayodhya Hill, Purulia District of West Bengal.

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Sanjukta Banik
& Prof. Malay Mukhopadhyay

Abstract

Man-Environment Interface has rendered uniqueness to Ayodhya Hill in terms of its landuse, culture, language etc. Here in the leeward side of foot hills of Ayodhya, the farmers are fighting environmental extremes with the help of traditional wisdom. Sugarcane is one of the most water thirsty crops which is grown successfully year after year without irrigation of any form in Sirkabad area of Purulia District. The authors through their empirical observation and detailed field study have found out that the farmers are now being lured by the methods of the outside world which is making them lose faith in traditional wisdom. This paper reflects the uncertainty of this unique agriculture system which is facing fear of dilution because of non-indigenous inputs. The authors want to enlist the non-environmental approaches and suggest ameliorative measures so that this environmental friendly agricultural system in the foot hills of Ayodhya hill is retained for the future generations.

Keywords: *Man-Environment Interface, Ayodhya Hill, Sugarcane cultivation, Traditional wisdom, environmental friendly agriculture*

Introduction

Life has never been easy for the villagers of Sirkabad. Located on the undulating plains of Ayodhya Hill fringe area at an elevation of 400 to 500 m, the scope of agrarian livelihood gets confined in the outer periphery of the talus deposits of Ayodhya Hill. The subtropical latitudinal location aided with their proximity to the bare rock surface of mighty Ayodhya, gifts them severe cold in winters and oppressive heat in summers. The colluvium soil which supports their livelihood also does not possess true soil character in which the desired layerization of the individual horizon is found. Moreover to add toall these, the farmers also have to adjust with the meagre rainfall as Sirkabad mouja of Arsha Block is located on the leeward side of Ayodhya which gets only about 1100 mm of rainfall as compared to the Baghmundi mouja on the windward side where more than 1400mm of rainfall is found.

Sirkabad marks it's name in the history of agriculture on the basis of the fact that the majority of the villagers of this area in the hands of such adversity has still chosen agriculture as their livelihood. Moreover the uniqueness lies in the fact that sugarcane which is oneof the most water thirsty crop is chosen as a cash crop in this area and is grown successfully year after year without irrigation of any form in this drought prone area only by the conserving moisture in the soil from the dew drops with the help of traditional wisdom.

Traditional wisdom of sugarcane cultivation

Traditional wisdom is a treasure that is passed from one generation to another by the word of mouth, millennia of experience and observation. The United Nations University (1990's) proposal says, "Traditional knowledge or 'local knowledge is a record of human achievement in comprehending the complexities of life and survival in often unfriendly environment."

Farming can never be practised without water or moisture. Dry Farming refers to the practise of conservation of soil moisture through tillage and through the growth of drought resistant crop which

Sanjukta Banik, Department of Geography, Visva-Bharati, Santiniketan, India.
E-mail: sanjuktadun@gmail.com
Prof. Malay Mukhopadhyay, Department of Geography, Visva-Bharati, Santiniketan, India. E-mail: malaygeo56@gmail.com

is practised from ancient times in Mesopotamia, Egypt and in the north western part of India (Macdonald,1909).Empirical observation shows that this practise of dry farming is very well documented in the dew endowed sugarcane cultivation by the farmers of Sirkabad, which they have learnt through folk knowledge and are practising for four to five generations in the face of adverse environment. *Kayam Kattu* which is the local variety discovered by indigenous people drought resistant sugarcane is grown in these fields for generations which has adjusted itself to the natural biodiversity and is resistant to the aridity and does not require irrigation of any form.

In India, Cultivation of Sugarcanedates back to the Vedic Period. The earliest mention of sugarcane cultivation is found in Indian writings of the period 1400 to 1000 B.C. It is now widely accepted that India is the original home of Saccharum species (Directorate of Sugarcance Development, Govt. of India, 2013). Sugarcane usually requires a perennial supply of water for six to seven months either in the form of irrigation or rainfall. However in the drought prone area of Sirkabad the farmers have resorted to the knowledge and experience of their forefathers to find an answer to food shortage, farmers plight and environmental challenges. The abundance of dew in the leeward side of Ayodhya Hill isutilised to grow sugarcane in this region.

Mazurek (2012) has said that the typical characteristic of farming without water or dry farming is that the crop absorbs less water, thus the flavour is less diluted

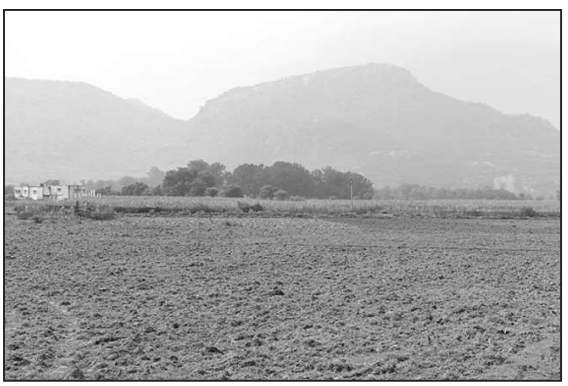

Fig. 1: Dew Endowed Sugarcane cultivation in the foot hills of Ayodhya

and when the summer progresses and ground dries out, it creates a stress on the fruit which ripens them and adds to their sugar content.This can also be seen in the sugarcane crop of Sirkabad, which though small in size, have more sucrose content and are flavourful as compared to their irrigated counterparts.

Cultivation process

Sirkabad lies in the belt of the occasional dense fog which is utilised by the farmers to feed the crop in winter months. Here during night time, the temperature adjacent to ground surface falls by conduction process, which results in the condensation of vapour into water. This on becoming heavy, falls on the soil surface making the top soil wet. The farmers cover the field in the dawn hours before the dew or fog evaporates

The water holding capacity of sandy soil is increased through tillage which is secured by ploughing in particulars times of the day. Ploughing starts in mid day and the next day early morning before sunrise, they plough in the same land for covering and absorbing humidity of the soil. This practice continues during six month from January to june. This method of tillage helps to form soil structure just like powder dust. This results in increased capillary movement of water in the sandy soil. During the field study a middle aged sugarcane farmer named Chinmoy Cuiri said "When the soil is fully prepared and gets a powder like texture it becomes ready for sugarcane cultivation where even an egg will not break on dropping."

Organic manure like cow dung is applied during the preparation of land. One or one and a half inch of sugarcane cutting is set in approximately ten inch water level in the seedling unit, from where the cuttings are finally transplanted to fields after root formation takes place. The crop requires a period of 10 to 11 months from sowing to harvesting as a result field remains fallow in alternate years.

This pattern of sugarcane cultivation is aided by the practise of growing pulses and other leguminous crop when the land remains fallow in order to fulfil the nitrogen requirement of the soil and to add to the secondary income of the farmers.

Soil of Sirkabad and Dew Harvesting Method

Dew Harvesting process depends entire upon soil as the sole reservoir. Sandy soils are kind in nature which

gives the farmer enough time for his tillage operation and pose little threat when too wet or too dry. Unless the soil is sufficiently deep and can retain moisture from one season to next it is not appropriate for this kind of farming. (Buffum, 1909).

The sandy soilof Sirkabad is very deepand have water retentive or holding capacity which through the process of tillage and ploughing is made suitable for dew harvesting of sugarcane. National Bureau of Soil Survey and Land Use Planning (NBSS & LUP, 2018) has defined the Sirkabad series on account of its uniqueness where the presence of sand is maximum in all the horizons.

Table 1 : Soil Texture Characteristics of Sirkabad Series

Horizon	*Depth (cm)*	*Size class and particle diameter (mm)*		
		Sand (2.0-0.5) % of <2mm	*Silt (0.05-0.002)*	*Clay (<0.002)*
Ap	0-15	72.5	12.3	15.2
Bw1	15-50	48.7	25.3	26.0
Bw2	50-90	42.2	22.2	35.6
Bw3	90-125	42.5	21.5	36.0
Bw4	125-170	45.2	24.5	30.3

Source: National Bureau of Soil Survey and Land Use Planning (NBSS & LUP, 2018)

Livelihood Based on Sugarcane Cultivation

Livelihood of more than 80 percentage population in Sirkabad is directly or indirectly dependent on sugarcane cultivation in some way or the other. The production of sugarcane is as high as 5.65 tonnes/hectare (NBSS& LUP, 2018). The farmers cultivate pulses and other leguminous crops during other season (fallow period) of the year in order to supplement their income and also to aid to the nitrogen requirement of the soil. The indigenous sugarcane though short in length as compared to other non-indigenous variety is rich in sucrose content and is very profitable to farmers and is sold at eight times the price of production. The farmers prefer the selling of sugarcane in raw form as compared to processing in jaggery, as the profit margin is higher in the former one which is almost Rs. 60,000 per acre of mature sugarcane while in case of jaggery is around Rs 35,000. However though the processing of Jaggery is a longer process, yet it employs more workers and specially the female members of the individual household who find it convenient to help in the making of jaggery within the premises of their own house instead of going to the fields. The farmers sell sugarcane products and by products in Purulia as well in the neighbouring towns and cities of West Bengal. Moreover the sugarcane is also exported in the national market.

By virtue there is no concept of middle man, however the big farmers buy the productof the small farmers and sell it in the market at a reasonable fixed price.

Cost benefit analysis of one acre of dewendowed sugarcane cultivation

Operational cost anually = Rs.6000 (Ploughing) + Rs. 9000 (Planting) +Rs.4500 (Fertilizer)
+Rs.5400 (Weeding)
= Rs.24900

Therefore, Total Cost is Rs. 24900

Production = 3500 kg per acre

Selling Price =3500 kg @ Rs. 25 per kg = Rs 87500

Total Profit = Rs 62,600

(Considering some hidden cost profit approx Rs 60,000 per acre)

Source: Data collected by the authors from a group interaction with the farmers

Topographic Order and Crop Association

Sirkabad mouja of Arsha Block is located on the north eastern periphery of Ayodhya Hill and along the right bank tributary of Bandu River. The general slope is from from south to north. At the intersection of the metalled and unmetalled road, homesteads have developed.

The foothills of Ayodhya is covered in talus deposits and many exposed rock debris with a slope of about 45°. The region below it is locally called the *Tanrland.* The lower part of the *Tanrland* which records gradual decrease in slope is called the *Baidland (Ray, 1984)*. *Tanrland* and *Baid land* are not characterised by well-drained soil. Colluvium deposits is found in *Tanrland* and the *Baidland* which renders it unsuitable for any type of cultivation as proper layerisation of the soil is not found here. However this area is used for the cultivation of sugarcane and other leguminous crops with the help of moisture conservation. Some times when rainfall is available then a few low grade cereals are grown in the Baid land. Next to it comes the *Kanaliland* which is gently sloping and is covered with well drained moisture retentive loamy soil. Here vegetables are grown but cultivation during *Kharif* season is dependent on rainfall. Lastly come the *Bahalland* which is the most valued fertile land where paddy cultivation is done. This area consists of fertile transported well drained alluvial soil where late maturing variety (130 to 135 days) of paddy is grown.

Thus from the pedogenic point of view, the *Tanrland* may be referred as the zone of transference and *Bahal Land* as the zone of accumulation, which typical of an erosion catena (Ollier, 1976)

Uncertainty of Dew Endowed Sugarcane Cultivation

While the major portion of the world is resorting to industrial farming as a solution to the growing food scarcity, the farmers in the foot hills of Ayodhya have mend their own traditional ways to cope the unfriendly environmental extremes. However, in present time, traditional wisdom is trying to survive in the era of conventional wisdom. The farmers are now being lured by the methods of the outside world which is making them lose faith in their traditional knowledge.

The dilution of this unique agriculture is taking place in the hands of inputs from the outside world. Lured by the yield and quality of the crop, crop variety from the nearby areas of Daltonganj (Jharkhand) were brought which were named as IR-36 and VM-2 respectively. These non-indigenous variety when grown in some patches of the same field through the process of moisture conservation did not give expected output. The crop demands more water and the sucrose content is also very less as compared to the indigenous variety. This has been the result of crop production failure for successive years.

In present time the biggest threat to the age old method of dew harvesting of sugarcane cultivation in the area is the introduction of micro irrigation in the form of dug well under Pradhan Mantri Krishi Sinchayee Yojana (PMKSY). This lured a section of the farmers, who thought that by this irrigation system they can raise crop twice a year without much labour as they have seen in the other areas. While there are still many farmers who looked down upon this irrigation system and feared that their indigenous variety which is '*Kayam Kattu*' had adjusted itself to the ecology of this drought prone area and was being raised successfully year after year without irrigation. Non environmentally friendly inputs in the form of dug well irrigation will disturb the resistance of the crop and increase its demand for water. Water scarcity is one of the major problems in Purulia. Moreover the area lies in the lee ward side of Ayodhya hence it receives very less rainfall compared to the windward side. Therefore though dug well may act as the source of irrigation for few years, in the long run this will not sustain as groundwater level is very low in this

region and will further fall down due to over extraction like in other parts of the country. It is found that, the wells which are dug till the depth of 50 mts are drying out as ground water level has fallen below that. From this one can apprehend the forth coming situation.

The soil which was producing successful yield of sugarcane year after year will no longer be able to perform in the same manner. In this way the present developmental policies is degrading the quality ofecology of this region for short term goals.

Fig. 2: Dug Well Irrigation through Pradhan Mantri Krishi Sinchayee Yojana (PMKSY)

P-Reject Categorisation and Despondency

Jaggery is one of the main byproducts of sugarcane cultivation and this adds substantially to the income of the farmers. Jaggery is produced in this region in traditional method manually without the use of any chemicals. This renders it a dark colour and is discarded for human consumption. This discourages the efforts of the farmers and they blame the governing body for not looking into their cause. Moreover the implementation of 'P- Reject' by the sales tax department on the transport of this goods from one state to another is also looked down upon by the farmers. Though 'P Reject' denotes lack of taxation on agricultural products this is misunderstood by the farmers and they take it as the non-acceptance of their product. Astrali Ansari one of the sugarcane farmers of Sirkabad proclaims "I want to appeal to the government to withdraw this tag of 'P-Reject' so that our product is honoured in the market."

Synergising Traditional Wisdom and Conventional Farming

In traditional times in the absence of any technological forecasting of rain and without any scientific knowledge the farmers would still fight the extremes of nature and produce crop successfully. As drought occurrence has become frequent the farmers are returning to old methods of finding out water hidden in nature.

The concept of farming without irrigation can be traced long back in history and here in the Sirkabad region the farmers could develop this technique of cultivation only through years of trial, without receiving any formal training or education. Thus their emotion lies deep rooted in this agricultural system which should be considered and catered to before any transition is imposed in the name of development.

There are many area specific agricultural system in various parts of the world which is based on

indigenous traditional knowledge. These can be the answer to all the agriculture and food related worries if practised today with fewer alterations suiting the present scenario.

The problem lies in dilemma between traditional wisdom with conventional practise in order to prove which one is sustainable from the point of view of environmental restoration. It is not necessary that one has to discard scientific thinking in order to validate traditional wisdom but there are some areas of the earth where the traditional knowledge is much suited and efficient and perform eco-friendly. In such areas these practises should be promoted through encouragement and its grass root level information should be spread amongst the massesso that it gets popularised and act as a solution to emerging crisis in the harmony between agricultural development and environmental revival.

Moreover if such unique area specific agriculture system can be preserved then in future it can act as a laboratory for agriculturists and environmentalist where they can study how aesthetic connection between Man and Nature is maintained.

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Island Ecoscaping by the *Onge* Community through the Indigenous Knowledge System

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Dr. Saswati Roy

Abstract

Introduction: Ecoscape is a sustainable landscape designing in the modern day architectural engineering. But this scientific method had been within the livelihood of several tribal communities and Onge's of the remote Little Andaman Island are amongst them.

This distant island for centuries together has been the homeland of the Onge"forest indigenous community". They have adopted an in-depth sense of their island through perception. On the basis of their indigenous knowledge they defined and demarcated a few scientific micro-physiographic and geo-environmental units, having varied significance to support their spirit of livelihood and maintain the ecological equilibrium as well.

Objective: It is through this paper the author have tried to relate the Onge's traditional science of perceiving climate with the modern day meteorological study.

Methodology: Based on both intensive and extensive field studies, perceptive information in the form of evidences of past and present changes in response to developmental strategies was explored.

Findings: In fine, the author proposes cognitive approach in synergising their traditional science of classifying climate with the island resource with the modern methods of meteorological studies.

Keywords: *Onge, climatic classification, ecoscaping, livelihood, meteorological relevance, synergism.*

Introduction

Islands display considerable ranges of scale, resource availability, economic opportunities and levels of development. Despite such wide distribution and variations, islands everywhere are subject to the impact of a common range of constraints imposed of their insularity (Hein, 1986). This shock is seen much more on one of the most important resources i.e. the traditional communities sustaining in such small islands for ages together with their traditional wisdoms (Hamnett, 1986).

The *Onge* forest indigenous community of the remote Little Andaman Island as adhered with the island ecosystem for ages together have attained a deep essence of understanding the natural dynamics of their surroundings to make hunting and gathering as their means of sustenance. Their livelihood, socio-cultural practices, rituals, faiths are all related to nature (Cooper, 2002). On the basis of this they have demarcated several regions – like topographical regions, climatic regions, forest resource regions and many more.

Objectives

Through this paper the author has tried to relate the relationship between the meteorological data and traditional wisdom. To draw the mental maps constructed by the Onge tribal communities on the island done on the basis of the weather and climate. Henceforth the mental maps are derived to extract the significance with the Onge's livelihood and sustenance.

Methodology

Author visited this inaccessible island and interacted with the forest indigenous Onge people with the assistance of government deputed interpreter to understand their Traditional Ecological Knowledge (TEK).

Dr. Saswati Roy, Department of Geography, Sarsuna College, University of Calcutta.

Physical Attributes of Little Andaman Island

Physiography

Little Andaman Island is the fifth largest island amongst the 348 islands that make up the Andaman and Nicobar archipelago and is the southernmost island of the Andaman District. Geographically, the Little Andaman Island is situated between 10°30' to 10°54' North latitude and 92°21' to 92°37' East longitude.

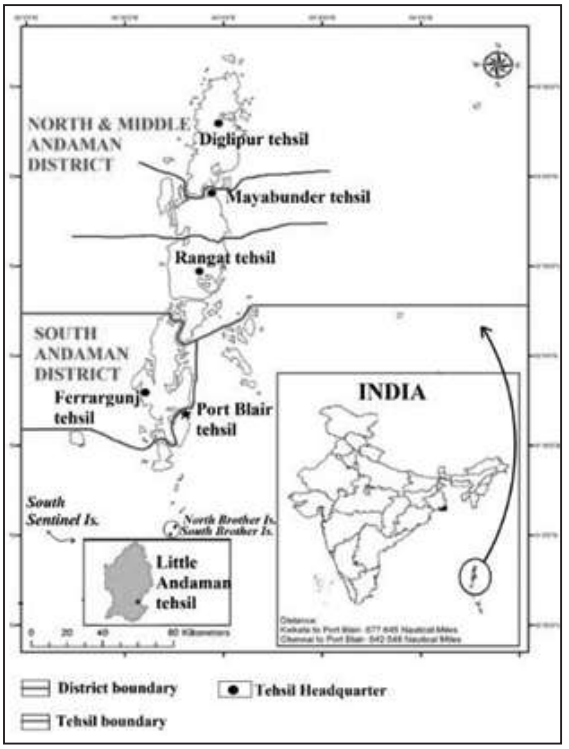

Figure 1: Location map of Little Andaman Island

Geologically, Little Andaman Island is mainly of thick Eocene sediments deposited on pre-tertiary fine grey sandstone, shale and silt with intrusion of basic and ultra- basic igneous rocks. The soils are immature, loose in texture, poor in drainage and low in moisture retaining capacity (Pandien, 2011 to 2021).

Climate

The climate of Little Andaman is sub- tropical. The climate resembles much to that of lower Myanmar, and the temperature throughout the year is uniform. The forest on the southern and western shores presents a striking contrast to the forests of the other islands, and bears witness to the strength of the south-west monsoon (Kloss, 1902). The island experience both the north-east monsoon (October to December) and the south-west monsoon (May to October).

Temperature: The Island possesses warm and humid, tropical climate with a temperature range of 20°C to 32°C. The average mean annual temperature during the last 10 years is recorded to be 26.85°C (Pandien, 2011 to 2021).

Humidity: The relative humidity varies from 65% to 91% and a mean relative humidity between 82 to 85% throughout the year. The highest humidity is experienced from May to November during the south-west monsoon period (Pandien, 2011 to 2021).

Rainfall: The rainfall ranges from 2020 mm to 3774 mm per year. Areas lying to the south west of the hill ranges receive a greater amount of rain. The south west monsoon which brings most of the precipitation normally begins in May and ends in October. The north-east monsoon starts from the second half of November and continues till the end of December. January, February, March and April are the calmest and driest months of the year (District Statistical Handbook, 2011).

Demarcation of Seasons according to meteorological study

Generally a year is divided into three main seasons depending on the prevailing climatic conditions in this Little Andaman Island.

i) The south-west monsoon: The longest and the most prominent season in this island. This season starts from the month of May with a sudden rise in humidity as well as rainfall. The temperature tends to be high (29^0C). The strong south-west and westerly winds blow continuously hitting the westerncoast.

ii) The north-east monsoon: At late October or early November the north-east monsoon currents establish in the region. The temperature remains low (near about 25^0C) in this period along with a decreasing trend ofhumidity.

iii) The dry Season: During the next four months, the island remains mostly dry with 50 mm mean monthly rainfall and a rising trend in the mean maximum temperature.

Table 1: Month wise general weather condition around Andaman Islands

Months	*Temperature*	*General wind direction*	*Rainfall*	*Sea Condition*	*Remarks*
January	Fairly cool	N & NE	Trace	Mostly calm	-
February	Cool with strong sun	N & NE	A few showers and dew	Do	-
March	Warmday coolnight	N & NE	Trace	Calm	-
April	Very hot sultry	N &NE changing	Heavy if early monsoon	Calm to rough	-
May	Pleasantly cool	SW &W	Heavy	Quite rough	Monsoon outburst on first day
June	Do	SW &W squall	Incessant	Do	-
July	Do	Do	Do	Do	-
August	Fairly cool	Do	Do	Do	-
September	Do	Do	Heavy	Do	-
October	Do	SW &W changing	Infrequent	Rough to calm	-
November	Fairly cool	NE changing	Occasional	Gets rough	Sea and weather uncertain
December	Do	N& NE	Do	Rough	

Source: District statistical hand book (2011)

Knowledge of Climate within *Onge*'s Perception

The *Onge*, in their endeavour to exploit the natural resources for survival, had developed fairly good knowledge of their own habitat. This knowledge is the result of the face to face interaction between man and nature through their hunting and gathering activities (Buchi, 1973). Records show that till the middle of the seventies these expert sea-faring people used to visit several surrounding islands of the Little Andaman like Rutland, Cinque, Brother and Sister group of islands, even as far as Port Blair (Portman, 1899). Moreover, in spite of about two decades of interference of the government welfare organisations and outsiders these primeval hunters have preserved their ability to survive on their own as they have been doing for centuries. The root of their success is perhaps their own expertise and adjustment with the nature through the traditional wisdoms developed out of the study of knowledge of their own habitat (Reddy, *et al* 1990).

Knowledge of sky, weather and climate

The *Onge* being among the earliest settlers of this region have perceived the island's weather and climate very well and have developed a strong perception of their own. Their livelihood and daily activities are very deeply related to nature and particularly to the climate and weather condition. The *Onge* have acquired meteorological observation and forecasting system, completely indigenous to them. The elderly male members of each settlement acquire this knowledge from their earlier generations and are being passed on through oral transmission (Basu, 1990). On the basis of the weather conditions they fix up their days for hunting, gathering, sea voyages and turtle hunting. For example, days of calm days are selected for long distance turtle hunting or sea voyages to other islands.

Onge calendar

It has been observed that the *Onge* associate the phases of moon to correlate the tidal condition of the sea and other weather conditions. Hence, several names are

given to full and new moon when extrem etidal levels occur and accordingly they plan their activities in the sea. Infact two days before and after the full and new moon are the most important period to the *Onge* for crab collection and turtle hunting (Buchi, 1973).

Ikututeme is the most widely used term for the full moon while in *Onge* vocabulary the word is related to anything biggest or largest or full grown. It means that the moon has attained its maximum. *Gakoegambutebe*or *Gobumamebe*are used for the increasing or the waxing phase of moon. During the 5-7 days around full moon they have observed that the high tide occur during the early part of the day and plan for community fishing on coral reef at mid-day and afternoon during low tidal level. Hence, few days around 7th or 8th day after the full or new moon is not suitable for fishing or turtle hunting and the *Onge* call this phase *Gobojalebe* to signify the phase of half-moon (Danda and Mukherjee, 1990).

Perception of weather and season

To the *Onge*, wind is the most important weather element and has given names to the various winds blowing from different directions. On the basis of the prevailing winds they have demarcated four seasons having different weather conditions which covers most of the part of our calendar. Thus, names of the winds are synonymous to the names of the seasons (Portman, 1899). On the basis of the wind and wind direction the *Onge* have demarcated four well defined seasons. Theyare:

i) Dahre*:* Early part of south-west monsoon, wind from west coast or south-west
ii) Kwalakangey*:* Later part of south–west monsoon, wind from south or south-east
iii) Mekange*:* North-east monsoon period, wind from north and north-east
iv)Torale*:* North-east monsoon, north wind continues as in *Mekange*

Table2: Seasonal cycle as perceived by theOnge

Name of the Seasons	*Wind and wind direction*	*Weather condition and other related phenomena*	*Duration of period*	*Availability of subsistence*	*Other information*
Dahre	Early part of south-west	Heavy rainfall, sky full of	May to mid-	Fish available	*Tanagiru* (initiation ceremony) of young boys are
	Monsoon, wind from west coast or south-west	dark clouds and rough sea	August	near the sea shore, pigs accumulate maximum fat.	observed
Kwalaka Ngey	Later part of south west monsoon, wind from Car Nicobar i.e. south or south-east	Maximum velocity of wind with occasional heavy rain and cyclonic storms (*bigobakuila*) high waves in the sea (*ingatinge*)	Mid-August to mid-October	Fish, turtle, (dugong in early times) available maximum in the sea and wild potatoes in the forest	
Mekange	North-east monsoon, north wind from north and north-east.	Little rain with lower temperature, mostly clear sky	Mid October to December	Maximum availability of potatoes	Arrival of *Mekande* bird indicates the onset of this season. It is observed that this particular bird starts coming by the end of September and early October.
Torale	North-east monsoon, north wind continues as in Mekange	Totally dry and sunny hot weather	January to April	Honey collection in the forest	Appearance of white high clouds *Urele*marks the beginning of this season when honey will be finished the *Torale* season will also be over

Source: Based on Danda and Mukherjee, 1990

Perception of season by observing the cloud formation

They identify the onset of a season mainly by a change in wind direction and certain related changes in weather condition and the growth of certain plants or fruits in the forest. They demarcate a particular season by intricately observing the clouds. *Enakoe* is the name called for rain bearing clouds mainly observed during the *Dahre* or the south-west monsoon season. *Beyja* is a common term meaning heavy dark cloud full of rains i.e. the cumulus or the cumulonimbus clouds. They even pointed out one type of cloud in the early *Mekange* (end of September) as *Onibototagulume* which they observe during the evening hours only. Likewise during the hot sunny days of *Torale* the white high clouds are termed as *Bambo age* by the *Onge* (Danda and Mukherjee, 1990).

According to the *Onge*, the rainy season (south-west monsoon) is important because pigs get fatter and are also easy to hunt because of the water-logged forest. Hence, they usually fix up the date of their celebrations and ceremonies during *Dahre* (May-July). Likewise, *Kwalakangey* is a season of sorrow and hunger because sea becomes rough due to high wind and cyclonic weather. The forest also becomes inaccessible due water logging and turns swampiest. The *Mekange* brings to them a mixed fortune, as they start fishing and turtling regularly and collect large quantity of wild potatoes and fruits from the forests. *Torale* is the driest part of the year and they enjoy the most due to less rain and availability of forest materials (Danda and Mukherjee, 1990).

Island Ecoscaping through Climatic Perception

Ecoscaping integrates the disciplines of landscape architecture and spatial planning with environmental science and provides an innovative approach in creating a sustainable and nature- friendly design. Ecoscaping is a process of building and rebuilding based on nature, sustainable development and human aesthetics.

On the basis of this ecoscape knowledge they defined and demarcated a few scientific micro- physiographic and geo-environmental units, having varied significance to support their spirit of livelihood and maintain the ecological equilibrium. Through this science they have categorised the whole island into various micro regions that help them in carrying their subsistence form of livelihood.

Onge's Ecoscape designing for equitable territorial division

The *Onge* have a fair knowledge of weather, seasonal activities of the wind, rain, storm, cyclone, tsunami etc. of Little Andaman Island and its surroundings. Such knowledge is necessary for them to move to distant places in the open sea or the neighbouring islands in search of turtles, eggs, fishes with their canoe fitted with outrigger (Bose, 1994).

The *Onge* categorizes the island of little Andaman into three geographical territories based on the seasonal criteria namely:-1) Gire-mekangey 2) Gire-darey 3) Enga-kwalakange.

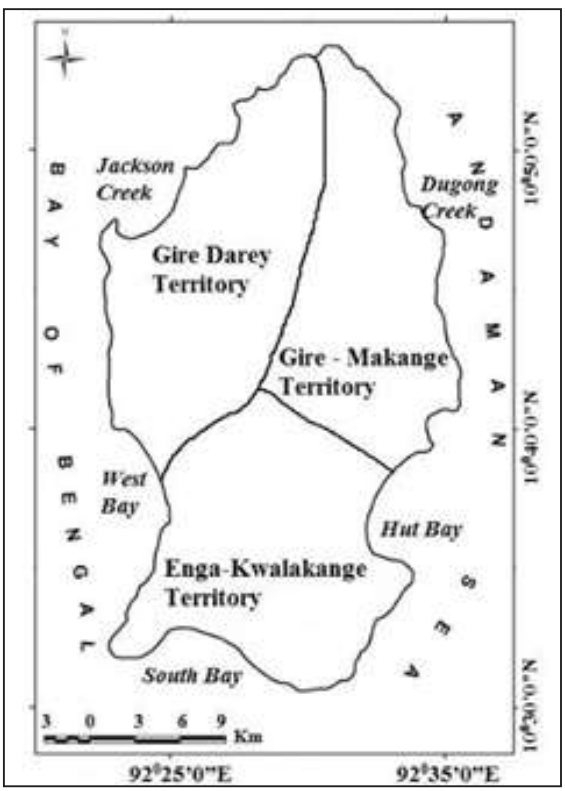

Figure 2: Ecoscaping for equitable territorial division

All the members of the *Onge* society at any given moment of time are members of one territory or the

other. Each of these territories is endowed with a variety of floral and faunal resources necessary for their survival. The *Onge* according to their opinion have divided the island almost of equal size and each territory receives equal proportion of coasts, forest resources, creeks and streams (fresh water). These territories are basically areas of resource-exploitation by a group and, thus, members of one territorial group are not allowed to forage in another territory (Reddy *et al.* 1990). This once again proves their resource management ideology.

Onge's Ecoscape designing for regionalisation of habitats

The *Onge* have divided their own island into two major regions i.e. Coastal Plains and Central forested upland area. It is expected that they have developed this regionalisation to signify the basic difference in the immediate habitats of the coastal dwellers (*embelakwe*) and the forest dwellers (*engeakewe*).

Thus, the communal huts or *'beyra'* have been grouped according to their location on the coast or inland.

The term *Engakwaleye* has been used to denote the group of huts located far from the coastal plains inside the inland forest. The remaining coastal rim of land has again been divided into north and east coast called *Giremekaye*, south and west coast called *Girerartwaye* respectively (Nigam, 1962).

These two coastal sub-divisions have been made as per the frontal zones of the two major winds i.e. the south-west and north-east monsoons. The south and the west coast region or the *Girerartwaye* is the zone which experiences the strongest currents of south-west monsoon and hence wider in area than the north and east coast or the *Giremekaye* where the monsoon is milder one (Danda and Mukherjee, 1990).

Onge's Ecoscape designing for resource allocation

It has been observed by D. Danda and S. Mukherjee that the *Onge* divided the island into four types and they are: 1) Tontibu 2) Butu 3) Tambojokoa 4) Totijaloa.

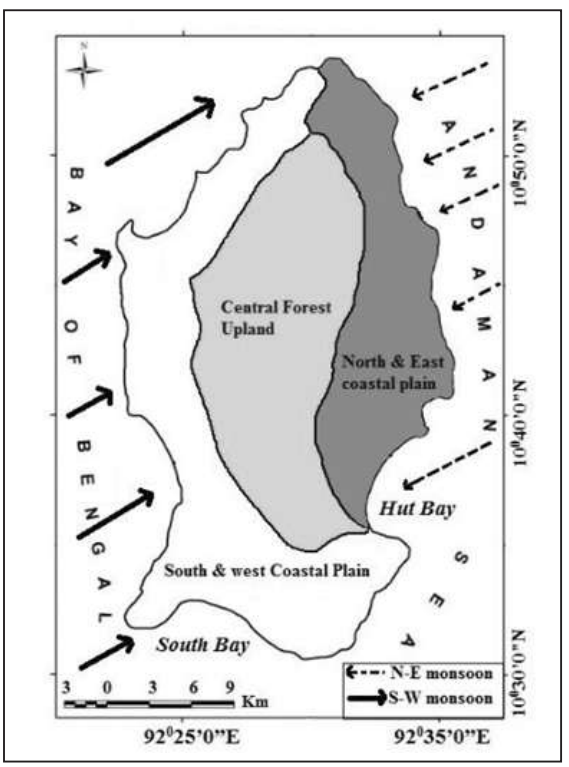

Figure 3: Ecoscaping for regionalisation of habitats

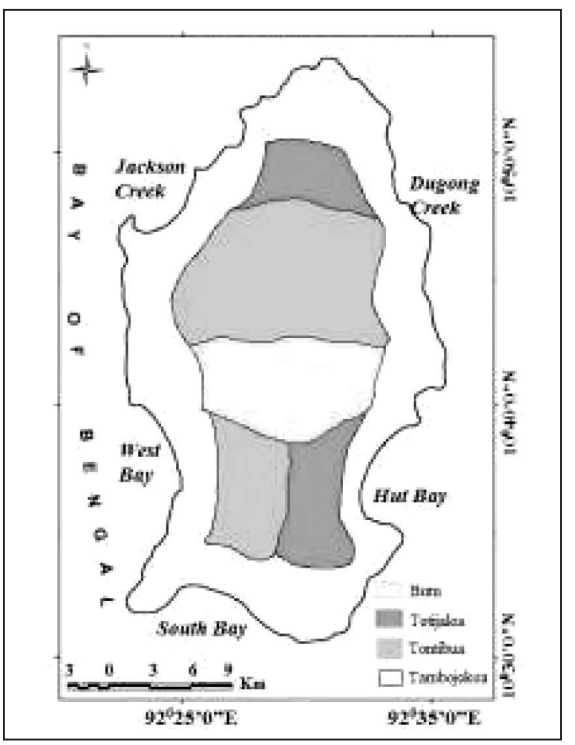

Figure 4: Ecoscaping for demarcating Resource Regions

Tambojokoa is located along the coast while the rest of the three are situated in the interior of the island and is shared almost impartially by *Onge* territory.

Tambojokoa is a forest full of cane and bamboo which is the site of cane collection but less accessible during hunting. Being located along the coast, it prevents them from hunting. This area is selected by the *Onge* for collection of large crabs and small fishes.

Butu is a type of forest where it is easy to chase a pig as it is dry forest of tall trees with less undergrowth, easily accessible for pig hunting.

Totijaloa lies along the retreating south west monsoon so it is comparatively dry. Hence this forest is used for fruits and tuber collection.

Tontibu forest lies along the course of the south west monsoon winds and hence receives a good deal of moisture in the form of heavy rainfall resulting in luxuriant tree growth. This forest is used for honey collection from medicinal plants (Reddy *et al.*1990).

Conclusion

The *Onge* have been residing on this island for centuries together, using this island's resources for their sustenance. Since then they never had to think upon any resource management or island's ecosystem balance till the invasion of the modern civilization.

Thus, it is obvious that the latent science within their livelihood was perfect enough for the island's sustenance. It is seen that there is a strong association of their climatic classification and land regionalisation with their hunting gathering livelihood (Hein, 1986).

The author, during her field research, had witnessed how the artificial makeover of the *Onge* is having a disastrous impact upon their socio-cultural life. Thus as a post modern approach the author would like to propose a synergism of the traditional knowledge and the modern day science. The author apprehends that this synergism might assist in the environmental and disaster management as well.

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Optimum Utilization of Wetland: A Study on Purbasthali I and II Blocks of Purba Barddhaman District, West Bengal, India

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Payel Das
& Sutapa Mukhopadhyay

Abstract

Wetlands are the 'biological super market' but they are the most fragile and threatened ecosystem today because of the indiscriminate human interference. In the days of increasing demand for food, it is very important to enhance the agricultural production but for that purpose wetland conversion is not ecologically acceptable and the people have to know how the wetlands can be sustainably used for agriculture. Here, an area specific analysis has been done on Purbasthali I and II Blocks of Purba Barddhaman District because the wetlands of this region are experiencing an unprecedented environmental degradation due to irresponsible human activities. Local farmers want to reclaim the wetland for agricultural activity which will destroy the total natural ecosystem. After estimating the existing economic value of the wetland, an effective planning and management strategy has been proposed for optimum utilization of the wetland.

Keywords: *Wetland, Economic valuation,optimum utilization, alternative economy, Agri-aquaculture*

Introduction

The worldwide demand for food production is gradually escalating because of tremendous population pressure. Global food safety is becoming a severe dilemma as one in eight people are undernourished (FAO, 2013). Therefore, food production enhancement is one of the key challenges to provide food for a rising global population. It will make a greater stress to reclaim the virgin natural areas for agricultural purposes. From the historical past, wetlands are being reclaimed for agriculture purpose all over the world through diking, draining and filling (Verhoeven and Setteret, 2010). Due to agricultural conversion, the wetlands are losing the original character and they are turning into agrarian ecosystem from natural wetland ecosystem. But, wetlands are one of the most productive ecosystems on the earth (Ghermandi et al., 2008). Therefore, it is the time to rethink about the conservation of this water resource and its management.

Various scientific studies have done on the spatio-temporal changing scenario of wetland (Mandal and Pal, 2016; Mukherjee and Pal, 2018), wetland vulnerability assessment (Starford et al. 2011; Cui et al. 2014) and wetland fragmentation etc (Song et al., 2012; Zhao et al. 2015). All of these studies generate basic data of wetlands but along with it addition of people perception regarding the design making of sustainable managerial strategies is necessary for the economic development of the rural community. With this background in mind, in the present study, Purbasthali I and II blocks have been considered as study area. The main aim of this work is to identify the changing behavioural pattern of wetlands of the blocks and then to estimate the existing economic value of the selected wetland and to chalk out the effective managerial strategies for optimum economic utilization of the wetland.

Study Area

The study area, Purbasthali I and II CD Blocks is located at the eastern part of Purba Barddhaman district with an areal coverage of 345.74 km^2 and has latitudinal extension of 23°18′17′′ N. to 23°36′23′′ N. and longitudinal extension of 88°12′11′′ E. to 88°23′12′′ E. Administratively the three sides

Payel Das, Department of Geography, Visva-Bharati, Santiniketan-731235, West Bengal,
E-mail: dastista91@gmail.com
Sutapa Mukhopadhyay, Department of Geography, Visva-Bharati, Santiniketan-731235, West Bengal.

of the study area are surrounded by block boundary i.e. Manteswar and Katwa II CD Block to the west, Kalna I CD Block to the south and Katwa II CD Block to the north and the eastern side is bordered by district boundary i.e. Nadia district. The total population of the blocks is 4,19,332 (2011 census). Physiographically, the study area encompasses with Bhagirathi delta plain and Khari plain with an average elevation of 15.5 m.The area is studded with a number of riverine flood plain wetlands.

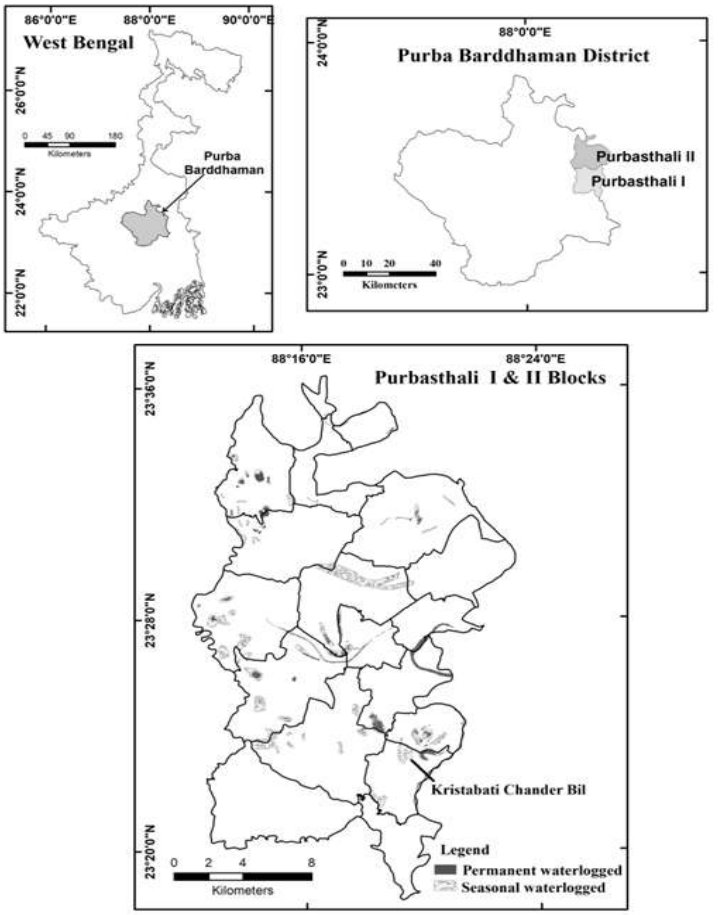

Fig. 1Distribution of wetlands in Purbasthali I and II blocks

Database and methods

The whole work is done on the basis of two fold approaches i.e. intensive field survey and multi-dated map analysis. To prepare the water presence map of wetland, Topograhical sheet of 1968-69 and Landsat-8 (2017) have been used. McFeeter's NDWI has been applied on Landsat-8 to identify the water presence area. Local peoples' perception regarding the wetland use is the key element of the present study. Therefore to collect the data about resource utilization pattern, discussion has been done with the representatives of each group who are directly dependent on the wetland resources. To estimate the economic value of the wetland, market price method and surrogate price method have been applied.

Results and discussion

Changing Status of wetland

Purbasthali I and II blocks were referred (Mondal, 2014) as '*Khalbiler desh'* (a place where wetland is very abundant). Numbers of wetland were formed in different times since historical past because of changing

nature of river Bhagirathi. All those riverine flood plain wetlands played a vital role in the contemporary economy, society and environment and then with time they became derelict and new one was formed. Nature's rhythm started to break from when the demand for food has increased, due to increasing population pressure. Stress on wetland has been increased for agricultural invasion, settlement extension etc. Wetlands' condition are being deteriorated i.e. water presence area has started to shrink; depth of wetland has become shallower; wetland habitat has lost and so on.

Temporal variation of water presence area of wetland

An extensive change has been noticed in water presence area of wetlands within fifty years of time span (1968-2017). Intensive agriculture, changing groundwater status, continuous siltation, massive eutrophication and modification of connective channel between river and wetland may responsible for wetland deterioration. During the period of 1968, water presence area of wetland in pre-monsoon was 10.44 sq. km. which is declined into 4.55 sq. km. in 2017. In case of post-monsoon period water surface area of wetland was 14.82 sq. km. during 1968 and only 6.92 sq. km. water surface area has been recorded during 2017. So, here also the decreasing trend of water surface area of wetland is being noticed. Number of wetlands have lost their water permanency and turned into semi-permanent (Salte bil, Shalkona bil, Bathakuro bil) and seasonal wetlands (Unir bil, Kristabati Chander bil).

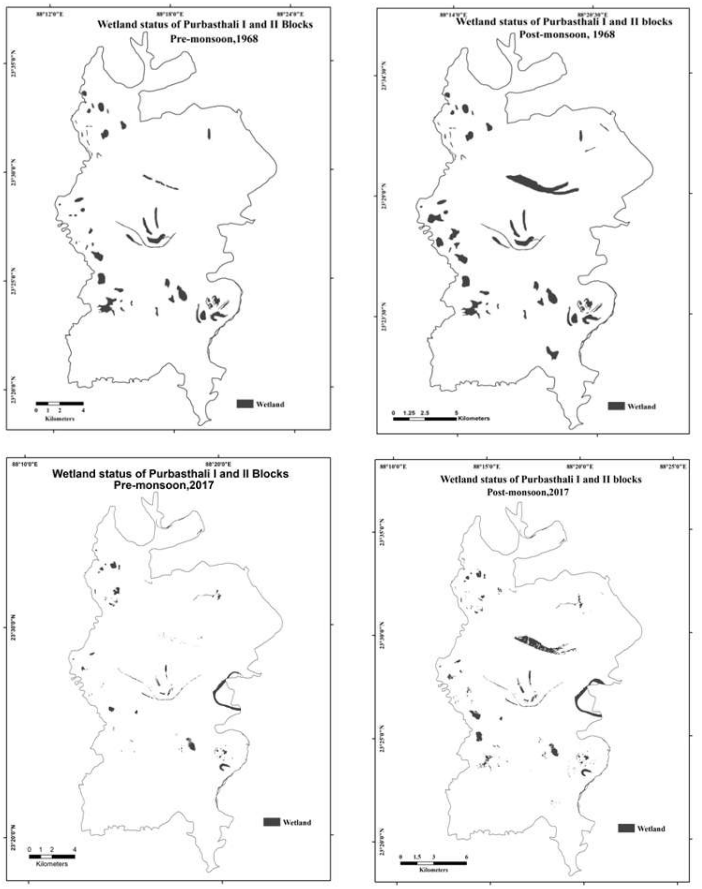

Fig.2 Changing status of wetland in Purbasthali I and II blocks

Depositional characteristics of wetland

Wetland siltation is very alarming issue because it continuously threatens the storage capacity and the physical life of the wetland. The wetland-wise deposition rate varies from 2.64 to 4.5 mm./year (fig.3). Depositional rate depends on the surrounding land-use pattern, number of drainage inlet and out let and wetland bank materials. The rate is high in Purbasthalir bil and Paltar bil because both the wetlands are directly connected with river Bhagirathi through the drainage inlets. Huge amount of silt enters with monsoon water during the bankful stage of the Bhagirathi. Pandul, Kurmul, Unir bil have also connections with river Khari by number of inlet channels which carry huge amount of silt. Comparatively, Santler bil records low rate of siltation (2.64 mm./year) because it has no drainage inlet. During rainy season, only the terrigenous deposits accumulate from the wetland bank.

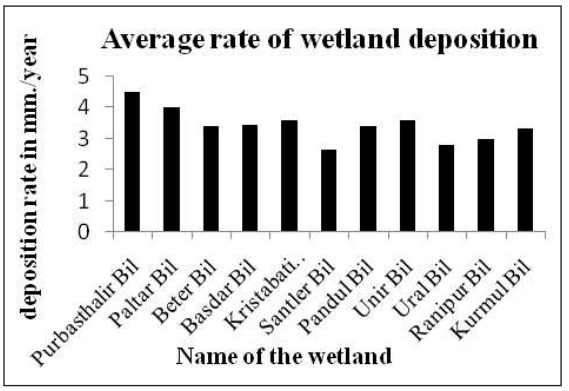

Fig.3 Per year depositional rate of wetlands

Depositional characteristics of wetland

Wetland siltation is very alarming issue because it continuously threatens the storage capacity and the physical life of the wetland. The wetland-wise deposition rate varies from 2.64 to 4.5 mm./year (fig.3). Depositional rate depends on the surrounding land-use pattern, number of drainage inlet and out let and wetland bank materials. The rate is high in Purbasthalir bil and Paltar bil because both the wetlands are directly connected with river Bhagirathi through the drainage inlets. Huge amount of silt enters with monsoon water during the bankful stage of the Bhagirathi. Pandul, Kurmul, Unir bil have also connections with river Khari by number of inlet channels which carry huge amount of silt. Comparatively, Santler bil records low rate of siltation (2.64 mm./year) because it has no drainage inlet. During rainy season, only the terrigenous deposits accumulate from the wetland bank.

Table 1: Loss of water holding capacity of the wetland for fifty years (1968-2018)

Name of the wetland	*Loss of water holding capacity (cubic m.)*
Paltar Bil	244210.6
Beter Bil	530444.6
Basadar Bil	824428.6
Kristabati Chander Bil	59177.65
Santler Bil	281427
Pandul Bil	106354.9
Unir Bil	177111.6
Ural Bil	230092.2
Ranipur Bil	790224.3
Kurmul Bil	73065.06

Wetland conservation

All over the world, wetland ecosystems are being threatened for extensive wetland loss, fragmentation etc. Wetlands of Purbasthali I and II blocks are no exception. Initially wetlands were mostly used for fishing, domestic purpose and small scale irrigation. But, with increasing population pressure,the using patterns of wetlands are being altered. At present, wetland conversion, hydrological alteration are some very critical issues at national and global level. Lack of proper valuation of wetland is major cause behind such deterioration.Therefore, it is needed to formulate an integrated planning to maintain the equilibriumity between man and nature. Here, Kristabati Chander Bilis selected as a sample wetland.

Conversion tendency towards agriculture

Kristabati Chander Bil is located at the margin of Samudragarh and Srirampur Gram Panchayat of Purbasthali I block. During 1968-69, it was a permanent wetland of 32.87 hectares but now it is a seasonal wetland. During 1968-69, fishing was the

main economic activity of the wetland. The fringe part of the wetland was utilized for *Aus* rice production. Since the decade of 1990, wetland dwellers started the *Boro* culture within the wetland command area. On the basis of satellite image of 2017 with field verification it is revealed that about 27.12 ha. of wetland is engulfed by agricultural activities and rest 5.75 ha. remain as unused land. Gross cropped area of the wetland is 35.87 ha in which *Boro*, Jute, Mustard are cultivated. Wetland dwellers depend on the wetland not only for crop production but also for fish catch, fodder collection, jute retting and hydrophytes collection. The wetland becomes a temporary fishing ground for five months (June-October) of the year to all villagers.

For profit maximization, recently, the local farmers want to convert the wetland into agricultural land. Besides, they want to raise up the height of the deepest part of the wetland by earth filling so that water can not accumulate within the wetland. If the whole wetland is reclaimed, additional 5.75 hectares of the wetland can be utilized for *Boro* cultivation and during post monsoon, the whole wetland can be utilized for Rabi crop cultivation. The yearly total profit from crop production will be estimated as 9,94,918.36 in Rs.

Existing economic valuation of wetland services

In this scary situation, for the survival of the wetland, some action plans are needed so that local people will be benefitted and the hydrological and ecological nature of the wetland can be conserved. Economic assessment of wetlands is a concerning matter because it helps to formulate the future plans for generating more economically profitable goods and services from the wetlands by maintaining the hydrological and ecological properties of wetland.

Benefits from crop production

Local farmers use the wetland bed for practicing *Boro* crop during Feb to May and Mustard during November to January. About 9 hectares of wetland is utilized for jute cultivation during Kharif season. Total area under *Boro* and mustard cultivation is 18.12 hectares and 8.75 hectares respectively. Per hectare net profit of Boro, Jute and Mustard is Rs.6794.92, 6177.2 and 23,473.36 respectively. Total estimated benefit is Rs. 3,84,110.65/ annum.

Benefits from crop production = Total area of crop cultivation × Net profit from per unit crop cultivation (Mukhopadhyay and Das, 2016)

Benefits from fishing

This wetland is not used for commercial fishing purpose throughout the year as it is a seasonal wetland. Only during monsoon period,villagers catch fishes and sell to the markets for gaining money. Applying market price method, total benefit from fishing is estimated as Rs.1,50,000/ annum.

Benefit from fishing = Total number of households obtaining this benefit × Average yearly fish catch per household (in Rs.) (Das, 2000)

Benefits from jute retting

Local farmers use this wetland for jute retting purpose during monsoon and they do not have to pay for this service. The value of jute retting can't be directly measured by market price method. So here, surrogate price method (Das, 2000) is applied. Few farmers use the private tanks for jute retting purpose and they have to pay average 200 Rs. per bigha of jute to the tank-owners. Following that expenditure it has been estimated that the money saved for jute retting in wetland is considered as benefits of wetland. The estimated benefit of jute retting is Rs. 42,954 per annum.

Benefits of jute retting = Total unit of jute retting in the wetland × saving amount for per unit of jute retting

Benefits from fodder collection

To feed the livestock, approximate, twenty households collect fodder from this wetland for fivemonths (January to May) of the year and they save average Rs. 400 per month because they can reduce the expenditures from straw and mustard cake. The total estimated benefit is Rs. 40,000 per annum.

Benefits from collection of hydrophytes

About 15 households collect amaranthus (Kalmi, Susni, Helencha etc.) from this wetland throughout year and monthly average income is of Rs.110. Total estimated benefits is Rs.19,800/annum.

Table 2: Existing economic valuation of wetland

Varieties of Economic use	*Benefits in terms of money per annum*
Crop Production	3,84,110.65
Fish Catch	1,50,000
Jute retting	42,954
Fodder collection	40,000
Collection of hydrophytes	19,800
Total Benefits	6,36,864.65

Sustainable wetland managerial strategies

To minimize the wetland degradation and to protect the natural system of wetland more than two hundred states and central laws exist in the world (Shine and Klemm, 1999). In India numbers of laws have been designed to conserve the wetland habitats. Instead of 'Elite Model' approach (Bassi, 2016), *wise use* of wetland is more acceptable for the success of sustainable wetland utilization. To manage the wetland efficiently an alternative economy has been proposed here. The wetland can be utilized for integrated agri-aquaculture for seven months (June - Dec.) and coriander cultivation for five months (Jan. to May).

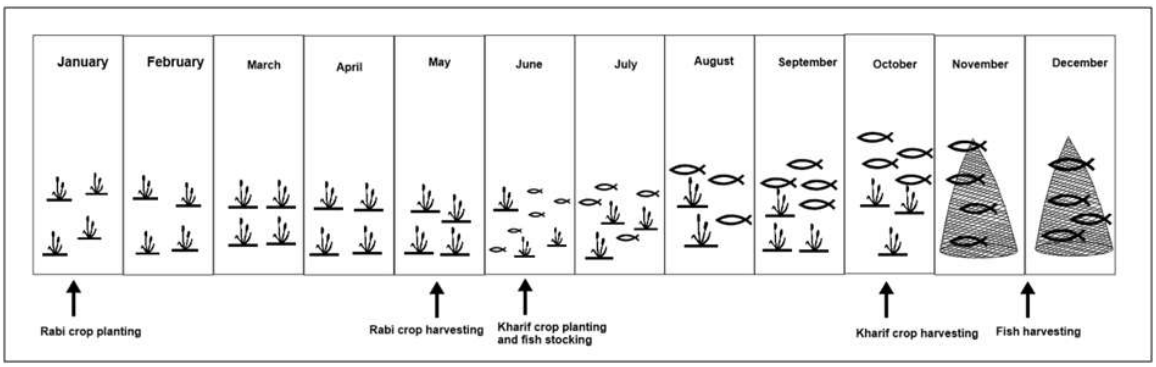

Fig.4 Seasonal calendar of proposed Cropping pattern at Kristabati Chander Bil, based on: FMSP project report, 2005

Integrated Agri-aquaculture

Integrated agri-aquaculture is better than monoculturing of rice because it provides extra foods to the rural communities (Ahmed and Garnett, 2011) and it also increases the production of rice by 8–15% due to the presence of fish (Mishra and Mohanty 2004). Rice-fish farming helps to cut down the cost of fertilizer, pesticide and herbicide because the excreta of fishes help to fertilize the rice field and they are good pest controller (Halwart and Gupta 2004).

Suggested Indigenous Rice varieties

Flood-tolerant crop varieties like *Sada Jabra, Lakshmi-dighal, Banya-sal, Jal kamini* etc can be introduced during rainy monsoon because they have the capability to endure high water level. All the modern varieties of rice provide high yield only in ideal situation but can not survive in marginal condition but indigenous crop varieties have excellent capacity to sustain in marginal environment. They have a propensity to grow taller with the water level of the field, because of their elongated stalk. *Lakshmi-dighal* can sustain in six meter depth of water (Deb, 2009). The yield rate of indigenous crop varieties is recorded as much higher than that of the modern varieties in marginal environment (Cleveland et al.,2000).

Suggested fish varieties

The fishes to be stocked in rice fields have the capability of enduring in a hard environment characterized by: low water level, high (up to 40°C) and changeable temperatures (range of 10°C within a day), low oxygen levels and high turbidity (Khoo and Tan 1980). A large number of fish species has been cultivated including common carp, Indian Major Carp- Rohu, Mrigal and Catla, Chinese carp -Silver carp and occasionally grass carp, Tilapia (Gupta et al. 1998). On the basis of marketability or demand, variety of fish species should be stocked.

Table 3: Input-output pattern of fish farming in one bigha of land (Source: Department of fisheries, Barddhaman)

Input	*Expenditure in Rs.*	*Production in Kg.*	*Sale price of fish in. Rs. per Kg.*	*Total sale price in Rs.*	*Profit in Rs.*
Mohua Oil Cake	7500	500	100	50,000	(50,000 - 21000)= 29000
Lime	700				
Cow dung	1000				
Urea	400				
Super Phosphate	600				
Fish Seed	4000				
Fish Feed	5000				
Prophylactic	1800				
Total	21000				

Table 4: Input-output pattern of paddy culture in one bigha of land (Source: Department of Agriculture, Visva Bharati, Santiniketan)

Input	*Expenditure in Rs.*	*Production in quintals*	*Sale price of rice in Rs. per Kg.*	*Total Sale price in Rs.*	*Profit in Rs.*
Seed	420	15	600	9000	4600
Manure	1400				
Labour	3970				
Machineries and others	840				
Total	5400				

Table 5: Input-Output pattern of Coriander cultivation in one bigha of land (Source: Consultation with local farmers)

Input	*Expenditure in Rs.*	*Production in quintals*	*Sale price of Coriander in Rs. per Kg.*	*Sale price of Coriander in Rs.*	*Profit in Rs.*
Seed	600	6	60	14,400	9700
Labour	3000				
others	1100				
Total	4700				

Comparison between the profit of existing and proposed two fold economic activities

Table 6 gives an idea about the comparative study of profit gain from existing and proposed economic activities. The monetary profit from existing utilization pattern is lower. Moreover, farmers are interested to reclaim the wetland for crop production for extra profit and it is about 3,58,053.71 in Rs. But this transformation of wetland is not environmentally applicablefor the sustaining of the wetland ecosystem. Therefore, an alternative economy has been recommended which promotes better socio-economic condition to the villagers and preserves the wetland hydrology and habitat.

Table 6: Comparison between the profit of existing and proposed two fold economic activities (Source: Calculated by researcher based on input output pattern)

Utilization pattern	*Monetary profit in Rs./annum*
Existing	6,36,864.65
Proposed by local farmers	9,94,918.36
Proposed by researcher	64,65,666.5

Conclusion

Presently, wetland agriculture is essential for food safety and poverty reduction of the developing countries but the people have to know the proper way of wetland utilization so that the ecology- economy equilibrium is achieved. For proper implementation of wetland plan, involvement of local communities is very important as they are directly dependent on the wetlands and they have better understanding about the wetland environment. Lack of sufficient knowledge about the wetlands' services eventuates exploitation of wetland resources by the local people, thinking only for short term financial profit. Initially the mind setup of the tempted farmers should be changed and then they have to be trained by the skilled professionals for the success of wetland management. It is well accepted fact that the wetlands are the valuable rural water resource so the conservation of that resource with the aid of scientific knowledge must be considered during rural development programme.

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Disparities in Rural Development: A Study in Purba Medinipur District of West Bengal

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Balai Adhikary
& Dr. Krishna Chandra Rath

Abstract

Most of the area in India comes under the rural area. Development scenario of rural area in India and in West Bengal is varied from place to place and inter and intra village's disparities of rural development is the common phenomena in the integrated India. In Purba Medinipur district of West Bengal performance of Village Panchayat regarding the development of rural areas are varies from mouza to mouza. Main objectives of this paper are measuring the disparities in rural development and performance of village Panchayat regarding the development of rural area. Census of India, municipality published sources of demography data consider here as a secondary data. Primary data has been collected through household survey. Calculate percentage, Cumulative percentage, Performance rank for measuring the development and performance level. Exert class interval methods on performance rank for categorization of villages into state of rural development. Apply Arc GIS software for preparation of map. In Kumarara Gram Panchayat area disparities in rural development is prevalent and execution of Panchayati raj regarding rural headway is incompatibility. The outcome of this work may be applied in the any part of the rural area in the integrated India for the sustainability of the area.

Keywords: *Rural, Village Panchayat, Performance, development, disparity, measurement, sustainability.*

Introduction

In the process of rural development performance of Panchayati Raj plays dominant role. Gram Panchayat, Panchayat Samiti and Zilla Parishad are the level of Panchayati raj systems in West Bengal (Bandyopadhyay, 1985). In the process of three tiers Panchayat raj in West Bengal Gram Panchayat is in lowest level and each Gram Panchayat has five subcommittees (Bakshi & Okabe, 2008). Development from grass root level done in the society by the process of decentralized planning through the implementation of Panchayati raj systems in West Bengal (Salim, 2011). Each Gram Panchayat has five subcommittees i.e. agriculture and animal resource development, women child development and social welfare, education and public health, industry and infrastructure, finance and planning and each subcommittee has particular work and name of each subcommittee reveals the type of development work of the every subcommittee of Village Panchayat. Gram Panchayat prepared the plan according to the demand of local people and demand of local peoples raise in the Gram Sansad and Gram Sabha meeting and implemented the development work in the village. Rural livelihood development depends on the Gram Panchayat (Sat, 2010). In the process of rural development agriculture, irrigation, education, public health, women and child development, social welfare, development of rural road and maintenance, development of rural industries, rural electricity, drinking water, sanitation, etc. has the mandatory works of a Village Panchayat (MRD, GOI, 2008). Quality of rural infrastructure is the common elements for rural livelihood development (Bulus&Adefila, 2014). In the process of rural development in integrated West Bengal disparities are found in agricultural, educational, health facilities, infrastructural, etc. Regional disparities are the common affair in the rural Bengal (Adhikary and Chakraborty, 2012).

Balai Adhikary, P.G. Department of Geography, Utkal University, Bhubaneswar, Odisha, India.
Email: balaiadhikary@gmail.com

Dr. Krishna Chandra Rath, P.G. Department of Geography, Utkal University, Bhubaneswar, Odisha, India.

Study area:

Purba Medinipur district comes under the West Bengal, India. The district consists 25 community development blocks, 223 Gram Panchayat, 2932 inhabited villages and 3035 mouzas (District Statistical Handbook, Purba Medinipur, 2012). Nandakumar community development block comes under the Tamluk subdivision in the district. Total geographical area of the Nandakumar community development block is 165.70 sq. Km. and the block consist twelve Gram Panchayat (Census of India, 2011); Kumarara Gram Panchayat is one of them. The said Gram Panchayat consist thirteen mouzas namely Mandergechia, Jamburbasan, Rauturi, Jashnan, Dhitaibasan, Khejurberia, Namal, Bagmari, Haripur, Kumarara, Naikundi, Mahammadpur, Fatehpur. The study area comes under the riverine plain region and formed due to the deposition of river Haldi. Climatic conditions of the area are tropical monsoon in nature and wet summer and dry winter is the common characteristics of the area. Soil is alluvial and fertile in nature and area familiar for agricultural practice. The said geographical area encircled by the rural area. Paddy production and bettlevine agriculture is the common economic activity in the entire geographical area. In Kumarara Gram Panchayat area total population is 25626 and male and female population is 13007, 12619 (Gram Panchayat office, 2015).

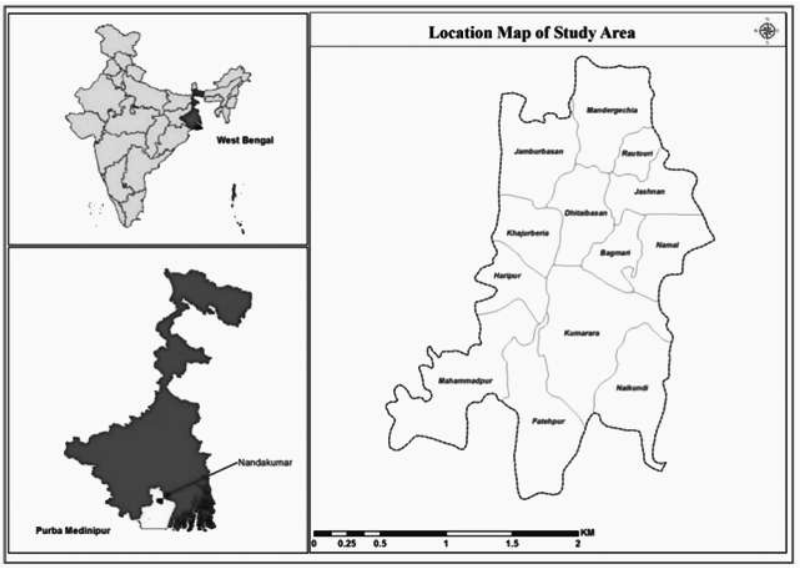

Fig. 1: Location of the study area
Source: NATMO, Kolkata and prepared by authors

Objectives

Main objectives of this work are as follows:

1. To analyze the mouza wise scenario of rural development in the area.

2. To highlight the disparity in rural development in the entire geographical area.

3. To measured the performance of Panchayati raj regarding rural development.

Database and methodology

Data base and methodology of this work are as follows:

Data Sources: District Census Handbook, Purba Medinipur, 2011 and Gram Panchayat office is the main sources of secondary data. Household survey is the sources of primary data.

Data collection: In the entire geographical area total mouza is thirteen and total sample size is one hundred and thirty. Number of sample for each mouza is ten and sample selected through systematic sampling method and samples are distributed in the whole area. People's perceptions have been considered for analysis the performance and level of development.

Data analysis: After collection the primary data

arranged it in a proper manner and prepared in a tabular format. Calculate percentage, rearranged the percentage either descending or ascending order on the basis of nature of parameters, calculate cumulative rank, performance rank for better inferences and measurement the level of rural development. Calculate class interval and apply this technique for the preparation of level of rural development categorization. Used Arc GIS software for preparation of maps for better presentation and easily understand.

Result and discussion

To measuring the disparity and performance of Village Panchayat in rural development in the entire geographical area consider twenty parameters for come to the decisions. These are as follows:

1. Percentage of household access irrigation facilities during winter.

2. Percentage of household access good quality of irrigation facilities.

3. Percentage of household distance lees than 2 Km. for access the primary school.

4. Percentage of household faces problems to access the drinking water in summer.

5. Percentage of household distance less than 500 m to access the safe drinking water from their households.

6. Percentage of household benefitted by the MGNREGS scheme.

7. Percentage of household got works fifteen to thirty days by the MGNREGS scheme.

8. Availability of moderate quality black topped road in the area (in percentage).

9. Bad condition of rural road in rainy season (in percentage).

10. Water logging on the road in rainy season (in percentage).

11. Availability of muddy road in the area (in percentage).

12. Availability of electricity (in percentage).

13. Bad quality of power supply during summer (in percentage).

14. Peoples have known regarding Gram Sansad and Gram Sabha meeting and the function of these meeting (in percentage).

15. Programmes regarding cleanliness and beautification of the environment (percentage of respondents).

16. Peoples education level (up to primary in percentage).

17. Percentage of household has their own latrine.

18. Percentage of household has septic latrine.

19. Male literacy rate (in percentage).

20. Female literacy rate (in percentage).

Ranking done of these said criteria, then calculate cumulative rank and calculate performance rank on the basis of cumulative rank. Applied class interval method on the performance rank and categorized the mouza according to the class interval method.

Table 1: Percentages of availibity, facilities and oppurtunity of the said above criteria

Sl No.	*Name of the village*	*A*	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*
1	Khajurberia	20	50	90	30	100	57.14	75	30	80	80
2	Bagmari	62.5	80	100	80	80	100	33.33	60	50	80
3	Rautouri	100	100	90	30	87.5	57.14	50	30	40	50
4	Haripur	100	66.67	90	30	87.5	33.33	75	20	30	50
5	Naikundi	50	33.33	90	60	60	50	100	00	30	54.54
6	Jashnan	100	50	100	50	90	100	70	20	50	40
7	Namal	100	80	80	60	80	75	50	20	80	60

Table 1: Percentages of availibity, facilities and oppurtunity of the said above criteria (continue)

Sl No.	*Name of the village*	*A*	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*
8	Mandergechia	100	50	100	60	90	66.67	50	20	70	46.15
9	Jamburbasan	75	25	100	80	88.89	66.67	83.33	10	80	10
10	Fatehpur	100	42.88	90	100	90	50	40	10	40	50
11	Mahammadpur	62.5	33.33	80	100	100	50	100	00	60	63.64
12	Dhitaibasan	00	00	90	60	90	33.33	00	60	50	80
13	Kumarara	80	70	100	80	60	40	50	30	50	80

Contuning...

Sl. No.	*Name of the village*	*K*	*L*	*M*	*N*	*O*	*P*	*Q*	*R*	*S*	*T*
1	Khajurberia	10	100	20	50	20	58	100	70	50.98	49.01
2	Bagmari	30	90	80	90	10	34.03	100	80	37.74	62.26
3	Rautouri	30	100	30	70	20	52.94	90	40	51.35	58.65
4	Haripur	10	100	50	60	10	50	90	70	45	55
5	Naikundi	20	100	30	90	10	49.05	100	70	58.18	34.54
6	Jashnan	20	100	30	100	00	56.52	100	50	48.83	51.16
7	Namal	40	100	10	70	00	52.94	100	60	52.63	47.37
8	Mandergechia	63.64	100	60	90	20	50.98	80	30	52.94	47.05
9	Jamburbasan	70	100	20	60	40	61.22	80	40	58.33	41.67
10	Fatehpur	20	100	60	90	10	37.5	100	60	52.63	47.37
11	Mahammadpur	33.33	100	30	90	30	34.15	90	50	54.76	45.24
12	Dhitaibasan	30	90	80	90	20	75.68	90	60	52.38	47.61
13	Kumarara	40	100	50	80	00	30.90	100	40	52.94	47.05

A, B ….T Reveals the parameters.

Source: Primary survey and computed by authors, September-2018.

Table 2: Ranking of the percentage availability, facilities and oppurtunity of the said criteria

Sl. No.	*Name of the village*	*A*	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*
		D.O.			*A.O.*	*D.O.*				*A.O.*	
1	Khajurberia	12	7	8.41	2	1.5	6.5	4.5	4	12	11.5
2	Bagmari	9.5	2.5	3	10	10.5	1.5	12	1.5	6.5	11.5
3	Rautouri	3.41	1	8.41	2	8.5	6.5	8.5	4	3.5	5
4	Haripur	3.41	5	8.41	2	8.5	12.5	4.5	7.5	1.5	5
5	Naikundi	11	10.5	8.41	7	12.5	9	1.5	12.5	1.5	7

Table 2: Ranking of the percentage availability, facilities and oppurtunity of the said criteria (continue)

Sl. No.	*Name of the village*	*A*	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*
		D.O.			*A.O.*	*D.O.*				*A.O.*	
6	Jashnan	3.41	7	3	4	4.5	1.5	6	7.5	6.5	2
7	Namal	3.41	2.5	12.5	7	10.5	3	8.5	7.5	12	8
8	Mandergechia	3.41	7	3	7	4.5	4.5	8.5	7.5	10	3
9	Jamburbasan	8	12	3	10	7	4.5	3	10.5	12	1
10	Fatehpur	3.41	9	8.41	12.5	4.5	9	11	10.5	3.5	5
11	Mahammadpur	9.5	10.5	12.5	12.5	1.5	9	1.5	12.5	9	9
12	Dhitaibasan	13	13	8.41	7	4.5	12.5	13	1.5	6.5	11.5
13	Kumarara	7	4	3	10	12.5	11	8.5	4	6.5	11.5

Contuning...

Sl. No.	*Name of the village*	*A*	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*
		D.O.			*A.O.*	*D.O.*				*A.O.*	
1	Khajurberia	12	7	8.41	2	1.5	6.5	4.5	4	12	11.5
2	Bagmari	9.5	2.5	3	10	10.5	1.5	12	1.5	6.5	11.5
3	Rautouri	3.41	1	8.41	2	8.5	6.5	8.5	4	3.5	5
4	Haripur	3.41	5	8.41	2	8.5	12.5	4.5	7.5	1.5	5
5	Naikundi	11	10.5	8.41	7	12.5	9	1.5	12.5	1.5	7
6	Jashnan	3.41	7	3	4	4.5	1.5	6	7.5	6.5	2
7	Namal	3.41	2.5	12.5	7	10.5	3	8.5	7.5	12	8
8	Mandergechia	3.41	7	3	7	4.5	4.5	8.5	7.5	10	3
9	Jamburbasan	8	12	3	10	7	4.5	3	10.5	12	1
10	Fatehpur	3.41	9	8.41	12.5	4.5	9	11	10.5	3.5	5
11	Mahammadpur	9.5	10.5	12.5	12.5	1.5	9	1.5	12.5	9	9
12	Dhitaibasan	13	13	8.41	7	4.5	12.5	13	1.5	6.5	11.5
13	Kumarara	7	4	3	10	12.5	11	8.5	4	6.5	11.5

A.O.-Ascending order, D.O.-Descending order

Source: Computed by authors, September-2018.

Table 3: Calculation for Performance Rank

Sl.No.	*Name of the village*	*Cumulative rank = ∑ (A+B+----------+S+T)*		*Performance rank*
1	Khajurberia	121.91	PR = ∑ (A+B+----------+S+T)/N Where, PR= Performance rank N = No. of parameters considered.	6.10
2	Bagmari	145.5		7.28
3	Rautouri	120.32		6.02
4	Haripur	129.82		6.49
5	Naikundi	140.41		7.02
6	Jashnan	105.41		5.27
7	Namal	143.41		7.17
8	Mandergechia	142.41		7.12
9	Jamburbasan	143.5		7.18
10	Fatehpur	144.32		7.22
11	Mahammadpur	157.5		7.88
12	Dhitaibasan	162.41		8.12
13	Kumarara	164		8.20

Source: Computed by authors, September-2018.

Table 4: Categorization of villages by the uses of class interval method on the basis of Performance Rank in table no.3.

Class	*Name of Village*	*Development level*
0-6.00	Jashnan	Very High
6.01 -6.74	Khajurberia, Rautouri, Haripur	High
6.75 -7.48	Naikundi, Namal, Mandergechia, Jamburbasan, Fatehpur, Bagmari	Moderately high
7.49 -8.22	Mahammadpur, Dhitaibasan, Kumarara	Low

Source: Computed by authors, September-2018.

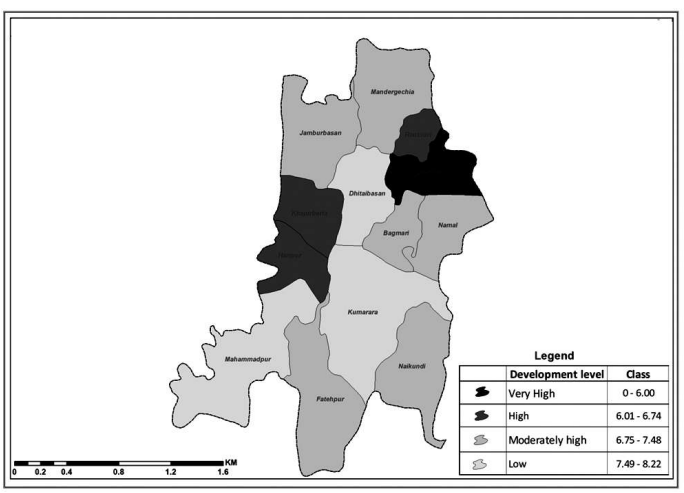

Fig. 2: Disparities in Rural Development
Source: Prepared by authors from table no. 4

On the basis of the performance rank, development level of different villages of Kumarara Gram Panchay at in Purba Medinipur district of West Bengal are varied and disparity in development and performance of village Panchayat regarding rural development is the common scenario of the entire geographical area. Among the thirteen village's level of development and performance of Village Panchayat regarding rural development is low in three villages namely Mahammadpur, Dhitaibasan, Kumarara. But it's true that overall performance of the Village Panchayat is so well in the aspect of rural development and ten villages namely Jashnan, Khajurberia, Rautouri, Haripur, Naikundi, Namal, Mandergechia, Jamburbasan, Fatehpur, Bagmari achieve better condition of rural development. In many cases also site and situation is also factor for the proper and timely implementation of different developmental process and scheme. So, we cannot deny this and every time Gram Panchayat not responsible for this unwanted lower rate of developmental level. Not only that sometimes remote location, problem of boundary delimitation, critical geographical location, depressed terrain character, lack of soil fertility, problems of land and space, vastness of the area, lack of proper funding, inaccessibility, etc is also hindrance factor for the better performance of Village Panchayat regarding smoothly prevails the rural development work in the village area. Consequently inter and intra regional disparity in the development of rural area is the common phenomena.

Major findings

Major findings of this work area as follows:

1. Performance of Village Panchayat regarding the development of rural area are varies from place to place, village to village and mouza to mouza.

2. Inter and intra Panchayat disparity in rural development is the common phenomena in the rural West Bengal.

3. Effectiveness of Village Panchayat performance regarding the developmental work in the village area also depend on location, size of the village, site and situation, availability of natural resources, geographical characteristics of the village.

4. Development of rural areas consider the development of agriculture, irrigation, forestry, employment, sanitation, housing, environmental cleanliness and beautification, safe drinking water, education, public health, electricity, rural roads, etc.

Suggestions for development

If the local authority implement following suggestions in future problems of disparity regarding rural development can be reduced and performance of Village Panchayat may be better effective in the said geographical area regarding developmental work in village area. These are as follows:

1. Focused on the local demands during the time of developmental plan preparation.

2. Prepared the plan regarding developmental work in the village area on the priority basis.

3. Plan preparation and implementation time incorporate the local people for better performance of the development work in the village area.

4. Prepared the separate plan for each village ward instead of generalized plan like one plan for one Gram Panchayat area.

5. Reduces the biasness during the time of development plan preparation and implementation.

Conclusion

We may say here condition of rural development in the entire geographical area is very high to moderately high in the seventy percent area of the entire Gram Panchayat and only thirty percent area remains on the low condition of rural development scenario and this character reveals the better quality of Village Panchayat performance regarding the developmental work in the entire geographical area. Many hindrances factors are also responsible here that we have already explained in above. We may conclude that implement the above given suggestions for betterment of present performance and improving the rural livelihood systems and enhance the rural quality of life. The outcome of this works and suggestions may be implementing in the others parts of the state and helpful for sustainable rural development.

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Quasi-natural Hazards of Groundwater and its Abatement: A Case Study of Amdanga Block, North 24 Parganas, West Bengal, India

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S. Biswas, A. Debsarkar & G. Bhandari

Abstract

Global fresh water has become a limited resource with the ongoing trend of increase in population. Scarcity of fresh water has struck various parts of the globe, particularly in developing countries due to its sheer mismanagement. Quality, quantity and reliability of water are three major factors interfering with the quality of urban and rural life. Sustainable management of water can only be a feasible solution in supplying safe water for everybody. The case study of Amdanga block, under North 24 Parganas district of West Bengal, India, is an ideal example for quality-related scarcity of safe water. In this region, rain is incidentally more than sufficient leading to flooding of vast areas particularly during late monsoon. Uncontrolled abstraction of groundwater has also made the arsenic-iron contamination of groundwater a quasi-natural hazard. A cost-effective water management policy framework based on rain water harvesting can be an effective solution to overcome the problem.

Keyword: *Arsenic-iron contamination, Rain water harvesting. Sustainable water management, quasi-natural hazard*

Introduction

Water is presently reckoned as a 'fugitive resource', more precisely defined as an agent flowing through space, time, landscape, society and economy of a nation(UNESCO, 2012). Uncontrolled population pressure continues changing land-use pattern which further changesthe environment. Water is not the only measure of development; it also helps indirectly to reduce poverty. Human beings cannot create new water and whatever water is used in any manner does not always reappear in a re-usable form (Iyer R.R., 2000). Modification of water resource by human is the sources of water crises. This intensifying water related tensions and conflict put extensive pressure on environment. In developing countries,uncontrolled increasing trend of water demand makes the situation more complicated as groundwater is being treated as a private property. UNDP (2006) reported that, in developing countries 1.8 million child deaths happen per year due to diarrhoea and another 443 million school day loss happen only due to water related illness. So far quality of water is a matter of safety of life. Again,the quality of water is a relative term and depends on 'how it is used for'. On the other hand, poor drainage and irrigation create another 10% water logging and salinization [World Water Assessment Programme (WWAP) 2015]. Simultaneously our lifestyle has become water-centric and sometimes wateris treatedas a luxury good or as if 'birth right'. According to Planning commission of India, India is going to face an acute shortage of fresh water in coming 30 to 40 years with projected total water demand of 843 BCM by 2025 (CWC, 2013). Whereas every year flood is associated with so many damages like cropped area, total affected area, value of damage to crop, affected population, loss of human lives and cattle, damage to house and public wealth etc. (CWC, 2013). National Water Policy (NWP 2002) emphasizes on not to exploit the ground water but recharge it to ensure the social equity and assigns the highest priority to drinking water. But it still remainsin the form of a paper declaration. In view of the gravity of the problem, it is required to conserve water scientifically with good governance, planning and implementation. Roof

S. Biswas, Department of Geography, Mrinalini Datta Mahavidyapith, Birati, Kolkata (West Bengal), India,
Email: satabdibiswas2009@gmail.com

A. Debsarkar, Department of Civil Engineering, Jadavpur University, Kolkata (West Bengal), India

G. Bhandari, Department of Civil Engineering, Jadavpur University, Kolkata (West Bengal), India

top rain water harvesting may be of much help to solve water related problems both in urban and rural areas. However, RWH means to understand the value of rain and its optimum use to meet the tremendous demand. South 24 Parganas, and part of Howrah, North 24 Parganas, have also been affected by contamination of ground water with arsenic and iron. Generally in South Bengal, high rainfall and plenty of groundwater are easily available to people. Consequently, the inhabitants of this part of the state, as such, do not face any water scarcity but in terms of quality it is offering a serious threat. Amdanga block under North 24 parganas, West Bengal, India has a similar kind of problem. People are fully depended on ground water for every sector. Nowadays even government started surface water supply to the communities but mentally these people pay more trust on tube wells. The dichotomy is that, huge amount of rainfall with water logging in rainy season and water scarcity in summerare found side by side. However,in number of cases, patients are coming to local health centres with the symptoms of arsenicosis. Under such circumstances, rational use of this excess water and recharge can be considered as an easier way to overcome this problem of geogenic contamination of groundwater.

The present study was undertaken with the objective of assessing the status of groundwater along with the scope of RWH in the study area. The willingness to adopt RWH by common people in the study area is also explored under the purview of the present study.

Study area: Amdanga, mainly a rural block, is situated at western side of the North 24 Parganas in the state of West Bengal, India. It is surrounded by Haringhata block of Nadia district in the North, Habra II in the East, Barasat I in the South and Barrackpore II in the West. Total population of the block is 191673. Total surveyed villages are 8 with 31033 populations, which is 16.19 % of the block. Surveyed population is 983 with 179 household, which is the 3.13 % of these 8 villages.The survey was carried out on the basis of random stratified sampling. This sampling covers upper, middle and lower rung of the society with a view to findout the people who practiced RWH in any form. According to 2011 census, it has 64 tap water, 76 hand pumps, 47 tubewells, 61 tank or ponds for drinking purposes. People have 66.35% permanent houses, 31.76% semi permanent houses, 1.4% temporary houses. Sex ratio of the block is 944 and for rural it is 943.In this block, as per 2011 census, majority of people (112093 people or 58.48%) was Muslim by religion, followed by the Hindu population of 79159 (41.30%), with most of them belonging to agrarian society.

Materials and Methods

Under the purview of present study both primary and secondary data were used for the sake of logical interpretation. A questionnaire schedule was prepared to collect primary data. Secondary data in the form of 31 years (1971-2001) of rainfall data and 13 years (2001-2013) of well data were collected from IMD Puna, State Water Investigation Department (SWID) and 4th Minor Irrigation Census (MI Census) respectively. SPSS software (version 21) was used to analyse the physical and socio-economic profile of the study area. Multiple linear regression model was used toexplore the relationship between socio-economic conditions and RWH.

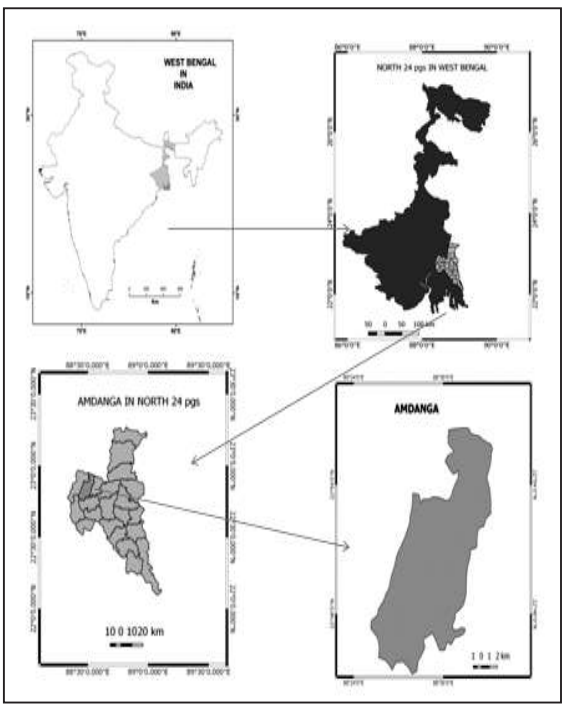

Fig.1: Location of Study Area

Results and Discussion

Rainfall status of Study Area: Thirty two years of monsoon rainfall data (1971 to 2002) from June to September shows a mean value of 1289.01mm with astandard deviation of 252.12 mm. It implies that the variation of rainfall from mean is not significantly high and hence it is reliable. This reliability is further established from the histogram. It is almost normal with uni-modal curve and the nature of kurtosis is mesokurtic.

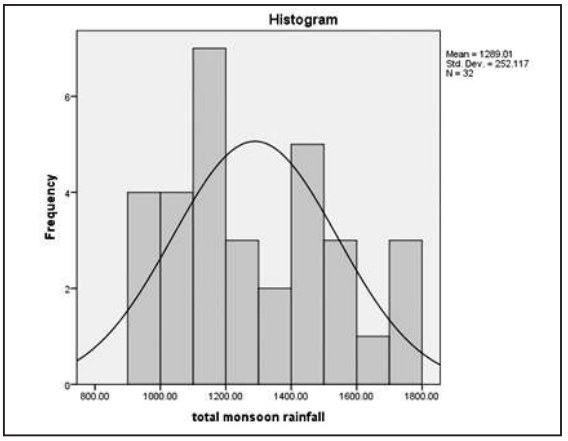

Fig.2: Monsoon Rainfall of 32 Years

The following table depicts the results of statistical analysis of rainfall data carried out based on SPSS software (version 21).

Table 1: Summary of Statistical Analysis of Rainfall Data (1971-2001) Source: IMD Pune.

Parameters		*June to July mean rainfall (mm)*	*August to September rainfall (mm)*	*October to November rainfall (mm)*
N	Valid	32	32	32
	Missing	0	0	0
Std. Deviation		88.14643	93.97895	43.20678
Skewness		1.046	1.075	0.468
Std. Error of Skewness		0.414	0.414	0.414
Kurtosis		1.453	1.145	0.712
Std. Error of Kurtosis		0.809	0.809	0.809
Range		406.27	402.71	197.00
Minimum		161.40	203.16	8.38
Maximum		567.67	605.87	205.38

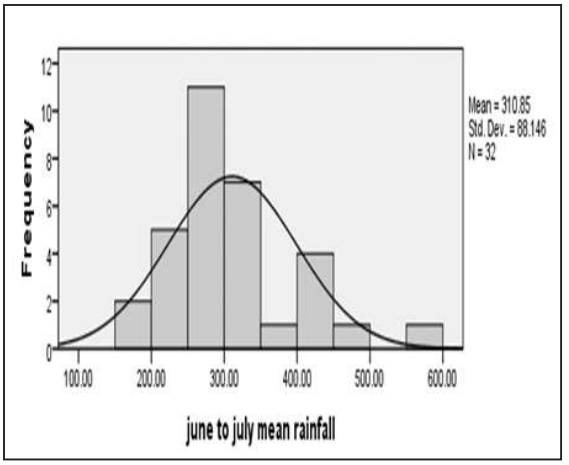

Fig.3: Rainfall of June to July (32year)

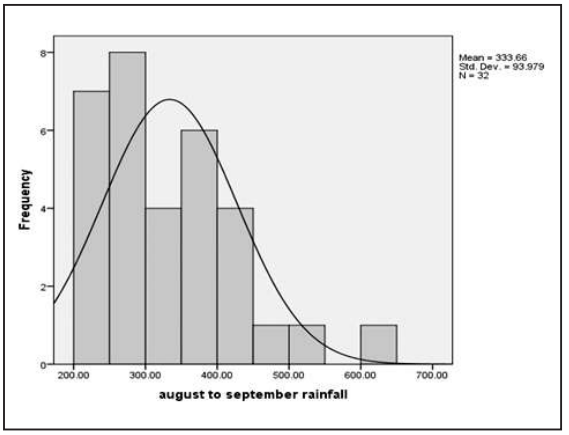

Fig.4: Rainfall of August to September (32 year)

In the rainfall distribution pattern for June -July months over the same period also exhibits a normal or bell shaped curve with a mean value of 89.40 mm and standard deviation of 43.21 mm. It is highly skewed with positive value 1.046, kurtosis value of 1.453, range 406.27 lying between minimum 161.40 to maximum 567.67 mm. Similarly during August to September months, rainfall distribution is also characterized by highly positive skewed nature with 1.075, leptokurtic. It signifies unimodal peakness of very high degree. Thus, the quantity of rain available is high and it is very closely distributed from mean and rainfall happened in consecutive days with range of 402.71 mm. The distribution pattern during October - November months is slightly positive skewed with leptokurtic, with the range of 197 mm, maximum 205.38 mm and minimum 83.8 mm respectively. Thus, the general trend of historical rainfall is huge and more than sufficient.Though out the entire study period, the standard deviation values obtained are reasonably low, which imply closely grouped data nearer to the respective mean values and the departure is very small with respect to mean.The rainfall distribution pattern, observed as a whole over the moths of June to November over the period of 32 years (1971-2002) implies a huge potential for RWH in the study area.

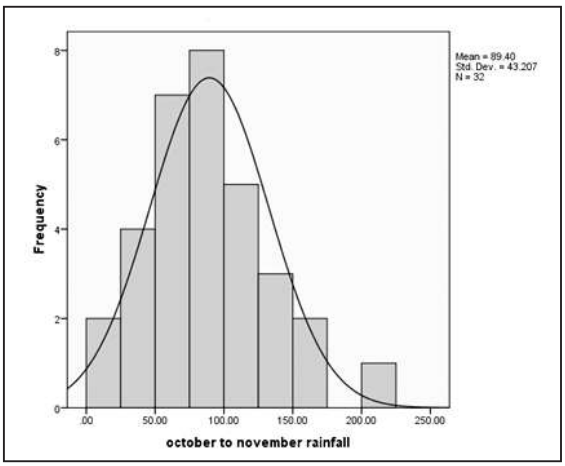

Fig.5: Rainfall October to November (32year)

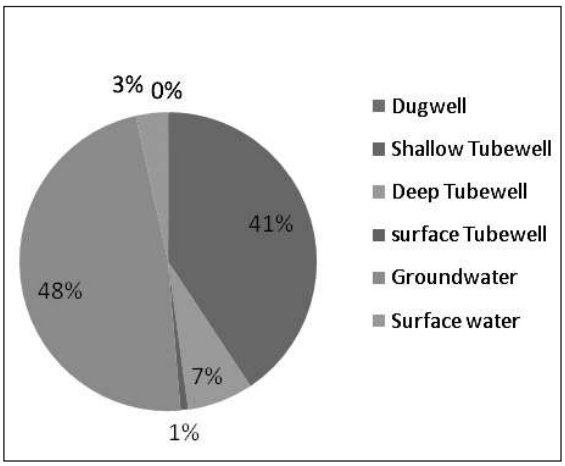

Fig.6: Percentage of Culturable Command Area of North 24 pgs, 4th Minor Irrigation Census

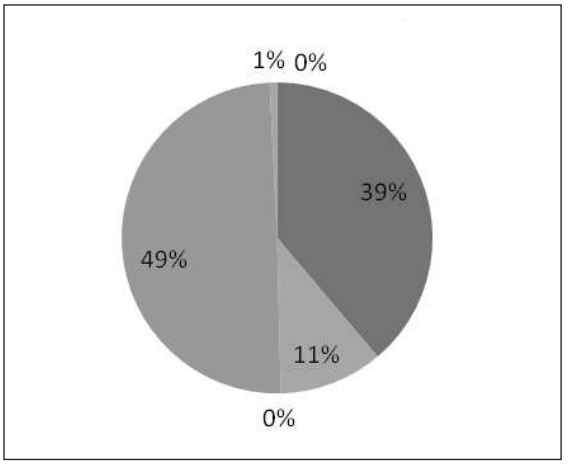

Fig.7: Percentage of Culturable Command Area of Amdanga Block
Source: 4th Minor Irrigation Census in W.B (2006-2007)

The Culturable Command Area (CCA) of North 24 Parganas,is largely irrigated byshallow tubewells and ground water scheme. An identical trend is observed in Amdanga block. Combination of shallow tube well and surface tubewell is more than 89% and 88% as found in respective two areas. The surface irrigation is rarely practised here, which is only 3% in North 24 Pgs and 1% in Amdanga respectively. Deep tube wells are safe in terms of arsenic but in Amdangablock deep tube well irrigated CCA is 11% while the same is 7% for the entire district. In the study area, a large portion of irrigation is done by shallow tubewell which is highly alarming. Geologically, Amdanga is an arsenic contaminated area which is observed just 20 to 50 m below from the ground level. Due to the prevalence of cultivation throughout the year and in the practice of Boro cultivation, the farmers have to solely depend on shallow tubewells for adequate supply of irrigation water.

Ground water profile: In Amdanga block, 5 observation wells were excavated and maintained by SWID, over the period of 2001 to 2013 during pre and post monsoon seasons. All these wells have a general declining negative trend of water lavel with respect to time. In the case of Idga Padmanavpur area, the post monsoon curve shows sharp declination of ground water level even to the extent of more than 5m since 2012 because of intensification of Boro cultivation. In West Bengal, as per 4th MI Census data, the area of Boro cultivation has increased by an amount of 33.15% compared to 3rdMI Census. Hence, percentage of drafting of ground water has also increased for the same. In the case of pre monsoon curve of same well, as a whole, the overall trend of ground water level is observed to be declining. In this case, the residual errors are 26.8% and 62.4% during pre monsoon and post monsoon respectively.

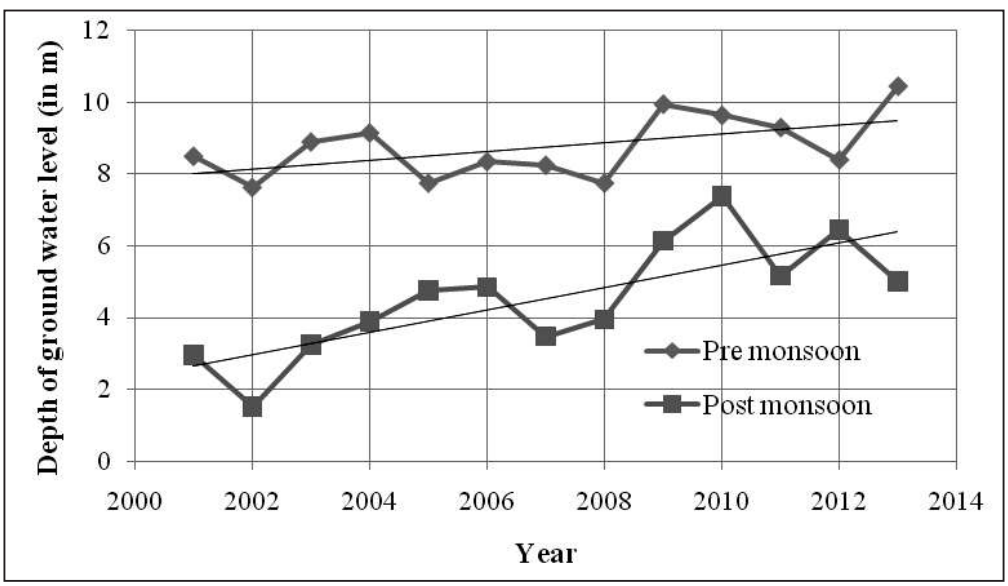

Fig. 8: Ground water level of Idgapadmanavpur Well (13 years) (Source: SWID, Kolkata, 2018)

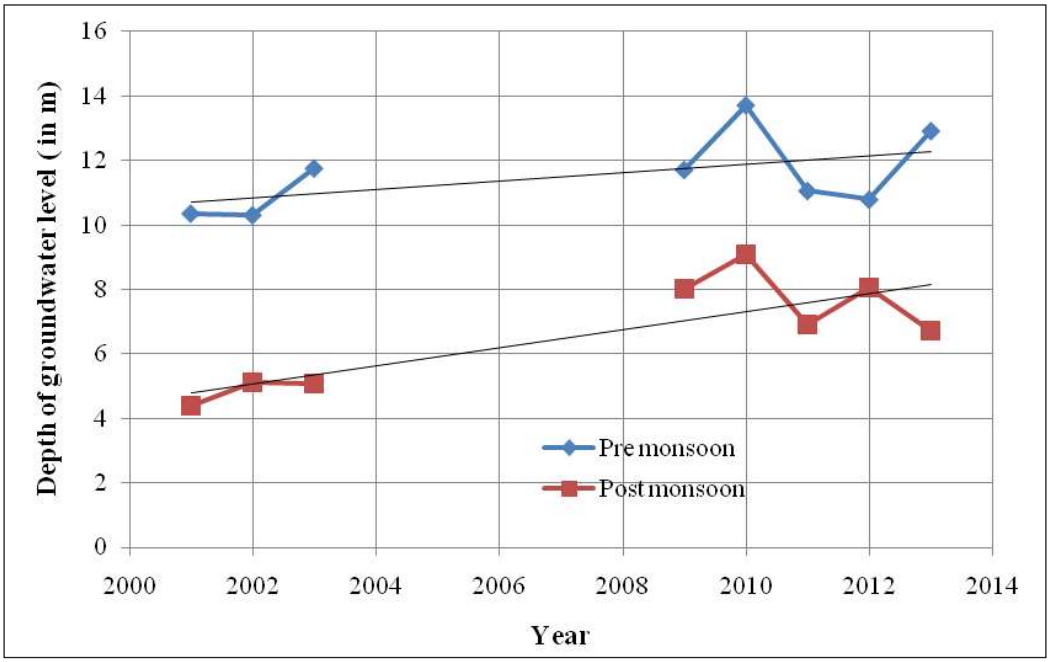

Fig.9: Ground water level of Amdanga B.D.O Well (13 years)

In the case of Amdanga B.D.O well, the post monsoon water table is observed to be declining over last couple of years. It is slightly more than 2.0m in the year 2013. However, for pre monsoon curve the trend is little bit fluctuating. In case of Amdanga B.D.O well, during 2004 - 2008, the well got choked and was revived again in the year 2009. Hence, some data are missing during this period.

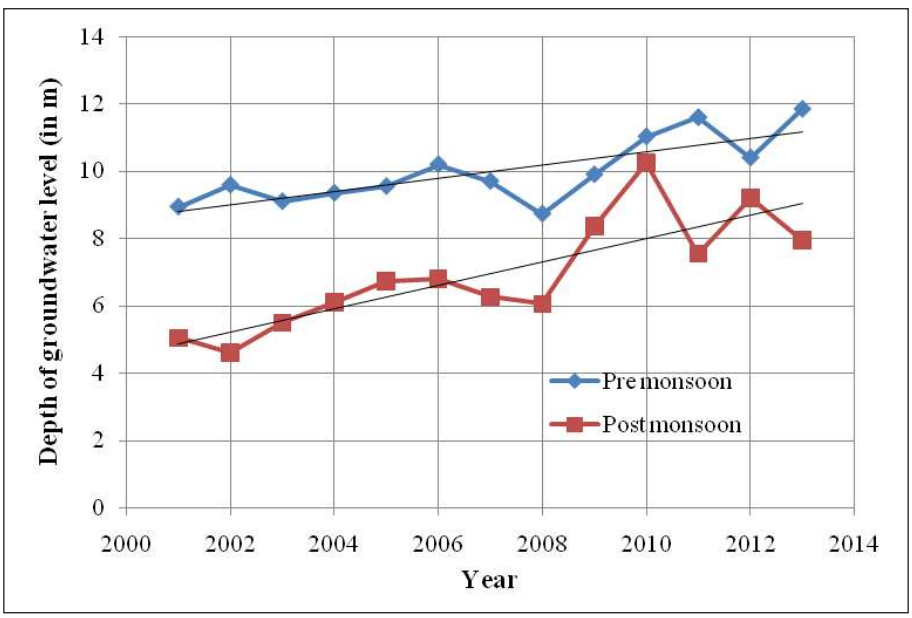

Fig. 10: Ground water level of Beraberia S.H.C well (13 years)

In case of Beraberia S.H.C well an almost identical trend was observed in post monsoon. There was a sharp decline of depth of water level in the year of 2013 to the tune of nearly 5.0 m, whichis very significant. During pre monsoon as usual a fluctuating trend was observed.

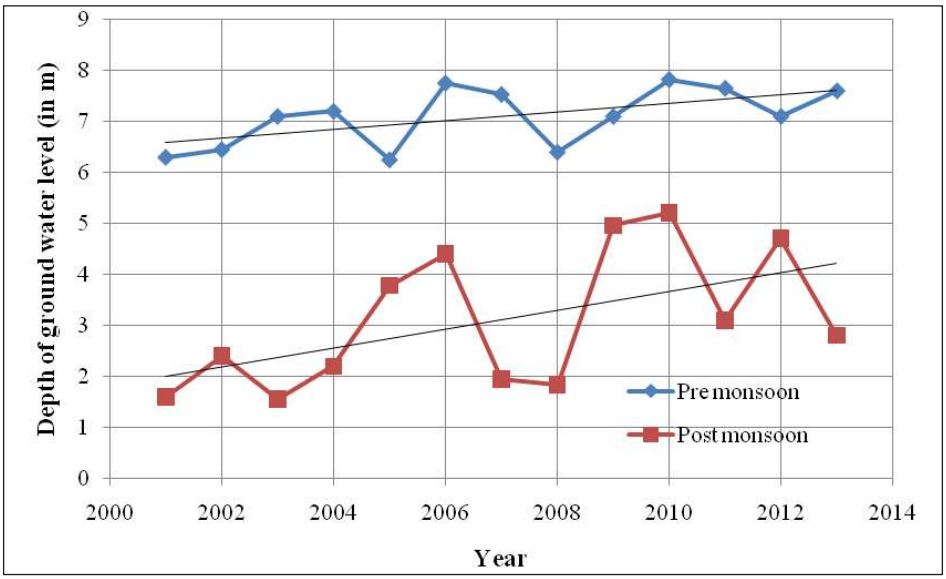

Fig. 11: Ground water level of Moricha S.H.C well (13 years)

For Moricha S.H.C. well the fluctuation of post monsoon curve was found very sharp declining in 2007, 2008, 2011and again in 2013. That is near about 2.5m, 0.3m, more than 2.0 m and 2.0 m respectively. Pre monsoon curve was fluctuating in nature.

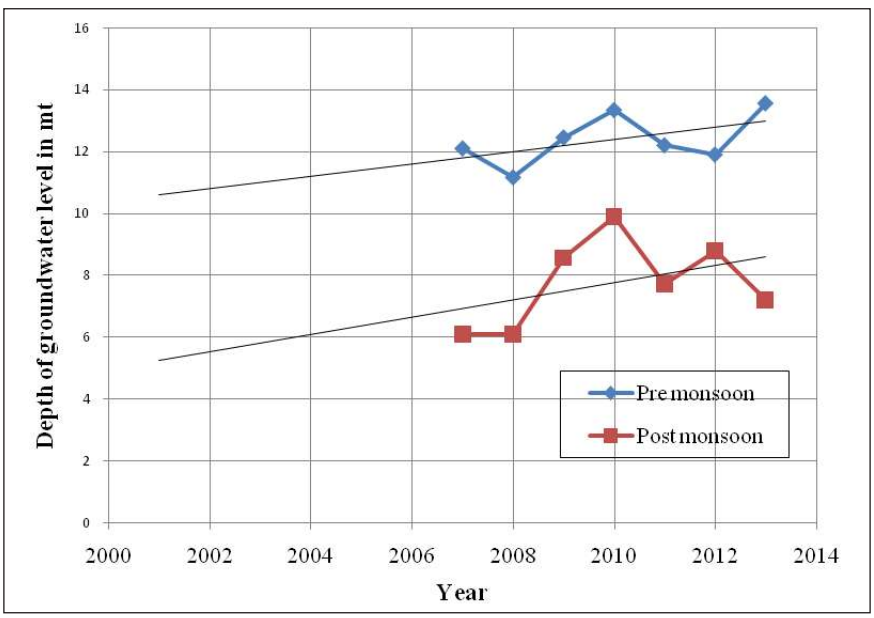

Fig. 12: Ground water level of Sirashini Primary School well (13 years)

The same incident of Amdanga B.D.O well took place with Sirashini well.Consequently, some data of water level were missing. There was a sharp decline of 1.6 m in the year 2013. The situation, in this case, is more alarming. Most of the farmers herecultivate sugarcane along with Boro cultivation and off season vegetables. Hence, water demand is very high. There was an urgent need to explore an alternative water source in the form of harvested rain water irrespective of its storage period.

Socio-economic profile of study area

Prior to the planning phase of a RWH project, it is essential toconduct a demographic study on human lives, their occupation, willingness and other socio-economic aspects for its success. Ministry of Water Resources (**MOWR) (2002**) suggested traditional as well as roof top rain water harvesting for future sustainability. Willingness to use harvested water for any domestic purpose is considered as a dependent variable with used harvested water for any purpose. Whereas, measurement of roof area and number of literate female membersin a family are considered as independent variables in multiple linear regression model.

Table 2: Summary of Multiple Linear Regression Model

Model	*R*	*R Square*	*Adjusted R Square*	*Std. Error of the Estimate*
1	0.363[a]	0.132	0.117	0.471

a. Predictors: (Constant), total literate female in family, measurement of roof area (sq feet), used harvested water for any purpose

Anova[a]

Model		*Sum of Squares*	*df*	*Mean Square*	*F*	*Sig.*
1	Regression	5.901	3	1.967	8.868	0.000[b]
	Residual	38.814	175	0.222		
	Total	44.715	178			

a. Dependent Variable: want to use RWH in future

b. Predictors: (Constant), total literate female in family, measurement of roof area (sq feet), used harvested water for any purpose

Coefficients[a]

Model		*Unstandardized Coefficients*		*Standardized Coefficients*	*t*	*Sig.*	*95.0% Confidence Interval for B*	
		B	*Std. Error*	*Beta*			*Lower Bound*	*Upper Bound*
1	(Constant)	0.225	0.089		2.517	0.013	0.049	0.401
	used harvested water for any purpose	0.376	0.074	0.369	5.115	0.000	0.231	0.521
	measurement of roof area (sq. feet)	0.000	0.000	0.114	1.591	0.113	0.000	0.001
	total literate female in family	0.021	0.031	0.048	0.679	0.498	-0.040	0.082

a. Dependent Variable: want to use RWH in future

In this model the coefficient of the depended variable 'want to use RWH in future'is significant when other three independent variables like 'used harvested water for any purpose', 'measurement of roof area' and 'total literate female in family' are held constant. In the model summary, independent variable 'used harvested water for any purpose' is also statistically significant. Underun-standardized coefficient, all the results are found positive. Increase in X is responsible for increase in Y. Among them highest value of 'want to use RWH in future'(Y variable) is +0.376 or 36.7%, which is explained by previously 'used harvested water for any purpose' (X variables). In standardized coefficient Beta one unit of change in (X_1) i.e. the independent variable 'used harvested water for any purpose' would increase by 0.37 times the change in predicted variable (Y) i.e. 'want to use RWH in future'. This independent variable significantly predicts the dependent variable. In the coefficient table the standard error is very low i.e. 0.89 which indicates the overall model is reasonably good to predict the future condition. The interception is 0.225, which implies that the dependent variable is 0.225 when X is zero. The interval of confidence of forecast of the model at 95% is 0.05 to 0.4%.

Here, the adjusted R square is 11.7% i.e. 11.7% of dependent variable can be explained by three independent variables. It is a prediction of sample in respect of whole population. Standard error of estimation is 47.1%. It explains measurement of variability of estimated dependent variable. In ANOVA table, residual value is obtained as 38.814, which means some other factors which mayinfluence the future willingness of RWH are not included in that model. Sum square of regression (Y) is 5.901 when X is 0. It is further statistically significant in ANOVA. Here, this independent variable 'use of harvested water for any purpose' is statistically significant to predict the 'want to use RWH in future'. The other two variables of concern are rejected.

Conclusion

In the study area, one of the major problems is water scarcity. At the same time in monsoon and post monsoon seasons, water accumulation is another big problem with the breeding of mosquitoes. Arsenic and iron contamination is considered to be a serious problem in the locality but most of the inhabitants are not aware of the effects of arsenic. The multiple linear regression model has been found significant. It is also significant for those people who are already practising harvested water for any purpose. In our study area, a large portion of the people is poor and they are forced to buy water for drinking purpose without knowing its quality. Based on historical data,the rainfall is deemed to be reliable. Different government agencies like CGWB, SWD etc. are concerned about water quality and are paying attention towards RWH. It was found from door to door survey that a very small section of household collects rainwater for domestic use and even few of them also drink this water. So it is not a new thing to them. Large section of common people is not aware about this 'safe and free of cost' water. NGOs and Government agencies are supposed to come forward to popularizethe practice of RWH for the sake of sustainable low cost water management. More and more studies and efforts are needed to popularize the same.

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Socio-demographic Factors and Malnutrition: An Analysis of Association from Indian Sundarban

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Rituparna Hajra
& Rajarshi Mitra

Abstract

The Global Nutrition Report 2017 stated that India is facing 'significant burden' of under- nutrition including 21% of under- five severely malnourished children and over half of the Indian women of reproductive age (51%) suffer from anaemia. Malnutrition results from a combination of various factors. The purpose of this study is to assess the association between socio- demographic factors and malnutrition among child and adults in the islands of Indian Sundarban Delta (ISD). The western boundary of the ISD is the major focus of this study specifically Sagar, Ghoramara and Mousani Islands. This study attempts to estimate the influence of age structure, gender, income, occupation and location of the island on the malnutrition condition by means of regression using collected primary survey data from randomly selected households within these islands. The result suggests that child and women are likely to suffer more from malnutrition. Income has negative association with malnutrition and occupation also has some significance with nutrition condition. Given the importance of malnutrition as major health problem, this study also tries to offer a number of concrete policy recommendations to improve the nutritional condition for both child and adults.

Keywords: *Child malnutrition; adult malnutrition; socio- demographic factors; regression; Indian Sundarban*

Introduction

Malnutrition is a major health issue as it affects human development and economy of the country. Proper nutrition of children leads to adequate growth and good health which is essential for future foundation of any country (Kumar et al. 2015). Still, in twenty first century around 2 billion people in the world suffer from various forms of malnutrition (IFAD/FAO/WFP 2011). Globally 2.6 billion children are dying each year due to malnutrition as an underlying cause (Black et al. 2008; UNICEF 2011) and one out of four of the Worlds' children (de Onis et al. 2011; Hakim and Kamruzzaman 2015) and one out of three children in developing countries are stunted (bodies fail to grow fully) due to malnutrition (Black et al. 2008). Undernutrition accounts for 11% of the global burden of disease (Black et al. 2008). Not only on demographic structure but malnutrition has also have negative impact on country's economy as they may lose 2% to 3% of their Gross Domestic Product (GDP) as a result of iron, iodine, and zinc deficiencies (Horton et al. 2008). Malnutrition among adults makes them earn at least 20% less than those who aren't (Grantham-McGregor et al. 2007). Under five mortality remains high in sub Saharan Africa (92/1000 live births) and Southern Asia (55/1000 live births), compared with developed countries (6/1000 live births) (Müller and Krawinkel 2005; Kumar et al. 2015). The major causes behind malnutrition in developing countries include poverty, household food insecurity, gender bias, population pressure, food taboos, health, hygiene and nutritional negligence, famine and man-made disasters (Hakim et al. 2015; Ghosh and Shah 2004; Kamruzzaman and hakim 2015; Fakir and Rahman 2015). Other social factors including intra-family conflicts, lower livelihoods, child abuse and deprivation of schooling chance also have significant influence on malnutrition in developing countries (Weitzmawqn 1987; Kuddus

Rituparna Hajra, Department of Geography, Sarsuna College, Kolkata - 700061
Email: rituparnahajra2502@gmail.com

Rajarshi Mitra, Department of Environmental Science, Vivekananda College, Thakurpukur, Kolkata - 700063
Email: rajarshimitra@yahoo.com

and Rahman 2015; Kamruzzaman and Hakim 2016; Hakim 2015).

Even after so many years of independence, India ranks 11th out of 136 countries with 48% of stunted children under the age of five, , 43% are underweight, and 20% are wasted (UNICEF 2009). It is obvious that poverty is the main cause of hunger and malnutrition, and gender inequality is another major cause behind women malnutrition. Undernutrition is more prevalent in rural areas and anaemia for both men and women is slightly higher in rural areas than in urban areas (Imai et al. 2014). Malnutrition affects not only children but also adult population in India. NHFS-3 report stated that according to the body mass index (BMI) 33% of married women and 28% of men are living below the standard nutrition level (NHFS- 3 2008). National Family Health Surveys (NFHS) reveal that in India malnutrition is not the result of a single cause; the problem is comprehensive, the causes acting individually or in combination with other complex factors like poverty, purchasing power, health care, ignorance on nutrition, unemployment, health education, female illiteracy, social convention, knowledge and awareness (Anon., 2012). Similar factors are prevailing in rural Bengal. In 2012-13, the prevalence of anaemia among adult women ranged from one-third in Kerala to three-fourths in West Bengal of the population (Meenakshi 2016). In West Bengal 45% of children under age of five years are stunted or too short for their age, which indicates that they have been, undernourished (NHFS-3 2008). This study tries to highlight the associated factors and issues with malnutrition from the rural Bengal giving emphasize on the islands of Indian Sundarban Delta (ISD) where a complex socio- ecological system prevails.

Heath is one of the major critical issues for the people of ISD. The health infrastructure in most of the islands are characterised by varying extents of deficiency with respect to number of PHCs, SCs, CHCs (HDR 2009). Due to their poor socio- economic status, low level of education, inadequate sanitation, unsafe water supply and poor food supply, people of these islands suffer from nutrition deficiency and related diseases (HDR 2009). The present study aims to assess the associations between the malnutrition and socio-demographic factors in ISD mainly focussing on Sagar, Ghoramara and Mousani islands (Figure 1). The area is a complex geomorphology with low, flat, alluvial plain intersected by a large number of tidal rivers, estuaries, and creeks with dynamic flow patterns of tidal water, along with the erosion and accretion of land (Das, 2006). Climate change, induced sea-level rise, changing rainfall patterns, and changes in the frequency and intensity of extreme weather events have had significant impacts on the islanders of ISD (Danda, 2010). Although earlier studies investigated the public health system and nutritional condition in Indian Sundarban (Vadrevu and Kanjilal 2016, Panda et al. 2016; Hazra et al. 2014), there is limited research examining the connections between both child and adult nutritional deficiency and causative factors. This study aims to fill this gap by examining the association between malnutrition and age structure, gender, economic factors as well as locational factors to offer a number of concrete policy recommendations to improve the inhabitant's nutritional condition.

Data and Methods

The present study is focused on western margin of the Indian Sundarban Delta (ISD) especially the islands like Sagar, Ghoramara and Mousani. With the aim of trace out associations between malnutrition and socio-demographic factors, here a primary data from household surveys conducted during March 2012 to October 2013 have been used. In the first stage, using Tippett's random number tables mouzas were selected from all three islands; in the second stage, a systematic sampling procedure is applied where a first house was selected randomly using random number table in each mouza and remaining were chosen maintaining a prescheduled constant gap of the houses. Sagar Island has 42 villages under 9 Gram Panchayats of Sagar Block. Ghoramara is a single mouza under Sagar Block and Mousani has 4 villages. The survey was carried out through direct interviews in 52% of the inhabited mouzas of Sagar Block, including Ghoramara (23 mouzas out of 42) and 100% of the inhabited mouzas (4 mouzas) of Mousani Gram Panchayat of Namkhana Block (Figure 1). For this particular study of malnutrition, the information related to age, sex, height, weight, income, occupation, sanitary system have been gathered.

However, efforts were made to have representation of all age groups in the data.

The malnutrition can be measured either using Mid Upper Arm Circumference (MUAC) or Body Mass Index (BMI). MUAC is measured by at the mid-point between the tip of the shoulder and the tip of the elbow. Standard ranges of MUAC are given by WHO with respect to gender, age structure. Although BMI is standard measure for malnutrition level but this can be replaced with MUAC due to easier process at field if strong linear correlations can be established among those two parameters for any specific population under study. In this study, both the MUAC and BMI, (calculated based on body weight and height), were estimated among 17% sampled population, including both males and females. Those BMI values have found to be highly correlated with MUAC values. Hence, the rest of the MUAC values have been converted to BMI using the regression equation which is mentioned later in the result section. Descriptive statistics have been calculated based on BMI values. According to WHO guideline (2006) an individual is considered to be suffered from malnutrition if the value of BMI is less than 18.5 and the normal range of BMI is 18.5 kg/m^2 to 24.9 kg/m^2. Binary indicators have been assigned as 1 for low BMI i.e. malnourished and 0 for higher BMI than 18.5. In this way the ratio scale have been converted into ordinal scale. Similarly, this study have assigned binary indicator to represent sex (S), occupation (O), income (I) and sanitation condition (SC). Sex variable takes 1 value if it is male and 2 if it is female. In case of government employee or big business 1 have been assigned, otherwise 0 have been assigned to the occupation variable. 1 or 0 have chosen to represent the higher income (> Rs.10,000/- per month) and lower income (Rs. 10,000/- per month) groups respectively. If the sanitation condition is reported good then 1 have been assigned and 0 assigned otherwise. This study has also considered the effect of the age (A) of the inhabitants. The numbers 1, 2, and 3 have been assigned if Sagar, Ghoramara and Mousani were considered. Here, BMI is the dependent variable and sex, occupation, age, income, sanitation condition are independent variables. Since the dependent variable is categorial, in fact ordinal in nature, logistic regression (Agresti 2002) has been carried out to find out the effects of independent variables on the dependent variable. The regression analysis is performed on SPSS software version 20.

In case of logistic regression if y is the dependent binary variable, $x_1, x_2, \ldots, x_k$ are the k explanatory (independent) variables and π =Probability (y=1), then the log model with intercept is:

$$\pi = \frac{\exp(B_o + B_1 x_1 + ... + B_k x_k)}{1 + \exp(B_o + B_1 x_1 + ... + B_k x_k)}$$

and hence,

$$\ln\left(\frac{\pi}{1-\pi}\right) = B_o + B_1 x_1 + ... + B_k x_k$$

Here $B_0, B_1, \ldots, B_k$ are the coefficient of regression equation. The *Maximum Likelihood* Method is used to obtain these estimates. In our problem we have k = number of independent variables = 6. Whether the explanatory factors have significant effect on the BMI, we have calculated p-value. If the *p*-value of the test is 0.05, then we say that the effects of the independent variables are highly significant.

After verifying the dependence between BMI (a measure of malnutrition) and different independent variables under study we have also calculated the correlation between the dependent variable and each independent variable separately. If both the variables are continuous then Pearson's product moment correlation has been used. But if we consider BMI as a continuous variable and some independent variables add nominal data then we have used ETA-coefficient

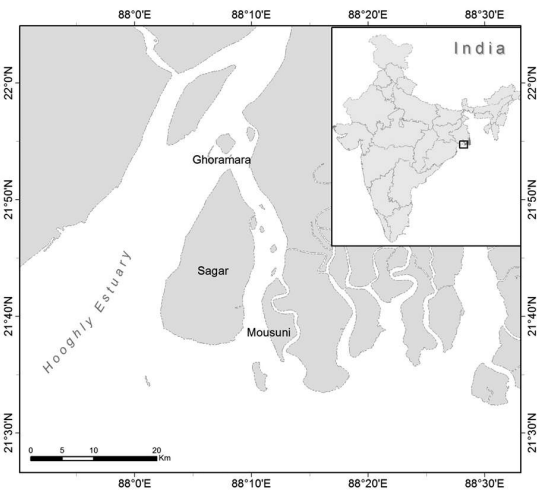

Figure 1: Location map of the study area (Hajra et al. 2017)

(Siegel 1956) to explore the dependence. The ETA Coefficient can be calculated using the information from the ANOVA as follows:

ETA^2 = (SSB- (p-1) MSW)/(SST+MSW)

Here,

p = the number of groups

SST= Total sum of square

SSB= Between sum of square

MSW= Within mean square

The correlation is also measured in SPSS software version 20.

Results

As it has been mentioned previously, the MUAC and BMI have been found to have linear relationships for male, female and children follwing the equatiobs BMI=1.25 MUAC+0.09 age - 5.3,BMI=1.15 MUAC+0.03 age - 8.7 and BMI=1.09 MUAC+0.06 age - 6.2, repectively.

The respective values of R^2 being 0.82, 0.75, and 0.79 indicate that the linear relationship between BMI and MUAC is well established to the data. So in further analysis, extrapolated BMI values have been used to exhibit the malnutrition in ISD.

Table 1: Descriptive statistics related to BMI

Descriptive Statistics					
	N	*Minimum*	*Maximum*	*Mean*	*Std. Deviation*
BMI	702	0.27	31.54	17.8315	6.48702
Valid N (listwise)	702				

From descriptive statistics (Table 1) it is evident that the average BMI of the surveyed islands is less than 18.5. This indicates that malnutrition is a major problem prevailing in these islands. Lowest value of BMI is also very low and the range of BMI is 31.27 which indicate that dispersion is also high. The value of standard deviation is also higher.

Logistic regression has been performed to estimate the association between the dependent variable BMI and independent factors age, sex, occupation, income, island and sanitation. In the following table (Table 2) the dependence level between BMI and other independent factors have been highlighted.

Table 2: Logistic regression of BMI on the independent variables

	Coeff.	*S.E.*	*Wald*	*Sig.*
Age	-0.050	.007	45.821	0.002
Occupation	-1.265	.244	26.954	0.070
Sex	1.630	.233	48.771	0.000
Island	1.006	.192	27.541	0.044
Sanitation	-0.374	.230	2.649	0.096
Income	-2.116	.271	60.932	0.000
Constant	0.257	.596	14.362	0.063

The findings indicate that age, island, sex, and income have higher significant dependence with BMI whereas the occupation and sanitation have relatively small effect on BMI. Since the value 1 and 0 of BMI represent malnutrition and normal nutrition respectively, the negative coefficient of age implies that with increase in age BMI also increase. So children are more prone to malnutrition than adults in these islands. Again the coefficient corresponding to sex variable reflects the fact that women are suffering more from malnutrition

than male. In Sagar the people are less affected by malnutrition than other two islands. Income has a diverse effect on malnutrition since lower the income high is the possibility of malnutrition. If the sanitation condition is good then BMI is high. The households having stable income source like government job or big business suffer less than the households without such job stability. -2 log likelihood value for the logistic model is 469.

This study has also analysed the dependence co-efficient on the basis of product moment correlation and ETA statistic depending upon the nature of the independent variable. The coefficients are given in the following Table 3. The above table also indicates that age, sex, island and income have high impact on malnutrition whereas occupation and sanitation have moderate effect on BMI.

Table 3: Measure of dependence between BMI and independent variables

Independent variable	*Correlation type*	*Value of correlation*
Age	Pearson's product moment correlation	0.724
Sex	ETA coefficient	-0.975
Island	ETA coefficient	-0.634
Income	Pearson's product moment correlation	0.564
Occupation	ETA coefficient	0.325
Sanitation	ETA coefficient	0.226

Discussion and policy implications

Large proportions of the households in the islands of ISD are poor and thus have limited access to resources and facilities (Ghosh, 2012). These areas are also suffering from lack of proper health care, adequate supply of quality food and lack of health awareness (HDR 2009). In this context, the results of the study confirmed that malnutrition is a major issue in the study islands. In line with previous literature (Rahman et al. 2016; Kumar et al. 2015; Pelletier and Frongillo 2003; Pal 1999) this study also found that children are more vulnerable to malnutrition than adults. Result of logistic regression shows that the gender issues are important influencing factor behind malnutrition as females are more malnourished than male population, that supports several earlier studies in different areas of developing countries like India and Bangladesh (Meenakshi 2016; Imai et al. 2014; Choudhury et al. 2000).

A comparative analysis show that amongst the three islands, Sagar island has fewer malnourished populations than other. This can be explained by the fact that Sagar island has a better developmental level than other two (HDR 2009). Hence, some policy recommendations are expected to have positive impact on nutritional status of the area. As it clearly appears that the region is suffering from poverty induced malnutrition any suitable framework focusing on the mobilization and proper distribution of resources at the regional levels needs to be implemented. The high average malnourished population among surveyed total may also be attributed to lack of awareness among people about good food habits. 'Midday meal scheme' for primary school children where at least one third of daily calorie requirement and half protein requirement is mate should be implemented more efficiently in Sagar Block and actions needs to be taken for reducing the number of school dropouts not only for the sake of education but also additionally to confirm better food security. In addition to the Primary Health Centres and Sub-Centres, 354 functional ICDS centres can also be used to supply necessary medicine and food to child and mother. Involvement of ASHA workers under National Rural Health Mission scheme might also be a positive step

for reproductive and child Health care. Regular monitoring and upgradation of sanitation condition and awareness building among locals about nutrition, good health can be raised by organizing special classes at schools, clubs etc.

Diversification of crop and vegetable production by horticulture may be effective in enhanced accessibility for food and ensure food security.

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Urban Functions, Processes and Morphology of Nabadwip Town, Nadia District, West Bengal.

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Surajit Das

Abstract

Nabadwip is a very ancient & indigenous city, and is anticipated to have been founded in 1063 A.D. (The medieval period). This city is symbols of rural-urban symbiosis. Religion also played an important force for the origin of the towns, have come into being predominantly because of religious sanctity at the point of their site. The tertiary sector of the economy & diversity of jobs have altogether changed the urban milieu. The city unit including areas around its nucleus from the indigenous oriental type of common patterns visible in its uncontrolled growth & provide a mixed land use. The city represents & conflict of blending of indigenous features and hybridized modern features. The dynamic nature of the city is the product of both historical and geographical processes. The stages of morphogenesis can very well be perceived in the morphological character closely associated with the functional morphology of the city. Morphology deals with the existing morphological structure and its developmental pattern. In this chapter, the development of the city morphology has been examined in the light of western theories of urban growth and looking to the unsuitability of these theories. Finally, formulations of remedial prescriptions have also been made to operationalise the urban development planning strategies into reality for restoring the sound urban health of the town.

Keywords: *Rural-urban symbiosis, Morphogenesis, Functional morphology, Indigenous features, Religious sanctity.*

Introduction

Urban morphology is the study of city as human habitat. It may be compares the developmental process of a town with the developmental biology of an embryo and finds similarities in histogenesis, pattern formation and morphogenesis with the concept of process, structure and stage respectively, in morphology of a town. The historical background of the city may be referred to the histogenesis and the development of roads and streets, the functional character of the city may be referred as the pattern formation and morphogenesis respectively. The similar comparison has been made in the forces also, where the actions of inter-cellular contact and paralysis is an embryo are compared to the centripetal and centrifugal forces. A general pattern of growth has been observed in cities. Every city originates with the formation of a nucleus. Thereafter some sets of centripetal forces originate which result into the form of concentric development in the builtup area. Religious nuclei and administrative functions are such important centripetal forces. Some other types of forces have been called as functional magnetism and functional prestige. Urban morphologists focus on the tangible results of the social and economic forces. They study the outcomes of ideas and intensions as they take shape on ground and mould our cities. Building, street, temple, monuments are among the main elements of morphological analysis (Moudon 1997). The third world urbanization in an unprecedented rate that exceeded the all past records, often occurring haphazardly (Ksarda and Crenshaw, 1991). The multi various processes of the third world urbanization has created the distinct urban morphological structures of various regions of third world (Pacione, 2005). Nabadwip, an unplanned town of west Bengal is growing slowly and experiencing step migration,

Surajit Das, Department of Geography, Visva-Bharati, Santiniketan.
Email: surajitgeo84@gmail.com

which is consequent upon the morphological structure. This trend makes the urban morphology of Nabadwip interesting and hence deserves attention.

Objectives

The main objectives of this paper are as follows:

1. To study the various urban functions of the town.
2. To understand undergoing factors and processes in shaping of urban functions.
3. To describe urban morphology of the town.

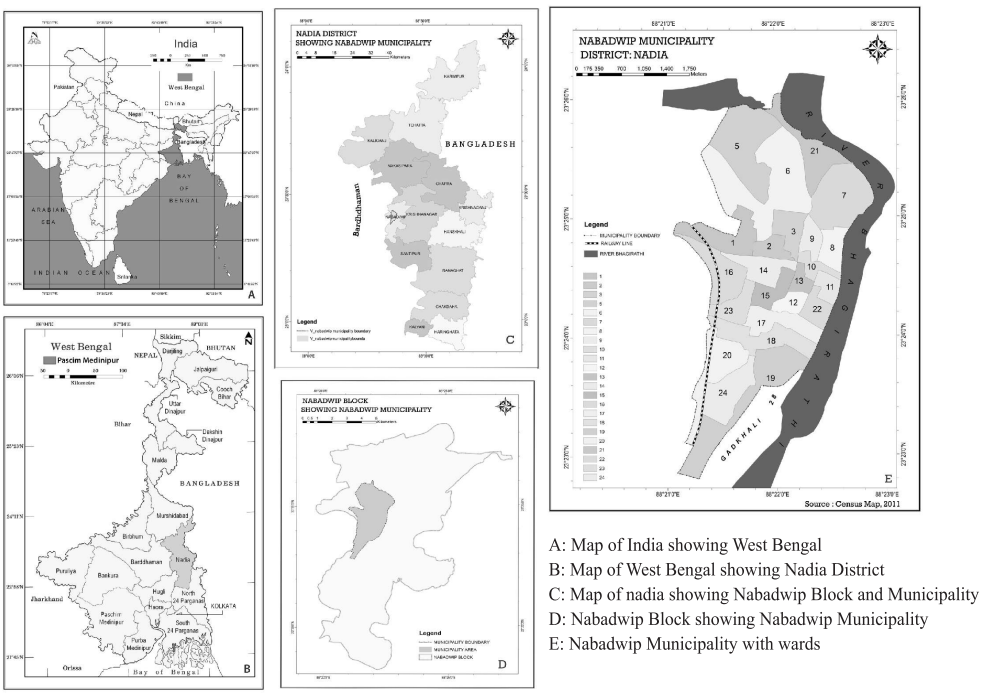
Database and methodology

The present study is based on secondary sources of data while the primary work played a vital role in the study of field check of urban functions and its spatial arrangement. The discussion with the local people enabled to understand the social and cultural aspects of the settlement. The interpretation of geographical data, map and phenomena are based on intensive field study. The population data is taken from district census handbook and primary census abstracts of different years.

Study area

Nabadwip Municipality is located in the western part of Nadia district and river Bhagirathi bound from north to east. Nabadwip Municipality lies between $88^0$21''E.–$88^0$23'E and $23^0$23'N.–$23^0$26'N and the town has a total area of 11.66 sq. km. consisting of 24 wards with a population of 125543 (2011 Census). The location of the study area is shown in Map no.1.1. Nabadwip is an old municipal town. It was constituted as municipality in 1869. The nabadwip police station extended over an area of 2.8 percent of Nadia district which now contains an area of 3927 sq km. It has an average elevation of 14 m.

Nabadwip municipality was established in the year 1869 A.D.(Garrett 1910) with 12 commissioners of whom 8 were elected and the remainder nominated. Through-out the 150 years of its urban career, the town has grown in an unplanned manner especially during and after the partition of Bengal in 1947 A.D.



A: Map of India showing West Bengal
B: Map of West Bengal showing Nadia District
C: Map of nadia showing Nabadwip Block and Municipality
D: Nabadwip Block showing Nabadwip Municipality
E: Nabadwip Municipality with wards

Fig. 1: Location Map of Nabadwip Municipality

Factor Affecting the morphology of the town

Physical factor

The river Bhagirathi is a principal factor in shaping and limiting the town area since its inception. The availability of water caused the origin of settlement and later on for a long time the perennial river played an important role of the physical boundary of the city in the northern and eastern portion. The riverine site forced the settlement to develop in a linear pattern leaving a small strip along the river.

Cultural factor

The Katwa- Howrah railway and the network of roads are the most important cultural factors in shaping the morphological structure of the town. The railway line caused development of the south western settlement and formed the southern boundary of the town. River Bhagirathi in the east and the railway line in the west formed a wide strip within which the town grew. Radhabazar road, Poramatola road, Baralghat road, Poraghat road formed the ribs of the town. Several secondary streets came into existence and formed the network. The role of Gouranga setu across the river Bhagirathi cannot be ignored. This bridge form the physical boundary in the south and rose some urban features across the river and ghosh para.

Religious factor

Nabadwip town is a religious town also. Different types of commercial activities are accomplished in this religious town centering various temples. In some wards surrounding the temple numbers of houses are increasing because throughout a whole year huge tourists come here from different places of West Bengal and India for worship and stay in the houses beside the temple for one or more than one night. People migrated from rural area for the purpose of business.

Administrative factor

Political and administrative factors are not less important in shaping the structure of the city. It may be conjectured that during the reign of Sen Kings the royal palace and cantonment were to the north of Ballaldighi. The present Nabadwip town in all probability would have been included in the Burdwan district for the reason that in 1793 all these villages were situated on the east of the old course. So, the west direction of the river Ganges indicated the old course of the Bhagirathi. The course of the Bhagirathi not been in the west of Nabadwip, four or five moujas including Nabadwip would have possibly been transferred to Jahangirabad or Satsyka paragana from Nadia district. Thirdly it is known that the merger that of Nabadwip with Burdwan district fell through owing to the objection raised by the king of Nadia. For centuries, river Hugli, the distributory of the Ganga, has been acting as a beneficial as well as controlling factor for the study area in many ways. For example, during the pre-independence period, the river acted as an approach track (water way), through which the European colonies were established. Hence, it may be concluded that, the river Bhagiratghi has played a significant role not only for the development of this city, but for its further expansion and formation.

Existing Morphological Characteristics

Nabadwip is an unplanned town which has grown spontaneously since 1869 i,e. from the clolonial period which is consequent upon the unplanned morphological characteristics.

Land use Pattern

Land use can define as activity is development that occupies land. Out of the total geographical area of the Nabadwip Town, more than 75 % is under non-commercial and residential area and various industries and commercial establishments occupy 7%. More than 60% Shops are concentrated in the core of the city i.e. Poramatala More, Buroshibtala More, Krishnakalitala More, Aswathatala More and Remaining Shops are scattered in the outskirts of the core area. The residential area is mainly located to the southwest and northwest of Nabadwip. Various new housing colonies are emerging at the above-mentioned areas. The river Bhagirathi is the main drainage line and there are several ponds and water bodies in this town. There is a large stretch of fallow land in the Northern part of the town and one other fallow land in the south. The fallow lands comprise 5% of the total area. The land use map of Nabadwip Town indicate that a very few of land under agriculture in the north eastern part, near the river bank of Bhagirathi.

The major land use zones subdivided conveniently are as follows.

Central Business District (CBD)

Two distinct CBD is found in the Nabadwip municipality. The CBD is semi-circular located towards the eastern and western portion of the town where the main market area and offices are existing. This is also the commercial hub of Nabadwip & growth of the town is heavily dependent on the interregional transport lines. It was circular in its early stage as the significance of its name-poramatola bazaar, indicates. Further expansion encircled it and then followed the main street towards the west of the town and became oval in shape. Hence the city has felt the inward and outward pressure of land competition to some extent.

Upper middle class

The belt is located around the CBD. In contrary to Burgess Model on urban land use (Park & Burgess 1925). It is seen that more people lives together near CBD because the city is not an industrial city. This is the largest belt accounting for 65% of the total land use. This belt is relatively compact due to lack of space.

Lower middle class

Around the upper middle class is the belt of lower middle class people. Here the people engaged in business & service sectors. The settlement in this zone is relatively sparse. Here the people have the character in between the truly urban society & rural community.

Lower class residence (slum)

Nabadwip is an unplanned town and it is very clear from the distribution of the slum population in the area. Slum are scattered throughout the town but the majority of the slums are located towards the periphery of the town. As the slums are the spontaneous settlement, they develop in the open spaces available. Slum development in Nabadwip is not a onetime process, but the several streams of migration have come across especially during and after the partition of Bengal in 1947.

Green spaces & agricultural belt

Urban agricultural belts are the outermost belt. It is not a continuous belt, found mainly alongside the Bhagirathi River for irrigation. The green spaces are located in the peripheral area of the town.

It is stated that physical site, as well as socio-economic factors, influence directly on the shape of various wards in the study area. There are some important controlling factors, not only influence the forms of such urban centres but also the layout functional morphology of the town. So the study of the shape of the town is of great significance in urban morphology. It is the reflection of various physical and cultural factors associated with typical site and the location. In the study area all wards represent typical types of external shape, identified by careful observation. It should be mentioned that here Bhagirathi River bank sites and Railway site are respectively two important factors for such development of external configuration of wards. There are classified as elongated, irregular, triangular, radial and amorphous forms. Several physical, cultural factors activating urban growth at various sites and determines the form of such urban settlement such as elongated or linear form, rectangular form, triangular, radious and amorphous form.

Morphological functions

This segment of the internal structure and arrangement of the landscape of the town has been discussed as morphological functions. This functional structure depends the nature and characteristics of different functions which perform distinctive areas. In general, the area of complex aspects, especially commercial functions of any town is referred as business zone or market area. So different types of functions in the central area or zone of town mentioned as central business section or bazaar area. This is also locally called as bazaar or market area. In general all towns have certain common functions and characteristics and their urban status varies according to the number and varieties of functions in towns they are endowed (Dickinson, 1956).

Thus keeping in view the future planning of towns of Nabadwip has to be necessarily made after a thorough study or analysis of the existing functional structure and their morphology. An attempt here has been made to search and identify the pattern of spatial interactions of various functional areas and their direct and indirect impacts on the existing urban landscape.

Functional areas of Nabadwip town

The changes in the structure of morphology, at the same time the different combination of economic activities and growth of population during different priods of time, all these factors have jointly imposed their impact upon the design of the functional landscape of the town of Nabadwip in the study area.

Five major functional areas have been detected; these are residential, commercial, administration, and other which includes medical, transportation etc.

Residential Areas

One of the most important functional zones of urban land use is residential. In general the residential area is committed the maximum land to the urban land use than for any other use. In this context it can be stated that in Nabadwip town residential areas covering nearly one- third portion of total areas. Analysis of land use map of functional morphology in this town displays that the percentage of the residential land to the total developed area of the town covers nearly 82 percentages. It is noted that residential zone of a town depends on its functional character, land value, the density of houses and existing urban amenities. Although it is stated that Nabadwip town has passed through a long time of changes during the different period of development of growth. In this town high classs residential areas surrounding the central business area, mostly elongated along the main route of the transport system toward the north to south ward direction. It is evident that the comparatively low land value area is occupied by poor people found in comparatively remote areas further away from the central part of the town towards extreme southern portion. In high class residential areas, multi storied buildings are found in the town. These residential buildings occur particularly in radhabazar more, Dearapara, Charichara para and so on.

Commercial Areas

In Nabadwip town, there is hardly a compact business area found in the core area of the town. But the main principle and commercial areas look like as a mosaic with different types of commercial shopping points follow the internal route system. Therefore the commercial areas develop with the arrangement of various shops, generally follow the pattern of roads and streets and bazaar. It is also clear that the shape and size of commercial areas are subject to continuous change following the expansion in size and functions of the town. The old area of shopping of the town found at tant kaporer hat, Poramatola bazar etc.

Poramatola bazaar as the main hub for all types of commercial activity here. The new shopping centres are developed as shopping complex in different transaction points of the town and these are new shopping complex such as Chaitanya plaza, Bus stand complex etc.

With the extension of town the bazaar is also growing towards the newly developed internal metalled roads and with the establishment of shopping malls, complex etc. In recent years the nucleus of commercial activity gradually expanded in a linear shape along the main road and its different roads raditaing in all directions. The commercial area is characterized by not only shopping centers but also all hotels, restaurants, and food plaza have grown here and there inside the town.Thus the morphological characteristics of the above said the commercial area is generally interrelated with different commercial activities, located at different points of locality. It can be concluded that the role of commercial zone in the process of urban growth determines the landuse pattern of business and commercial activities.

Administrative Areas

One of the important morphological characteristics of the Nabadwip town is administrative area. Each and every town large or small, old or new have an area comprising administrative zone. This is well distinct and developed area of Nabadwip town as the town has its history related to administrative activity for the very early period. The area, characterized by the administrative activity, in general called as an administrative zone. During the British period the administrative offices were confined and after the partition of Bengal, a remarkable change took place in the whole administartive set-up. In an analysis of the morphology of administrative area, it is quite noted that this area has mingled with the extension and growth of commercial as well as the residential area in this town. It consists nearly 4 percent of the

total urban land area. A large number of government offices have been scattered in the inner core of the Nabadwip town and these all are part of the morphology of the town.

Educational Areas

Education plays a vital role in the urban morphological structure. The role of culture in the determination of shaping of social life is also important part of functional identity of town. The distribution of educational institutions of various levels varies according to the size of towns as well as the growth of population in any region. Although about 1 percent of the builtup zone has been devoted for educational purpose in this town. Thus various types of educational instituions have been developed to meet the educational need and the social requirement of town people. In this town a lot of variation in the facilities available in government and private schools of primary , secondary and one degree college. All buildings, campus, hostel, library, playground facilities are generally close to residential areas. It is noted that each and every ward of the municipality has the primary school facility. The buildings pattern of schools, colleges vary from place to place depending on the quality of management of and the pull factor of these institutions.

Medical Areas

It usually forms an area comprising hospital buildings, dispensary, primary health and family welfare centres, residences of doctors, nurses and medicine shops. The medical establishments are usually found in the most congested parts of the inner zone of Nabadwip town. The medical zone covers a relatively smaller area below 1 percent of the total urban land. It is noted that the medical facility is one of the important unavoidable factors that acts as a pull factor in the urban expansion of Nabadwip town. The surrounding area depends on the Nabadwip town. The newer medical facilities have been developed with the increase rate of health requirement that resulted in the development of new private clinic which are all clustered in the heart of the town.

Religious Areas

Nabadwip town possesses several sacred temple, mosque etc. However these places of worship do not form a distinct character but often occur as at distinct points of religious identity. Places of worship having different idols of Lord Shiva, Rama, Krishna and the Goddess Durga and Kali, etc. are the important centres of human gathering on different holy auspicious occasions throughout the year in this town. The all religious spots are found the central part of residential areas. However the pattern and functions of the morphology of any large urban area are influenced by religious activities. The Nabadwip town has the highest concentration of Hindu community and thus the nature of religious area is uniform.

Recreational Areas

Resort, parks, movie theatre, clubs, and open spaces act as recreational areas provide amusement to the urban dwellers. The green and playgrounds in particular establish a maximum humanization of the natural landscape and function as lungs of the town. The recreational areas of Nabadwip town include open spaces, parks, playground, stadium, clubs etc. These places have recreational facilities considered essential for healthy living are generally attached to the main road and internal transport system of the town. These areas mostly used for public gatherings occasional festivals throughout the year. The children park swimming pool, in different wards, is very popular recreational sites of Nabadwip town. It is the town of culture and different colourful occasion, drama, musical arrangements, are well known in the state. Although the recreational areas of the town cover a smaller portion to the toal urban landuse area in this town. It can be summarized that the town is suffering from an inadequacy of recreational facilities such as open space, gardens, playground in the congested residential part in the heart of the town. For the fulfilment of the urban dwellers further development should be constructed for better recreational facility towards the outskirts of the town.

Transport Areas

The transport zone of each and every town is very important because it depends on the basic functions of the town. This zone characterized by state high way, railway, waterway, bus stand, rail station etc. In Nabadwip town all types of transport arteries run parallel to each other in the middle part of the town.

It is observed that the higher concentration of rickshaws, van, toto (E rickshaw) and other vehicles is found in the most commercial places. Many rickshaw stand have the concentration of different vehicles and all vehicles start from every part around the town. On the basis of direct connectivity matrix connectivity map is prepared. This map reveals the central area comprising the Ward No. 2, 9, 10, 13, 14, 15, 22, 23 has the high degree of connectivity in Nabadwip Municipality. By calculating Associated number and Shimble index through Shortest Path Matrix an accessibility map has been prepared, which clearly depicts the Wards No. 2, 3, 10,12 14, 15 have the low Shimble index value as well as high degree of accessibility.

Urban structure of Nabadwip and the Multiple Nuclei Theory:

The core area has a high percentage of old pucca buildings, and whatever municipal services are available within the Nabadwip are mostly limited to this zone. Trade, commerce and industry are all concentrated within this core (CBD). The urban problem is acute here and the attention of urban planners has largely confined to this core. In fact, isolated settlements sprang up in the town at different times along the banks of the river in response to religion, commerce and administrative requirements. From the administrative point of view, the periphery consists of vast areas under panchayat. Within this zone, there are two noticeable development patterns are formed. In the fringe, rural land is being divided into small plots for building and this is the most effective breeding ground for future urban chaos. It is through this process that a crisis of unprecedented magnitude is taking shape on the urban frontier. While high prices and exorbitant rents in the core encourage migration from the core to the periphery, there is attraction of small homestead plots to suit every pocket. The only exception to this general pattern of linearity are the cities of Nabadwip and Mayapur where growth has bulged over a wider area around the strong metropolitan centre acting as the Central Business District (CBD). Today, with the rapid increase in population, human settlements have been extending continuously over the marshes and the low-lying areas, in a sporadic manner. Now a day's emergence of gigantic sprawl giving rise to a spatial explosion beyond control, hence justifying itself with the structure of a multiple nuclei model of city development. Nabadwip town has passed through several stages, changes, reorganization and expansion processes. In turn, there changes influenced the layout and built the city. Thus the morphology of Nabadwip gained many colours from time to time.

The British period added multiple colours to the morphology of the city. The Railway Station, Railway colony, Main Hospital, Police line, Tehsil Office were built. The town expanded towards the tail of the fish due to the westerly linear growth. All this resulted into as S shaped town, with its base in the south. The town within the municipal boundary assumes the shape of a Japanese fan with its base in the south-east forms the handle of the fan and rest of the area as the blades of the fan, or petal.

In general the whole of the town area is a mixed one. No dividing line can be be drawn strictly. Nabadwip developed independently in a linear pattern within a wide strip between the river Bhagirathi in the east and Eastern railway in the west. Population potential model (Map no 1.2) shows different types of morphological zones of Nabadwip town.

Population Potential Model

The Central or Inner Zone

This zone mainly represent the highly congested unplanned areas of the inner part of the olden city. The main characteristics of the inner part of the town are following:

The central zone consists of the old town of Nabadwip representing the highly congested residential areas and temple of the city having the old structure of houses built of bricks, limestone, wooden structure etc with poor ventilation and having traditional plan of housing.The pattern of streets in the central zone of the city is amorphous having no marked geometrical shape with continuously moving thus shaping a zig-zag street pattern. The streets in the inner zone have changing widths often ranging from three feet to eight or ten feet at most of the places.

The most of the houses represent business and residential or small industrial units and residential

uses and the short spacing has been compensated by the vertical extension of the buildings and thus the buildings are generally multi-storied.Some of the buildings in the inner zone are deteriorating and the new constructions appear to replace the old structures, a case of gentrification process.

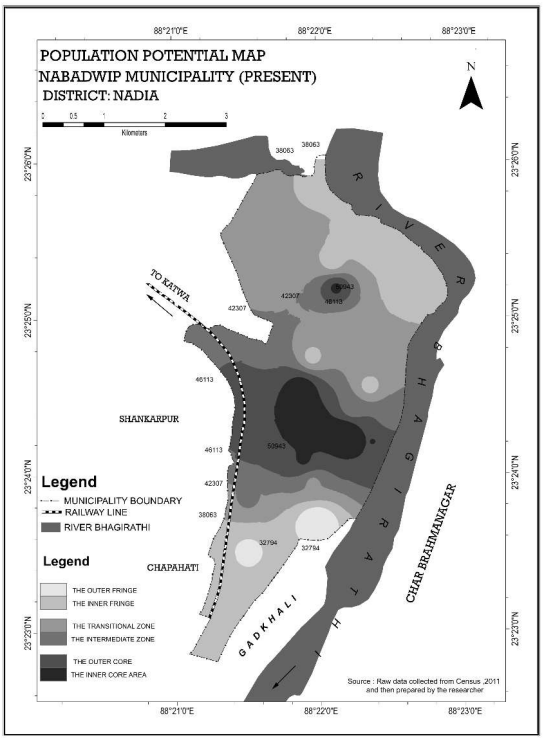


Fig. 2: Population Potential Map

The Middle or Intermediate Zone

The characteristics of the internal structure of the intermediate zone may be pointed out as under The middle zone represents various types of residential colonies inclusive of both low to high socio-economic groups. This zone has both old and new structures and it also represent the transitional zone of housing between the central part and the outer zone of the city. This zone comprises many planned colonies with modern architecture of houses given an advanced look of residences with suitable and hygienic living conditions. This zone includes not only the buildings for residential purposes but also for other various types of central functions like administrative, cultural, religious, parks, bus stand, business and industrial enterprises, education, health and other civic amenities. At some places undeveloped areas in the form of low-lying land and small agricultural land also appear especially at the outer parts of this zone and these areas may be utilized for the future development of the city.

The Outer Zone

This zone consists of the outer parts of the city which may be characterized as under –

This is the zone of the development of the city and the buildings are not in continuous form. The size of the buildings with their open areas is comparatively larger than other areas. The land of this zone has been taken into use for various purposes like open spaces, agricultural land, parks, garden, industrial units, godowns, railway station, petrol pumps, tanks etc. This zone represents the buildings of modern types and are developed mainly either by the elite class of the city or by the rich people moving from inner city for the betterment of their life or to deal their new occupations. Some such families also manage their farms in their villages having residence of their families in the city. This zone have the large sized institutional buildings like schools, mills, bus stand and railway station, stadium etc. with fair size of buildings with planned and good width street patterns having low density of population and houses.

This zone finally mingles in the outer agricultural land and rural areas of Burdwan district at the boundary of the city and thus it is the threshold of rural-urban fringe.

Conclusion

In case of Nabadwip it can be said that indigenous knowledge has been helpfull in some cases for the urban morphology because indigenous knowledge about the environment may have the good impact upon the urban morphological structure.

Despite the rapid changes in morphological characteristics, types of dwellings have also experienced phenomenal changes. In the wake of morphological changes, the family structure in Nabadwip also been changing rapidly. The common family type found in Nabadwip is the nucleus family. Thus, in Nabadwip the traditional Hindu joint family

is rare. Social values play an important role in solidity and integration of the people. It binds the people through invisible threads. Now the web of social relationship is disintegrating day by day because of urbanism and individualism. The old social structure and social relationships have begun to change as people adopted values, attitudes and customs much different from that of traditional. Increased social and physical mobility have determined the familial ties and values that subordinated the individual to the kin group. A new form of institution, association and behavioural pattern has come into existence. Cultural pattern have undergone a qualitative change and cultural life has become heterogeneous, individualistic, flexible and dynamic. It can be concluded from the above discussion that Nabadwip is rapidly becoming urban with associated morphological changes such as changing land use pattern, morphological characteristics, transportation and communication system and social structure as well. These changes are found very dynamic and continue to be so as the population pressure increases. It has been observed that urban population accompanied with other developmental activities has led to "urban sprawl" that has induced land use changes and transformation of social structure. Thus the relationship between change in physical morphology and social morphology is accepted. Detailed survey based on Cadastral map on plot-to-plot basis as well as based on aerial photographs and field trips are highly needed to enumerate the the social ecology as well as social pathology of town and its countrysides. It is very essential to take land development programmes on the basis of peoples partcipation at the lowest level of community to functionalise the dream into reality. For the purpose of solving transportaion problems, proper decentralized planning of residential, commercial and other institutional components are to be crosschecked as to the reality concerned.

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Changing Desire for an Additional Child in Urban Areas: A Ward Level Analysis of Kolkata Municipal Corporation

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Dr. Monorisha Mukhopadhyay

Abstract

Fertility decline is explained by change in attitude of the individual towards marriage and childbearing and preferences of number of children. This paper has concentrated on the process of decision making and determinants of low fertility. A two-stage systematic random sampling method had been chosen with city wards as the first stage unit and marital status of women as second stage unit for collection of primary information during 2013 through semi structured questionnaires and face to face interview schedules. The findings show that there is a tendency to regulate fertility among Bengalis. Overall there is undercurrent of desire for small families. There are various triggers that determine and influence the decision of childbearing. In this study it was found that fertility is closely associated with the education levels of the mother. Now, it will be a matter of time to see whether this trend will encourage people to have more kids or low fertility will become a norm among the population.

Keywords: *low fertility, one-child, Logistic Regression, Kolkata.*

Introduction

The emergence of low fertility, i.e. Total Fertility Rate at or below 1.3 is discernible in the Asian countries particularly Singapore, Hong Kong, Japan, South Korea, and Taiwan (Lesthaeghae, 2010). But these countries are economically closer to the developed world.The most striking feature of low fertilityis its divergence in developing countries like India. The country represents huge regional variation in fertility due to her cultural, economic and geographical diversity and the resultant combination of determinants generate different fertility regimes in the country.

In India, at the outset fertility first started declining in the southern states and then it spread to Hindi speaking belts of Northern India. Kerala among the southern states showed fertility decline even in the absence of much economic development. High female literacy was identified as the main reason for such decline (Susuman, Lougue and Battala, 2014). Also higher level of contraception, with higher age-at-marriage, catalyzed as intermediate or proximate variables which led to lower fertility in Kerala (Nair, 2010).

In most of the studies economic and social factors are given the maximum importance in explaining fertility variation. But it was also found that cultural factors like religion (Alagarajan and Kulkarni, 2008) and size of family also influence fertility variation (Pandey et al 2012). In this discussion it becomes imperative to mention that fertility transitions in the developing countries do not necessarily comply with the micro economic theories adopted from the experience of the western countries. The fertility transition in states from southern India like Tamil Nadu (Krishnammorthy et al 2005), Andhra Pradesh (Matthews et al. 2009; Saavala, 2010), and Karnataka (Lingaraju and James, 2012) took place without substantial level of female literacy or lowering of child mortality. The major factor contributing to the decline was connectivity between urban and rural areas which had prompted the rural poor to commute to urban areas for job. Moreover connections with the urban areas had influenced the rural population who began longing for education for children which has brought down the fertility level (Krishnamoorthy et al. 2005). Rising aspirations about children and quantity-quality trade-off contributed to lowering family size desires and

Dr. Monorisha Mukhopadhyay, Department of Geography, Rishi Bankim Chandra Evening College, WBSU
Email: mono.jnu@gmail.com

the family planning programmes provided the means to regulate fertility (Kulkarni, 2011). The fertility decline in Karnataka was at a much lower rate compared to the surrounding states of Tamil Nadu, Kerala, and Andhra Pradesh. The state showed large regional variations in transition with the northern districts lagging in the process due to lack of mass movement and low status of women; however fertility decline in southern Karnataka took place rapidly because of the neighbourhood influence of Kerala and Tamil Nadu.

Some western and north-western states of India followed the southern states in lowering fertility to replacement level; so did the eastern state of West Bengal. Recent study by Guilmoto and Rajan (2013), based on reverse survival estimation based on 2011 census, revealed that TFR of the city-Kolkata had come down to 1.2. Interestingly, a sub-population of this eastern state had been historically experiencing alow fertility regime (Basu and Desai, 2016). Ironically, the process of fertility transition in India, especially the southern states, had been well addressed, but little had been discussed about various processes that had propelled low level of fertility in one-off regions.

This challenges to unravel the mechanisms that bring the convergence of low fertility in such diverse andevolving population. The principal objectives of this paper were to find out the determinants of fertility and mechanism of changing desire for children in Kolkata.

Database and Methodology

In a metropolis like Kolkata, the population is widely heterogeneous i.e., varies socially, economically and demographically. Therefore, a two-stage systematic random sampling method had been chosen with city wards as the first-stage units and currently married and unmarried women from these as the second stage units with a total sample of 300. Kolkata is divided into 141 municipal wards and four special wards (Census of India, 2001) and among these 141 wards, four wards were chosen for sample survey. Female Literacy Rate was chosen as an indicator to arrange the wards in descending order and a systematic sample of four selected; this amounts to implicit stratification by female literacy. The data from the 2011 census were not available at the time of data collection and hence the selection of wards was based on the data from the previous census, that of 2001. From each ward two localities, one identified as poor and the other as non-poor, were selected based on the local enquiries and perception of the researcher. This was done to avoid homogeneity in the population. After listing of households in each locality, it was proposed to select 25 currently married women in reproductive age group and 12 unmarried women at random but in order to allow for non-response up to 30 currently married women of reproductive age and 15 unmarried women (The scope of findings results associated with unmarried women remains in a separate paper) were selected from each locality. Structured questionnaires were prepared and a face-to-face interview schedule was designed. The data were collected during the calendar year - 2013. In all 213 currently married women of reproductive ages (15-49 years) and 110 unmarried women of (15 – 40 years) were interviewed.

Results and Discussions

Emergence of one child family

The survey results pointed to a shift in inclination towards one child family as women in Kolkata were keen to have small families. The NFHS- III estimate also corroboratedthis as it shows that about 35 per cent of the currently married women in Kolkata and 27 per cent in Urban west Bengal idealize a family with one child (IIPS and ORC Macro, 2007). Similar reflection was observed during the field investigations where 25 per cent of currently married women were inclined to have a one child family. Similarly, about 70 per cent of women with one living children want no more children (IIPS and ORC Macro, 2007) which was also reflected in the primary study where about 76 percent with one living child did not prefer an additional child. The preference for a one child family is relatively higher among Bengali speaking women, those from middle income households and those with higher education. But the overall strong inclination for one child family is similar irrespective of family type. However, the phenomenon of voluntary childlessness has found little support in the studied population. Based on the responses of women from Kolkata it can be said that the low fertility in the region has been reached without actually following

the path of the European countries. However, the population studied in this paper is not an average or typical population of India and generalization to India or to urban India would not be appropriate.

Changing desire to have another child

Disadvantage of taking CEB as a fertility indicator is that it cannot estimate the current fertility trend or recent fertility decline. In all the societies it is seen that a woman has the urge to have at least one child. It is only in the case of an additional birth that rethinking is done. It can be argued that the level of fertility can also be determined by gauging the desire for another child.In the life course the decisions are taken sequentially with "each step dealing with the addition of a (another) child to the family" (Namboodiri, 1972: 198). In this paper, it was assumed that there are two types of decisions that women take in terms of childbearing - short term and long term. In the study, the question asked to the respondents was 'After marriage did you think of how many children you should have?' This is a long term decision where the family members take into account time, energy and money into consideration. There is always a tiff between traditional beliefs and modern thinking due to the effect of modernization. But many cannot assess the long term implications successfully. For them the decision is confined to a short term time frame. It is believed that the decision of childbearing is taken by the women after each birth and there is a change over family building process. Each birth has its own story and reflects different situations. Childbearing motivation may get influenced by investment on each prior child, sex of the previous child, present income, and priority ordering of the women.

Depending on the experience from the previous child a considerable re-thinking is done for having/not having another child. An attempt to discuss the pattern of change of desire from time just after marriage, to the point after every birth, i.e., after the first child, after the second child and after the third child had been made. The respondents were asked of the number of children they desired at each stage, just after marriage and after they had the first child, second child, and so on. These enquiries being retrospective naturally required time and patience and some respondents did not cite a specific number. Besides, all were asked if they wanted an additional child now (the time of the survey), and if so, how many. The women with one child and with desire for one more were considered to desire two children. Similarly, women with one child and desire to have no more were considered to desire only one child. The result (Table 1) reflects that there was change in desire from the time just *after marriage* to *post first birth* though to a small extent. Approximately one-tenth of the respondents who initially wanted one child desired an additional one after they had one child. One-fifth of the respondents who initially wanted one child but for whom the first was a daughter were keen on having an additional child. There is a clear indication that women with one son were contented with one child and an insignificant proportion desire an additional child. Similarly, about one-fifth of the respondents who initially (after marriage) thought of two felt that one was enough after they had the first child. It is interesting to note that about one-fourth women who thought of two children after marriage and have a son from the first birth could not give any numeric responses. High proportion of ambiguous answers indicates that respondents may forgo an additional child. Of the respondents who did not give a numeric answer for desired size after marriage, about two-fifths were still not sure after the first birth. These were the women who may decide to have a second child over time. The numbers of the respondents with two or more children at survey were negligibleas were the number who desired three or more children initially and hence information from them could not be analyzed. From the results it is apparent that there was slight undertone of sex preference that generates desire for an additional child. Also there was a segment of population whose childbearing decisions were affected over time. A large proportion of women (about 60 percent) who said that they had not thought of a specific number initially have over time developed precise preferences. This may be because after experiencing child birth respondents were more certain about the number of children they wish to have. This gives an impression and re-affirms the notion that decision on having number of children is taken sequentially over time.

The desire for an additional child may vary with the

number of living children and by background variables. In this analysis the desire of an additional child with one living child had been analyzed. One could also examine the factors influencing the desire to have an additional child for those with two children (that is, the third child). But almost all of those with two children (98 per cent) did not want an additional child and such an analysis will be pointless. Similarly, the number of women with three or more living children was quite small in the sample and hence no meaningful analysis could be done for desire for children beyond the second. To eliminate the confounding effects of all the variables multivariate analysis was done and logistic regression adopted since the dependent variable was dichotomous in nature (desire to have a child, do not desire to have any more) (Table 2). As was done earlier, two models were fitted, one which includes household income and the other that includes type of locality poor or non-poor, among the background variables. The results (Table 4) show that respondents from joint families and SC/ST were more likely to desire an additional child after first birth than women from nuclear families and "Others" castes respectively. Also non-Bengali speaking and non-Hindu women were more likely to desire an additional child than Bengali and Hindu women respectively. Further from Model 1 it was apparent that women who were residing in poor localities were more likely to desire an additional child after the first birth than the women residing in the non-poor localities.

Discussions and Conclusions

It is logical that the set of preferences in a population will bring about change in the fertility pattern only if the dynamics of the behavioral pattern changes. The findings show that there is a tendency to regulate fertility among *"bhadrolok"* (white collar upper and middle class) Bengalis. This can be stretched long back in history when the phenomenon of having less number of children got a boost with renaissance in the eighteenth century, the change in socio- cultural milieu, and with the advent of modernization (McDonald, 2008). Overall there is undercurrent of desire for small families. There were no respondents who preferred a childless family. This further points out to the fact that voluntary childlessness is still not acceptable in the society. The two children norm is most popular, although the preference for one child is emerging rapidly. Thus women prefer to have at least one child and not many prefer to forego childbearing altogether.

There are various triggers that determine and influence the decision of childbearing. In this study it was found that fertility is closely associated with the education levels of the mother. Historically in the region with modernization more and more stress was given to women's education and women's role in the intra-family set-up. This is also reflected in the present paper that education (both respondent's and husband's education) has fertility depressing effect. Education gives a woman basket of choices while taking decisions on life events like choosing a career, a life partner, and embracing motherhood. Apart from appreciating reproductive roles she also attaches importance to individual rights and accomplishments. Additionally it was found that belonging to a particular ethnicity have bearing on decision of choosing a particular number of children. Thus, apart from micro level factors like education (both partners) macro-level cultural factors catalyzed the process of lowering the fertility in the region.

Also, it is assumed that the childbearing decisions are programmed within a time frame - long or short. A decision to have a child is not a onetime practice. The choice of number of children is often taken just *after marriage* although depending upon the sex of the child and experience from the child it is found that the decision to have an additional child had changed over a time frame. Subsequently, the desire to have an additional child has a partial bearing on low fertility.

This paper has concentrated on the process of decision making and determinants of low fertility, although large sections of the demographic research also include the social and economic implications of having less number of children. Major impacts of low fertility will be proportionate increase of the age old population, sizeable decrease of population if in-migration stops and deficiency of young and innovative minds. Also, low fertility leading to a one-child family as discussed above may affect the psychology of the child. Parents often found association and affection of the siblings as indispensable for overall growth of the child. Now,

it will be a matter of time to see whether this trend will encourage people to have more kids or low fertility will become a norm among the population.

Table 1: Change in desire of the respondents for an additional child after every birth Field Survey, Kolkata, 2013

Desired family size	*Desired Family size*												
after marriage	*After first child*				*After first child*				*After first child*				
	1	2	3	NT/UG	1	2	3	NT/UG	1	2	3	NT/UG	No of women
1	75.8	11.3	0	12.9	74.2	3.2	0	22.6	77.4	19.4	0	3.2	62
2	19.5	65.9	0	14.6	11.1	61.1	0	27.8	26.1	69.6	0	4.3	41
3	-	-	-	-	-	-	-	-	-	-	-	-	1
Not thought/ up to god	23.8	33.8	0	41.2	35.0	17.5	0	47.5	12.8	48.7	0	35.9	79

Source: Computed from Computed from primary data; Note: NT/UG=Not thought/ up to god

Table 2: Logistic Regression of desire for an additional child for women with one living child, Field Survey, Kolkata, 2013

		Model 1			*Model 2*		
Background variables	*Categories*	*B*	*Sig.*	*Exp (B)*	*B*	*Sig.*	*Exp (B)*
Age group	19-29		0.303			0.102	
	30-39	-0.601	0.597	0.548	-0.695	0.512	0.499
	40-49	-3.039	0.128	0.048	-3.463	0.034	0.031
Caste	Others						
	SC/ST	3.788	0.013	44.185	2.821	0.025	16.788
Religion	Hindu						
	Others	3.707	0.017	40.746	4.021	0.010	55.747
Mother tongue	Bengali						
	Others	3.571xhk	0.008	35.564	2.626	0.030	13.821
Type of family	Nuclear						
	Non Nuclear	3.351	0.005	28.536	2.662	0.009	14.321
Respondent's education	Less than Graduation	-0.394	0.763	0.674	-0.651	0.675	0.522
Husband's education	Less than Graduation	-1.322	0.370	0.267	-2.008	0.154	0.134
Number of living son	0						
	1	-0.846	0.395	0.429	-0.744	0.430	0.475
Household income	Less than 25,000						
	25,000 and above				0.377	0.808	1.458
Type of locality	Non-Poor						
	Poor	1.978	0.081	7.23			
Working status	Not working						
	Working	-1.218	0.326	0.296	-0.812	0.497	0.444
	Constant	-3.646	0.035	0.026	-1.456	0.158	0.233
	Pseudo R^2		0.748			0.669	
	N				94		

Dependent variable: Whether another child is desired (dichotomous, Yes=1, No=0)
Source: Computed from primary data
Note: Logistic regression for two living children is not done because 96.4 percent of women with two living children do not desire an additional child.

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Rural Housing Quality: A Case Study of Amkopa Village, Garbeta-II Block, Paschim Medinipur District

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Dr. Priyanka Chakraborty

Abstract

The quality of housing comprises many housing facilities in the micro-environment and house structure such as house type, electricity, drinking water, sanitation etc. The study of housing quality is necessary to measure the standard of living and technological advancement of a society. This paper is an attempt to understand the housing quality in rural areas of Paschim Medinipur district with special focus on Amkopa village under Garbeta-II block. Different indicators to measure the housing quality have been fixed and different statistical techniques like Deprivation Index, Composite Score, Co-efficient of Variation and Simple Percentage Calculation, rates, ratios are applied here. The study reveals that the quality of housing in Amkopa Village is very low.

Keywords: *Composite Score, Deprivation Index, Electricity, Housing Quality, Standard of Living*

Introduction

Housing can be defined as an architectural unit for accommodation in order to protect occupants from the forces of nature. Housing is closely associated to the process of overall socio-economic development. It provides the shelter and raises the quality of life. The World Health Organization (1961) describes the housing as the provision of any physical structures, used for shelter, which includes facilities, equipments, services and devices needed for healthy living. The quality of housing comprises many housing facilities in the micro environment of house structure such as house type, electricity, drinking water, sanitation, drainage etc. The quality of rural housing in developing countries like India, widely differ from the urban housing quality. Lack of housing finance and accessibility of basic amenities, limited mobility of rural households, the lack of vibrancy, and marked volatility in agricultural income and lastly remote and inaccessible location are the combined factors for low housing quality in rural sectors (Bhide, et.al, 2009). The study of housing quality is necessary, because it is a yardstick to measure the standard of living and technological advancement of a society.

It is evident that the quality of housing, job opportunities, income level, and migration are the controlling factors of quality of life of a region. Due to lack of access to basic amenities and services, rural households are faced to live in an unhealthy condition. The housing quality of a region is the net outcome of the interaction of socio-economic, political, and environmental factors. Rural areas are such part of a society that is generally bypassed from the provision and development of basic infrastructure due to lack of investment and proper channelization of government funds. Lack of consciousness among the rural people is also a responsible factor, which makes the lives of rural people miserable.

Objectives

The study has following four major objectives:

1. To analyze the internal variation of the selected indicators of housing quality across the Community Development Blocks (CD Blocks) of Paschim Medinipur district.
2. To examine the regional disparity in housing quality at the block level of Paschim Medinipur district.

Dr. Priyanka Chakraborty, Hoomgarh Girls' High School (H.S),
Email: priyankachak1986@gmail.com

3. To analyze the housing quality in Garbeta-II block at village level.
4. To study the socio-economic condition and housing quality of Amkopa village of Garbeta-II block.

Database

The present paper is based on both primary and secondary sources of data. In order to attain the main objective of the study, Household Survey approach has been adopted to generate the primary data. Primary data has been collected from Amkopa Village under Piasala Gram Panchayet of Garbeta-II block. Data are collected in a structured way with the help of scheduled cum questionnaire through door-to-door survey.

The secondary data has been collected from the Houselisting and Housing Census, 2011; District Census Handbook, 2011 of West Bengal (electronic format). Beside this, few information have been collected from Piasala Gram Panchayet through oral discussion.

Methodology

A systematic methodological principal has been followed in this study to select a village for field study. This can be explained as follows:

Pre-field Study:

At first, regional disparity in housing quality across the Community Development Block of Paschim Mednipiur district has been calculated using Deprivation Index. It has been analyzed that Garbeta-II block is the only Jungal Mahal Area under Medinipur sub-division of the district, which records high level of inequality in housing quality. Therefore, Garbeta-II block has been choose for the village level analysis regarding housing quality. In this context, Composite Score has been used to examine the housing quality at village level of the concerned district. Therefore, all the villages are grouped into five categories. From the very low-level group of housing quality, Amkopa village has been selected for primary survey, which is a Scheduled Tribe (ST) dominated area.

Field Study:

The primary data has been generated by interviewing people of the Amkopa village under Piasala Gram Panchayet of Garbeta-II block with the help of well-structured questionnaires through door-to-door survey. Therefore, total 24 households as per 2011 Census have been selected randomly for field survey. The study has been done very carefully to evaluate the quality of housing in the village.

Post-field Study:

Data and other informations collected during the field survey are compiled. The compiled data is analyzed and interpreted precisely to explore the socio-economic condition and housing quality of the Amkopa village.

Simple rates, ratios, and percentage calculation are used for the analysis of the primary data. On the other hand, the block and village level secondary data related to the housing quality are analyzed using different statistical techniques.

While examining the disparity in the level of quality of housing across the blocks of Paschim Medinipur district, the Deprivation Index (DI) has been worked out using the following formula:

$$\textit{Deprivation Index,}\ (\mathrm{DI}) = \frac{M_{xi} - O_{ij}}{M_{xi} - M_{ni}}$$

Where, M_{xi} and M_{ni} are the largest and smallest value of the indicators among all the blocks and O_{ij} is the value of i^{th} indicator in j^{th} block

To calculate the internal variation among the different selected indicators across the blocks as well as villages of the particular block, the following formula has been used:

$$\textit{Coefficient of Variation,}\ (\mathrm{CV}) = \frac{\sigma}{\bar{x}} \times 100$$

Where, 'σ' and '$\bar{x}$' are the value of standard deviation and mean of the concerned indicator.

To measure the disparity in quality of housing, village-wise of the concerned block, the formula is as follows:

$$\textit{Z-Score}\ (\mathrm{zij}) = \frac{xij - \bar{x}}{s.d}$$

Where, *Zij*= Standard value of the indicator *i* in village *j*. *xij* = Actual value of indicator *i* in village *j*. $\bar{x}$ = Mean value of indicator *i* in all villages, *s.d* = Standard deviation of variable *i* in all villages.

The village-wise Z-Score of all indicators have been added and the average has been taken out, which may be called as Composite Score (C.S) for each village of the concerned block. It may be expressed as:

$$\text{Composite Score} = \frac{\Sigma zij}{N}$$

Where, *zij*= total of the Z-Scores of all indicators for each village, *N* = Number of indicators.

The high value of composite Score denotes the high-level of housing quality and lower value shows the low-level of housing quality.

The indicators, which are taken to examine the quality of housing in the present study, are as follows:

The percentage share of households with – 1. Good conditioned Census houses, 2. Owned housing status, 3. Permanent house structure, 4. Three dwelling rooms, 5. LPG/PNG connection as fuel used for cooking, 6. Safe drinking water sources (tap water collected from treated and untreated sources), 7. Separate kitchen facility inside the houses, 8. Electricity as main lighting source, 9. Septic tanks as flush/pour flash latrine, 10. Drainage connection (closed and open both).

Study Area

Paschim Medinipur district is one of the backward district in West Bengal, which is situated between 21°36′35″ N to 22°57′3510″ N latitude and between 86°33′50″E to 88°12′40″E longitude. The district comprises four sub-division- Kharagpur, Medinipur Sadar, Ghatal and Jhargram sub-division. Among the 29 CD Blocks, Garbeta-II is one and only Jungal Mahal Area in Medinipur sub-division.

There is 264 inhabited villages covering 10 Gram Panchayets across the Garbeta-II block. Among the inhabited villages, Amkopa is one of the small village under Piasala Gram Panchayet with 24 households acquiring 60.42 hectors area with more than 90% ST (Scheduled Tribe) population as per 2011 Census.

Findings

Inequality in Housing Quality in Paschim Medinipur District: Block Level Analysis

West Bengal is one of the urbanized states in India as per 2011 Census. In West Bengal, 68.11% people live in rural areas where 33.19% HHs are good conditioned. Based on ownership status, 95.62% HHs are owned and 36.03% HHs are permanent in nature. On the other hand, 40.31% HHs have electric connection as the main source of lighting. About 4% HHs have LPG/PNG connection as cooking fuel. About 20% HHs have latrine facility connected to septic tank. The safe drinking water facility is supplied to about 11% rural HHs. About half of the households have separate kitchen inside the house in rural areas. About 30% HHs have three dwelling rooms and only 15.30% HHs have wastewater outlet to drainage connection in rural Bengal.

In West Bengal, Paschim Medinipur district is one of the backward district. In rural areas of the district, the condition of HHs is not very good because the share of HHs in most of the indicators is below 20% except the share of HHs in respect of good, owned condition as well as availability of safe drinking water and electricity as a major source of lighting. The indicators-wise regional imbalance is measured through Co-efficient of Variation across the CD blocks and it is shows that the internal variation is highest in case of accessibility of safe drinking water (81.79%) followed by LPG/PNG, permanent HHs, three dwelling rooms, drainage connection where the CV value is above 50%. On the other extreme, there is very low internal variation among the HHs across the blocks with regard to the owned housing status (below 1% CV value) that means the regional disparity is more consistent in case of households with good conditioned, owned status, separate kitchen facility within the house, electricity and sanitation connected to septic tank.

After measuring the internal variation of each indicator, the Deprivation Index (D.I) has been applied to measure the inequality in housing quality across the blocks. Here, it has been analyzed that out of 29 CD Blocks, 21 blocks are experiencing high level of inequality in terms of housing quality and

5 blocks are experiencing low level of inequality and the remaining 3 blocks report medium level of inequality in housing quality (Table 1).

Table 1. Inequality of Housing Quality: Distribution of CD Blocks in Different Categories of Deprivation Index

Category	*DI Values*	*No. of CD Blocks*	*Name of the CD Blocks*
Low	Below 0.30	05	Garbeta-I, Daspur-I, Daspur-II, Salboni, Kharagpur-I
Medium	0.31-0.40	03	Garbeta-III, Ghatal, Midnapore
High	Above 0.41	21	Binpur-I, Binpur-II, Garbeta-II, Chandrakona-I, Chandrakona-II, Keshpur, Jhargram, Jamboni, Gopiballavpur-I, Gopiballavpur-II, Nayagram, Sankrail, Kharagpur-II, Debra, Pingla, Sabang, Narayan-garh, Keshiary, Dantan-I, Dantan-II, Mohanpur

Source: Calculated by the author based on Houselisting and Housing Census, West Bengal, India, 2011.

The highest inequality is prevailing in Binpur-II block and lowest inequality is in Daspur-I and Kharagpur-I block regarding housing quality.

Among the 29 blocks, only Grabeta-II is the only Jungal Mahal Area under Medinipur sub-division in the district, which records high level of inequality in the context of rural housing quality. Therefore, this block has been selected to observe the micro-level scenario of housing quality. To measure the level of housing quality in the village-wise of the concerned block, the Composite Score has been used. There is wide range of variations in housing quality, which varies from highest of 1.54 score in Amdiha village to lowest of -1.00 score in Rangametia village. The entire array of variation in Composite Score of housing quality has been grouped into five categories, which is shown in Table 2 below:

Table 2. Housing Quality: Distribution of Villages under Garbeta-II Block in Different Categories of Composite Score

Categories	*Composite Score*	*No. of Villages*	*Percent of Villages*	*Name of the Villages*
Very High	1.01 and above	09	3.41	Amdiha, Mahalisai, Balibandh, Bandhi, Amlasuli, Puinchharabara, Puinchharachhota, Humgarh, Nagdipara
High	0.51 to 1	22	8.33	Keshia, Goaltore, Kuchlasuli, Pingbani, Erimara,Teskona, Jungalbarikupageria, Lakshiabad, Shirishdanga, Rijband, Jharnadanga, Agarband,Chunpara, Alui, Kayabad, Chandabila, Metaldoba, Tangasol, Shutkujuri, Piasala, Bagdangra, Bagridi
Medium	0 to 0.50	88	33.33	Jamdahara, Domahani, Krishnasol, Harimara, Kalabati, Amjor, GachhUpra, Adalia, Shyamsundarpur. Sarengagar Mayna, Patharpara, Shitalpur, Parashia, Bisharbandh, Bablapani, Kharkata Bhururbani, Sundargere, Murakati, Kadasol, Daldali, Pinrrasuli, Betjharia Baranakdana, Kushtara, Dumardiha, Gorabari, Chengsol, Dudpatri, Kadamdiha, Nangalmura, Shiyarbani, Kumari, Barakadra, Chamtubad, Keshia, Gotsol, Panrdaha, Saltora, Kenja, Lakshiapal, Kakurara, Barashalgeria, Barabolbandi, Shitalpur Naya Bankati, Dolderia, Pat Tentul, Jaypur, Kontore, Bhatmaudi, Penchamura Malibandi, Khanapar, Padurbankati, Deriapur, Rajadali, Manikdipabara, Shuknakhali, Salgeria, Dhobani Chatra, Banribot, Baramasia, Kalabati, Suthanrar, Chakbindu, Dubda, Deulkala, Chemia, Gohaldanga, Birpathari, Barabagpichhla, Metyala, Umrapata, Kiamacha, AgayaIchharia, Madnapur, Harigeria, Patasol

Low	-0.50 to -0.01	118	44.70	Chechuria, Makli, Karanji, Bhalukbasabara, Rengtia, Keshia, Kadambandi, Ruparghagra, Bankati, Khajrabara, Nenguria Bara, Kunarpur, Hathimasan, Amdiha, Kadma, Peruabad, Nayabankati, Bhuniasol, Dobati, Bhandarpur, Amlachati, Metyal, Parakanali, Chhota Dharampur, Pitli, Nischintapur, Bulanpur, Hatia, Singla, Chhota Patasol, Nischintapur, Kenkanali, Dubrajpur, Benachapra, Bathantor, Dumuria, Chhagalia, Jirapara, Betjharia, Bhedya, Kerumara, Karasai, Kewakol, Nimkata, Dharampur, Shankhabhanga, Kankrisol, Gopinathpur, Subalbandi, Shirsa, Hirasol, Gangaduari, Gotshingla, Dhamchia, Karasol, Dhekineja, Lagiluari, Kusumdanga, Jamira, Thakurpara, Khasjangal Nischintapur, Hatibari, Chhotashalgeria, Junsol, Baglada, Aulia, Shuribanka, Babudanga,Chhota Chengsol, Barachengsol, Garduara, Naya Bankait, Bhama, Kupageria, Amakonda, Jharia, Panduri, Dhanghori, Ashargram, Kankdaha, Dhitingi, Chhatardanga, Kamilakon, Bhalukkulia, Sarbot, Taldanga, Ghagra, Arabari, Bankati, Mayna, Sitarampur, Talbandi, Jangalabadi, Baulara, Chekuasol, Dhobasol, Shiromonipur, Lalitpur, Basudebpur, Kurkutbandi, Jagardanga, Baranagara, Shalband, patharberia, Indkuri, Moldanga, Chhotapichhla, Dhepua, Hamargora, Ukhla, Bargiutra, Birbandi, Dubrajpur, Darikanchrator, Raghunathbari, Kundra Kantapal, Gopalnagar, Kanchrator, Chotadhadka
Very Low	-1 to -0.51	27	10.23	Baishnabsol, Chhotaborobari, Balikhunia, Bandrisol, Bankisol, Sirisbani, Andharia, Chhota Nakdana, Khapribhanga, Bara Chauli, Anusol, Kushkati,Chatrakhulia, Ekaria, Baraelageria, Chhotaelageria, Dhajuri, Ghusingdanga, Amkopa, Ashnasholi, Barasol, Patharmari, Rangametia, Bankumari, Amjor, Peruajol, Bhandar Bandh
Total	264	100		

Source: Source: Calculated by the author based on Houselisting and Housing Census, West Bengal, India, 2011.

The Micro Level Analysis Of Housing Quality in Sample Study Area

In order to get an insight into the prevailing factors, which are responsible for low level of housing quality, a detailed household survey has been conducted in the Amkopa village as a sample study area. Amkopa is a small, isolated village from the heart of the Piasala Gram Panchayet.

Demographic Characteristics

The Amkopa village is a Scheduled Tribe (ST) dominated area with 19 HHs out of 24 HHs that are surveyed. The remaining 5 HHs are of General category. There is 116 population lived in 24 surveyed HHs. The male and female population in the village is 52 and 64 respectively. Therefore, the sex ratio is 1231 female/1000 male. The child sex ratio is 666 female/1000 male.

Socio-economic Characteristics

The total effective literacy rate is 80.10%. The male literacy rate is 95.65%. The female literacy rate is 68.33%, which is much lower than the average literacy rate of the village. The female illiteracy rate (35.93%) is much higher than the male illiteracy (15.38%). The formal educational attainment is also high for male population (84%) than the female population (64%). However, for the both, the share of population decreases with the increase of the level of education. The dependency ration in the village is very low (21% approximately).

In the village, there is an almost 45% worker live in. Among them, 50% population are engaged as agricultural labour, followed by 34% as cultivators and rest 16% fall under other working category (business). Out of 24 HHs, 37.50% HHs falls under Rs. 2001 to 4000/month income group followed by below Rs. 2000/ month (29.16%), Rs. 4000 to 6000/month (20.83%) and above Rs. 6000/month (12.50%). Therefore, it can be said that as most of the people are cultivator and agricultural labour with low age and their economic condition is very poor, which affects their standard of living and as well as their educational status. The dependency ratio in the village is very low (above 21%).

Housing Quality

In the village, all households are residential and owned in nature. More than half of the total HHs are in livable condition, followed by good (33%) and dilapidated condition (13%). The predominant building materials used for construction of roof, floor, and wall are tin (94.50%), mud (79.17%), and mud/unburnt bricks (83.33%) respectively. Out of 24 HHs, about 38% HHs have one dwelling room, which makes over congestion and unhealthy living condition within the house, followed by three rooms (29.17%), two rooms (25%), and four rooms (8.33%). Most of the inhabitants household size is 5 (29.17%) and lowest is 2 (4.17%).

As it is small-clustered village, there is 5 number of tap water source near premises and 7 number of borehole within the village. One tube well is present here but it is not working properly. The tap water is used for domestic purpose but the water from borehole is used for both domestic as well as agricultural purpose. About 80% HHs collect tap water from treated sources and 20% from boreholes. More than half of the total HHs has responded that the quality of the water from tap and borehole is good. The iron content is the main problem of water quality. The villagers face difficulties to get minimum requirement of water during the summer season due to the frequent power cut. Most of the HHs does not use water purifier for drinking purpose.

There is no individual latrine in the households of the village. Under the Mission Nirmal Bangla, few public latrines have been constructed with no lighting and water connection. Therefore, only 15% HHs use the public latrine and remaining HHs are compelled to practice open defecation. Most of the public latrines have become abundant or villagers use the latrines for other purpose. There is no drainage connection in the village.

The main source of light in the village is electricity (about 80% HHs) and only 20% HHs have no electric connection. They use kerosene as a source of lighting. Frequent power cut is the main problem in the village. About 66% HHs use firewood as fuel for cooking purpose and the rest number of HHs use LPG/PNG as cooking fuel.

Conclusion

The present paper has analyzed the socio-economic condition and housing quality of Amkopa village. This is an isolated, small, and clustered village with 24 HHs as per Census 2011. This is a village located in Garbeta-II block (Jungal Mahal Area) which is experiencing low housing quality as per the analysis using Composite Score. To observe the ground truth, the field survey has been carried out to examine the socio-economic status as well as housing quality of the households of the Amkopa village. It is observed from the study that it is a Scheduled Tribe (ST) dominated village, where sex ratio is low. Most of the people are engaged in agricultural activity in which the proportion of agricultural labour is high.

The literacy rate is good in this village i.e. 80% but due to the poor economic condition and poverty, the educational attainment in formal institution is continuously lowering down with increase of the level of education. One Sishu Siksha Kendra (SSK) Primary School is present within the village, which attracts pupil from Amkopa village itself as well as from other nearest villages. Therefore, from the demographic and socio-economic condition, it is noticed that there is a huge potential human resources in the village, because a large share of population belong to working age group. In other words, as the dependency ratio is low and literacy rate is high, there is a light of hope for the development of the village. Only, Governmental initiative is necessary to improve their socio-economic condition by implementing different scheme related to education and economy. Demographically they have the potentiality, only educational and economic support

is necessary to upgrade their standard of living, which can accelerate the prosperity of Indian economy. It is a commonly known fact that if any part of a society remains backward; it pulls down the overall growth of a nation. All households in the village are kuccha, residential and owned in nature. One dwelling room with more than 5 household size promotes over congestion and unhealthy living condition. There are three beneficiaries HHs who have got housing facility under Pradhan Mantri Awas Yojana Gramin (PMAYG) Scheme. There is no indoor source of drinking water within the households. All HHs depend on outdoor public tap or bore hole for drinking water. Water scarcity is the main problem during the summer season due to the frequent power cut. There is no individual latrine within the HHs. Mainly open defecation is practiced by the villagers. The public latrines, which are given by Piasala Gram Panchayet under Mission Nirmal Bangla are generally not used by the villagers due to the lack of consciousness and poor condition of the latrines. There is no drainage connection as waste water outlet. Electricity is the main source of lighting but frequent power cut hampers the daily livelihood. Firewood is the main fuel used for cooking purpose. Therefore, it can be concluded that the households of the Amkopa village is characterized by high literacy rate, low dependency ratio, low educational attainment, agricultural activity with low wage, poor economy, over congestion, poor housing condition and lack of accessibility to basic amenities to maintain a good quality standard of living (except safe drinking water availability). Therefore, as a whole, housing quality, or the quality of life in this ST dominated village is poor. Therefore, proper implementation of Central or State Government Schemes and villagers' awareness are necessary to upgrade the quality of life of Amkopa village.

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Quality of Life in Paschim Medinipur District: A Study of Basic Amenities

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Dr. Avishek Bhunia

Abstract

Rural areas always play a pivotal role in Indian perspective. Though the majority of the dwellers belong to villages but the service delivery propensity is always toward the urban centres since the post independence period. Therefore, rural Bengal is facing an acute shortage in the provision of basic amenities and facilities. In the light of the above discussion, the present paper endeavours to examine the availability and variability of basic amenities across blocks in Paschim Medinipur district. The paper is based on secondary sources of data, collected from various publications of Census of India for the year 2011. The study reveals that there is a heavy 'demand and supply' problem regarding basic amenities to the rural households. The capacities of the local governments in many rural areas are overburdened. So it becomes difficult to formulate plans and programmes for the holistic development of the rural areas.

Keywords: *Quality of life, Basic amenities, Rural, Regional imbalances, Deprivation index.*

Introduction

It is evident that most of the economic activities in India, as also elsewhere in the world, are concentrated in the towns or cities. The urban centres, therefore, are considered as the engines of growth in any economy. But rural areas always play a pivotal role in Indian perspective. It is obvious that India still lives in villages. Around 70 percent population still resides in rural areas. Though the majority of the dwellers belong to villages but the service delivery propensity is always toward the urban centres since the post independence period. Observing the discrimination between rural and urban areas once Gandhi Ji told "if the village perishes, India will perish too. It will be no more India...". Due to the crunch of various socio-economic facilities, cultural opportunities, non availability of basic amenities and assets, scarcity of infrastructure, explosion of population etc., the quality of life of rural India gradually decline with the march of time. The term *Quality of Life* (henceforth abbreviated as QoL) is used in a wide range of extent. Here QoL is assessed on the basis of availability of basic amenities. Generally, QoL refers to the general wellbeing of individuals and societies. So quality of life is that degree of wellbeing to which a person enjoys the important possibilities of his/her. On the other extreme, *basic amenities* refer to those requirements which are necessary (although not sufficient) for anyone's daily life and has direct linkage with QoL. The future prospect of the pace of socio-economic transformation of the country relies on to a large extent on the availability of basic infrastructure facilities and social amenities. The availability of these services reflects upon the quality of life in rural areas. Ironically, however, the quality of life in rural India leaves much to be desired. The rural areas in the country rank very low in the world with regard to the environment, infrastructure and basic amenities. Rapid growth in population unaccompanied by sufficient investments in rural development during the post independence period has led to a serious scarcity in the availability of infrastructure and basic amenities in villages in our country (Hassan and Daspattanayak, 2008; Bhunia and Daspattanayak, 2016).

As per *Houselisting & Housing Census,* 2011, little

Dr. Avishek Bhunia, Department of Geography, S.B.S.S. Mahavidyalaya, Goaltore, Paschim Medinipur, West Bengal,
E-mail: avishekbhunia@gmail.com

more than one-forth rural household in the country do not have access to tap water. Households are having poor access to safe drinking water available on a 24×7 basis. Similarly, nearly 80 percent of the households do not have toilet facilities within the premises while around 70 percent are yet to be covered by drainage facilities for the discharge of waste water. More than half of rural households of the country are found not to be electrified. The drainage system for the disposal of rain water is insufficient in most of the rural areas as a result of which water logging on the roads or streets and in the down areas becomes a common sight during the rainy season poising serious health hazards to the dwellers. These are some of the main reasons underlying not only ill health and high morbidity levels among the people, but also a low level of economic productivity of the rural areas. Apart from the deficiencies in basic amenities, the operation and maintenance of infrastructure poses another set of challenge for the local governance (Hassan and Daspattanayak, 2008). For West Bengal, these figures are more discouraging. The villagers of this state are also suffering from other insufficient basic facilities. The access of basic amenities to the households is not only poor in general but also inadequate which creates a dehumanised living condition in many rural areas in the state. Evidences also indicate a marked regional variation in the levels of amenities available to the villagers across West Bengal. The factors working behind this substantial shortage are broadly socio-cultural background, economic affordability and growing population. The deprivation suffered by the dwellers with regard to such amenities is a big challenge to development and led to the degradation of quality of life in West Bengal (Hassan and Daspattanayak, 2008). It is evident that there is a heavy 'demand and supply' problem regarding basic amenities to the rural households. The capacities of the local governments in many rural areas are overburdened. So it becomes more difficult to formulate plans and programmes for the holistic development of the rural areas.

Objectives

In the light of the above discussion, the present paper endeavours to examine a comparative account between rural Paschim Medinipur district and rural Bengal as a whole with regards to the accessibility of basic amenities. In addition to this, the study is an attempt to judge the availability of select amenities as well as quality of life across blocks in Paschim Medinipur District. Apart from that, the present paper also examines the regional imbalances in the levels of select amenities across the blocks for the latest census year.

Materials And Methods

The paper is based on secondary sources of data, collected from the *Houselisting & Housing Census,* Census of West Bengal, 2011 and *Primary Census Abstract*, Census of West Bengal, 2011 (both electronic format).

All the above indicators are self explanatory in nature. However, as can be seen, two of these indicators need further explanation. 'Safe drinking water sources' here refers to water collected from tap (both treated and un-treated sources), well (both covered and un-covered), hand pump, tube well/ bore hole. Subsequently, 'Drainage outlet system' refers to both closed and open drains.

In order to work out dispersion among different civic amenities across blocks with regard to percentage share of households having each of the select amenities, *Coefficient of Variation* has been applied. In addition to investigate the relationship between decadal growth of rural population (2001-2011) of different blocks and households with basic amenities *Correlation Coefficient* technique has been applied.

On the other hand, while examining the disparity in the levels of basic amenities across the blocks in the district, a *Deprivation Index* has also been worked out using the following formula:

$$Deprivation \quad Index, DI = \frac{M_{X_i} - O_{ij}}{M_{X_i} - M_{n_i}}$$

Where, 'M_{x_i}' and 'M_{n_i}' are the largest and smallest values among all the blocks on the indicator, and 'O_{ij}' is the value of i^{th} indicator in j^{th} block (i.e. the block for which the index is intended to be worked out). This is only a relative measure of deprivation with regard to a given basic service in a block. In

other words, the measure is based on the highest and lowest value in the state. As is evident from the equation, the value of the index will be varying from 0 to 1.0. The best performing block with respect to a given service or amenity will have an index of perfect 'zero' while the one with the lowest coverage will report a perfect 'one'. Thus, the further an observation from 'zero' the greater is the deprivation with respect to a particular service or amenity (Hassan and Daspattanayak, 2008).

Study Area

Paschim Medinipur district is one of the districts of West Bengal, located in the south-western part. It was formed on 1st January 2002 after the partition of Midnapore into Paschim Medinipur and Purba Medinipur. It ranks second in terms of geographical area (9,295.28 sq. km.) amongst the districts of the state. It ranks third in terms of rural population (4.58 million) as well as ranks fourth in terms of percentage of tribal population (14.87). Paschim Medinipur district is home to the most villages of any district in India. The 2011 census lists Paschim Medinipur as having 8,694 villages, of which 7,600 are populated, and 1,094 are uninhabited. The district comprises three subdivisions viz. Kharagpur, Medinipur Sadar and Ghatal. There are 28 police stations, 29 development blocks, 8 municipalities and 290 gram panchayats. According to the 2011 Census, Paschim Medinipur district has a population of 5,943,300. The district has a population density of 636 inhabitants per square kilometre. Its population growth rate over the decade (2001-2011) was 14.44 percent. Paschim Medinipur has a sex ratio of 960 females for every 1000 males, and a literacy rate of 79.04 percent.

Result and Discussion

Always a society deserves quality of life for its residences. Therefore, the plan and policies have been introduced by the Government with a view to improve the standards of living of the people in an area. Rural Bengal presents a typical example of sub-standard quality of life and habitation for its dwellers. The situations in economically backward districts are even worse. Following table presents a comparative account of basic amenities available to the households of Paschim Medinipur district and in West Bengal as a whole for the rural households of the year 2011.

Table 1: Basic Amenities, West Bengal and Paschim Medinipur District, 2011

Basic amenities	*Share rural of households with*		*Gap (in percentage point)*
	West Bengal	*Paschim Medinipur district*	
Safe drinking water sources	98.16	99.20	-1.04
Latrines within the premises	46.74	41.90	4.84
Electricity	40.31	48.90	-8.59
Drainage connectivity	15.30	7.60	7.70
Separate kitchen inside the house	49.03	41.90	7.13
LPG/PNG	3.96	2.80	1.16

Source: Houselisting & Housing Census, West Bengal, 2011.

It is noted from the table that in terms of rural households with safe drinking water sources and households with electricity exceeds the share of state's average. Though it is evident that the gap between the sate and the district with regards to the accessibility of safe drinking water is minimal but in terms of electricity district's hare is around ten percent forward than the state as a whole. Apart from these amenities state holds better position than Paschim Medinipur district regarding the availability and accessibility of daily prime requirements. It is remarkable to note that the state's share is twice in terms of the rural households having drainage connectivity for waste water outlet. There exists little more than 7 percent gap between the share of the state and district in terms of the household having separate kitchen inside the house. The gap is barely 5 percent regarding rural households with

latrine facility within the premises. The gap is quite minimal in terms of LPG/ PNG as cooking fuel to the rural households between the state as a whole and the district average. Therefore, it can be concluded that quality of life with regards to the households with basic amenities in Medinipur district is not up to mark level and the households are sustaining with sub-standard quality of life with comparison to the state as a whole. It is also noted that the condition and quality of rural Bengal as a whole is not good enough because half of the households are not enjoying the delivery accessibility of basic daily requirements.

Table 2 presents the percentage share of rural households with selected housing indicators for the blocks of Paschim Medinipur district during the latest census. The *Deprivation Indices (DI)*, based on the equation mentioned above, with respect to the basic amenities are also given in the table. In addition, last two row of the table gives the values of *Coefficient of Variation (CV)* with respect to each basic amenities and *Correlation Coefficient (r)* between decadal growth rate in rural population and households having basic amenities. It is noted from the table that levels of household amenities are quite uneven across blocks. Likewise, it is remarkable to observe that within a block the disparity of different household amenities is also exist.

Every person aspires to a good life and every person has equal right to live a decent life irrespective of their socio-economic and regional geographic characteristics. But the phenomenon of inequality is persistent in everyday life of people especially those living in developing countries such as India (Venkatanarayana, 2013). These inequalities are also visible in West Bengal as well as in blocks of Paschim Medinipur district. This study looks at the most important aspects that shape human lives viz. basic amenities. In Paschim Medinipur inequality exists across the blocks in terms of availability and accessibility of basic necessities. Here six important basic amenities are discussed to identify the variations of each amenity. However, disparity across blocks is measured in terms of *Coefficient of Variation*, which varies from one amenity to another. It is revealed that, there are not much of the differences in the levels of households having electricity and separate kitchen inside the house. On the other extreme, there is very low variability among the households across the blocks with regard to the households having safe drinking water sources. The value of *Coefficient of Variation*, across the blocks, shows widest disparity in terms of households having LPG/ PNG connection as cooking fuel. The range of variation in the share of households having latrines within the premises and drainage connectivity for waste water outlet across the blocks is quite higher in magnitude. So it can be concluded that out of six select household amenities, the households having safe drinking water sources are more consistent than the other household amenities in the study area.

Table 2 shows the correlation between block-wise decadal growth rate of rural population (2001-2011) and household amenities in the form of *Correlation Coefficient* (i.e. *'r'*). It is noted that decadal growth in rural population is significantly correlated (at 0.05 significant level) with households having electric connection. Though the growth in rural population is positively correlated with the households having safe drinking water facility and toilet facility within the premises but the relationship is not significant. Apart from that, relationship is negative among growth in rural population with households having drainage outlet facility, separate kitchen inside the house and LPG/ PNG as cleaner, efficient and non-smoke producing fuel. The result signifies that the growth of availability and accessibility of basic amenities are not at par with the block-wise rural population growth in two consecutive census years.

It is evident (referring back to Table 2) that though the considerable share of households of few blocks exceeds the share of the district as a whole and enjoying the availability of different basic amenities but these opportunities are not evenly distributed over all blocks of Paschim Medinipur district. Majority of the households of some blocks are living beyond this opportunity and pursuing with substandard quality of life. In addition to this, it is also reveals that share of basic amenities are quite variable across the blocks of the study area. The regional variability can be examined based on *Deprivation Indices*.

Table 2: Basic Amenities and Deprivation Index in Blocks, Paschim Medinipur District, 2011

Sl. No.	Blocks	Growth in rural population (2001-2011)	Share of rural households with						Deprivation Index							
			Safe drinking water sources	Latrines within the premises	Electricity	Drainage connec-tivity	Separate kitchen inside the house	LPG/ PNG	Safe drinking water sources	Latrines within the premises	Electricity	Drainage connec-tivity	Separate kitchen inside the house	LPG/ PNG	Aggregate	Average
1	Binpur - II	8.78	95.20	7.10	31.70	5.00	40.60	1.40	1.00	1.00	0.94	0.80	0.62	0.91	5.27	0.88
2	Binpur - I	12.22	99.30	8.10	34.00	6.40	37.20	1.60	0.13	0.99	0.89	0.71	0.74	0.89	4.34	0.72
3	Garbeta - II	13.20	98.20	18.70	53.50	11.00	35.00	3.10	0.36	0.85	0.44	0.43	0.82	0.72	3.61	0.60
4	Garbeta - I	8.90	99.30	29.90	51.00	17.90	37.30	5.50	0.13	0.70	0.50	0.00	0.74	0.44	2.50	0.42
5	Garbeta - III	6.51	99.30	25.10	49.40	14.20	35.30	4.30	0.13	0.76	0.54	0.23	0.81	0.58	3.04	0.51
6	Chandrakona - I	15.18	99.80	31.80	53.00	12.20	35.70	3.10	0.02	0.67	0.45	0.35	0.79	0.72	3.01	0.50
7	Chandrakona - II	15.39	98.80	35.00	44.40	7.30	32.50	3.10	0.23	0.63	0.65	0.66	0.91	0.72	3.80	0.63
8	Ghatal	15.11	99.90	49.90	57.10	4.70	40.60	3.90	0.00	0.43	0.36	0.82	0.62	0.63	2.85	0.48
9	Daspur - I	16.05	99.70	60.00	69.50	10.90	46.80	6.20	0.04	0.30	0.08	0.43	0.39	0.36	1.61	0.27
10	Daspur - II	15.74	99.80	64.70	72.80	5.80	47.50	3.90	0.02	0.24	0.00	0.75	0.37	0.63	2.00	0.33
11	Keshpur	17.59	99.30	41.60	69.10	10.50	41.40	1.90	0.13	0.54	0.08	0.46	0.59	0.85	2.66	0.44
12	Salbani	14.16	98.20	20.50	59.10	14.80	43.20	6.40	0.36	0.82	0.31	0.19	0.52	0.34	2.55	0.43
13	Midnapore	21.37	98.80	30.50	62.10	10.10	32.40	4.90	0.23	0.69	0.24	0.48	0.91	0.51	3.08	0.51
14	Jhargram	10.93	99.40	13.80	37.90	8.00	39.60	2.00	0.11	0.91	0.80	0.61	0.65	0.84	3.93	0.65
15	Jamboni	11.29	97.10	11.00	34.70	10.50	39.00	1.70	0.60	0.95	0.87	0.46	0.68	0.88	4.43	0.74
16	Gopiballavpur - II	12.53	99.30	16.60	34.70	8.40	43.80	0.80	0.13	0.87	0.87	0.59	0.50	0.98	3.94	0.66
17	Gopiballavpur - I	14.15	98.50	16.80	52.20	12.20	33.30	1.90	0.30	0.87	0.47	0.35	0.88	0.85	3.73	0.62
18	Nayagram	14.73	98.20	10.80	29.10	6.50	30.00	0.60	0.36	0.95	1.00	0.71	1.00	1.00	5.02	0.84
19	Sankrail	12.46	99.70	23.30	48.80	9.20	33.80	1.40	0.04	0.79	0.55	0.54	0.86	0.91	3.69	0.61
20	Kharagpur - I	8.38	99.00	33.70	58.20	9.80	44.70	9.40	0.19	0.65	0.33	0.50	0.47	0.00	2.15	0.36
21	Kharagpur - II	13.35	99.80	49.20	45.60	2.90	42.70	2.10	0.02	0.44	0.62	0.93	0.54	0.83	3.39	0.56
22	Debra	13.09	99.50	63.40	48.30	5.50	47.20	2.60	0.09	0.25	0.56	0.77	0.38	0.77	2.82	0.47
23	Pingla	13.88	99.40	65.80	40.80	2.10	51.40	0.80	0.11	0.22	0.73	0.98	0.23	0.98	3.25	0.54
24	Sabang	13.33	99.40	77.20	37.70	1.90	47.50	0.70	0.11	0.07	0.80	0.99	0.37	0.99	3.33	0.56
25	Narayangarh	2.84	99.30	55.50	40.40	5.70	47.60	2.40	0.13	0.36	0.74	0.76	0.36	0.80	3.15	0.52
26	Keshiary	13.02	99.60	31.70	35.10	6.50	41.20	1.60	0.06	0.67	0.86	0.71	0.60	0.89	3.79	0.63
27	Dantan - I	9.61	98.80	39.80	39.80	4.90	40.20	1.20	0.23	0.57	0.76	0.81	0.63	0.93	3.93	0.65
28	Dantan - II	15.37	99.10	82.50	46.00	1.80	57.70	1.00	0.17	0.00	0.61	1.00	0.00	0.95	2.74	0.46
29	Mohanpur	16.17	99.70	80.30	49.90	4.60	39.50	1.40	0.04	0.03	0.52	0.83	0.66	0.91	2.99	0.50
Value of 'r'		-	0.200	0.219	.430*	-0.093	-0.097	-0.054	-	-	-	-	-	-	-	-
CV		-	0.98	60.53	24.58	50.74	15.54	74.42	-	-	-	-	-	-	-	-

*Notes: * Correlation is significant at the 0.05 level (2-tailed); ** Correlation is significant at the 0.01 level (2-tailed).*

Source: Computed by the author from Primary Census Abstract, Census of India, West Bengal, 2011; Houselisting & Housing Census, West Bengal, 2011.

The study conveys that out of 29 blocks, the average deprivation index is found maximum in Binpur-II block followed by Nayagram, Jamboni and Binpur-I etc. But the average deprivation index is much lesser in Daspur-I block followed by Daspur-II, Kharagpur-I and Garbeta-I etc. It is remarkable to note the fact that the western blocks (i.e. Binpur-II, Nayagram, Jamboni and Binpur-I) report a very low level of household amenities (i.e. high level of DI) as well as low quality of life in the rural areas. This is more so in the southern block (i.e. Nayagram). But the availability of these household amenities are better in Garbeta-I, Salboni, Keshpur, Debra, Daspur-I, Daspur-II, Debra, Kharagpur-I, Dantan-II blocks etc. because of various socio-economic factors. The disparity of basic amenities in the study area is presented in the Fig. 1 in terms of Average Deprivation Index.

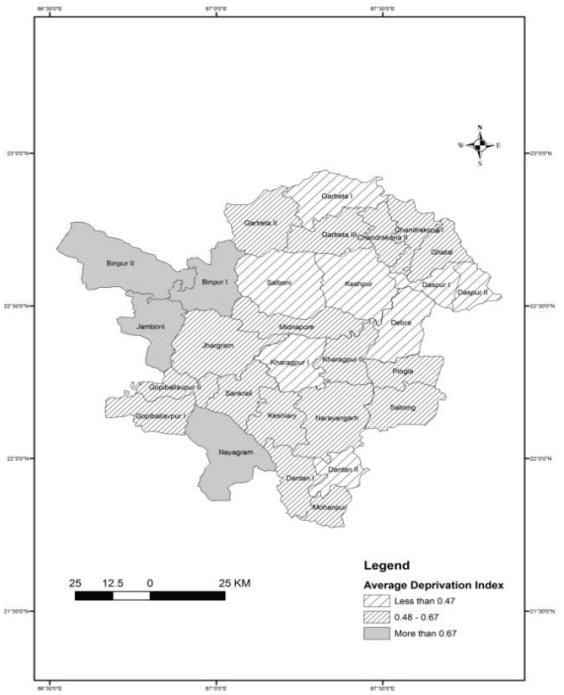

Fig. 1 : Regional Disparity in Paschim Medinipur, 2011

Conclusion

In Paschim Medinipur district there exists a great amount of regional variation in the levels of basic amenities as well as quality of life to rural dwellers across blocks. With high per capita income and a high level of investments, few blocks report a higher share of population under these basic amenities than the district's average vis-a-vis state's average. In the less developed blocks, on the other hand, a sizeable household still lives in an absolutely dehumanised condition. On the other hand, the situation in some blocks are starkly miserable because of economic backwardness, low per-capita income, low work participation rate, dominance of scheduled population (SC, ST) and minorities, low literacy rate, and lack of awareness of benefits of desired basic amenities and quality of life. In the context of rapid and haphazard population growth it is all the more important to devise planning strategies which ensure for a better delivery of basic amenities and services leading to a all round improvement in quality of life of rural dwellers. No denying of the fact that from time to time different plan and policies are implemented by the central as well as by the state government for overall development of rural areas and for enhancing the levels of quality of life ever since the First-Five-Year Plan. But this huge burden will not removed over night.

The first government-installed rural water supply schemes were implemented in the 1950s as part of the Government policy to provide basic drinking water supply facilities to the rural population. In 1972, the government began to improve rural water supply, and in the mid-1980s the issue was declared a national priority. In 2009, the Accelerated Rural Water Supply Programme was modified as the National Rural Drinking Water Programme (NRDWP) with major emphasis on ensuring sustainability of water availability in terms of potability, adequacy, convenience, affordability and equity, on a sustainable basis, while also adopting decentralized approach involving PRIs (Panchayati Raj Institution) and community organizations. As a result, by 2011, 95 percent of India's rural population had access to some form of water supply infrastructure. But in practice however many systems were no longer functional. Now The Ministry has prepared a Strategic Plan for the rural drinking water sector for the period 2011 to 2022

(Ministry of Drinking Water & Sanitation, 2013). On the other hand, it is also noted that open defecation is a widespread and persistent health challenge for the rural areas. Policies like Central Rural Sanitation Programme (CRSP), was launched in 1986, the Total Sanitation Campaign (TSC) was launched in 1999 and very recently Swachh Bharat Mission (SBM) is introduced to wipe out the problem. Similarly, it is evident that some of Indian villages have been living in dark for a long time. Few villages of our country lack the proper infrastructure for electricity even after 72 years of Independence. Electricity is an essential requirement for all facets of life of human beings. It has been recognized as a basic human need. It is a critical infrastructure on which the socio-economic development of any region depends. Supply of electricity at reasonable rate to rural India is essential for its overall development. For a start, electric lighting makes the use of candles, kerosene and other pollution for lighting redundant, not only saving money (and providing more light) but a improving health. Electricity can increase productive hours in a household lead positive outcomes on education and economic well being. Observing the necessity of electricity Central Govt. has launched various policies and schemes especially for rural areas viz. National Electricity Policy 2003, National Electricity Policy 2005, National Rural Electrification Policy, 2006, Deen Dayal Upadhyaya Gram Jyoti Yojana (DDUGJY), Rajiv Gandhi Grameen Vidyutikaran Yojana (RGGVY), Remote Village Electrification Programme, Village Energy Security programme and lastly in 2014 Central Government launched one of its ambitious projects of rural electrification. The centre plans to electrify 18,452 un-electrified villages within 1,000 days by May 1, 2018. To cope with the fuel problems Rajiv Gandhi Gramin Vitaran Yojana was launched and very recently Pradhan Mantri Ujjwala Yojana was launched recently (1st May, 2016) to provide 'free LPG connections' to women who belong to BPL (Below-Poverty-Line) households with a view to empowering women and protecting their health through reducing serious health hazards associated with cooking based on fossil fuel, reducing number of deaths due to unclean cooking fuel, preventing young children from acute respiratory illnesses caused due to indoor air pollution by burning the fossil fuels such as fire-wood, dried cow dung, crop residue and low quality coal used for cooking. So keeping in view the current dynamics of rural development, it can be argued that that while aiming at improvement in quality of rural life we must strive for rural growth with a human face that is equitable and regionally balanced, where all the sections of rural population will get an equal share of the fruits of the economic development. At last but not the least it can be concluded that the problems for the rural areas regarding insufficient availability of basic amenities will not be solved over night. It will only be solved by public interferences, good social wills of the dwellers, participation of the NGOs with Govt. initiatives.

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Geography and AssistiveTechnology: New opportunities for Visually Impaired Learners

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Ishita Halder
& Dr. Mousumi Boral

Abstract

Geography as a spatial science has been inherently challenging to the visually impaired learners as they face difficulties to grasp the concepts of space, time, location or to obtain particular set of skills like map reading, map drawing etc. Technology has revolutionized the modern era and has a significant impact on the discipline of Geography with the invent of GIS, GPS etc. Modern and advanced technological aids are helping learners to gain geographical knowledge rapidly and more aptly. Moreover, for visually impaired learners there are special technological devices which can increase their efficiency in learning Geography.

Keywords: *Geography, Assistive Technology, Visually Impaired (V.I.) Learners.*

Introduction

The subject Geography is unique in its perspective as it is not circumscribed to a particular subject matter. It concerns itself with the copious conditions and activities on the earth-surface like people-environment relationship, changes in environments and places, the socio-political and economic interconnections between different parts of the world etc. According to A. Bonnett (2012), it is a subject which connects different types of knowledge rather than compartmentalizing them. Geography talks not only about the diversities but also about the differences and inequalities in human society. In fact, from map reading to field-work, there are lots of activities inherent to Geography which makes the people with disabilities feel not updated in comparison to others. This is true especially in case of Visually Impaired (V.I.) learners because Geography focuses on concepts like location, space, distance, landform etc. which require vision to grasp the ideas appropriately and they have difficulty to build on knowledge and learn new or complex concepts and skills.

Defining Visual Impairment

The Rights of Persons with Disabilities Act (RPWD, 2016) has recognized two types of ailment as visual impairment i.e. 'blindness' and 'low vision'. According to RPWD act (2016), 'blindness' is a condition where a person either has total absence of sight or his/her 'visual acuity' is less than 3/60 or 10/200 (Snellen) in the better eye with best conceivable correction; or limitation of 'field of vision' of the person, subtending an angle of less than 10 degree. Again, 'low-vision' is a condition where a person's 'visual acuity' is less than 20/60 up to 3/60 or up to 10/200 (Snellen) in the better eye with best conceivable correction; or limitation of the field of vision is less than 40 degree and up to 10 degree. Here, the meaning of some terms demands clarification. Visual acuity generally means clarity or sharpness of vision and field of vision means the entire view or area encompassed by the eyes trained in any particular direction.

Most of the visually impaired students have IQs within the normal range (Watson & Johnston, 2004). Hence, they can learn at par with typical students. Now, in order to cultivate and augment the concepts regarding space, landforms, physical environment etc. among the V.I. learners in a regular classroom, a teacher requires the help of technology.Hence, using different technological aids in classes having V.I. learners is of immense importance and almost inevitable in the subject of Geography.

Ishita Halder, (WBUTTEPA), Email : ishitahalderofficial@gmail.com
Dr. Mousumi Boral, Satyapriya Roy College of Education, Kolkata, Email : drmousumiboral@gmail.com

Objectives

The objectives of the study include-

1. To know about the difficulties faced by the V.I. learners while studying Geography.
2. To acknowledge the relationship between Geography and technology.
3. To know about the recent technological developments which enable and enhance Geography learning.

Geography & the unique barriers faced by the Visually Impaired

Geography is essentially a human creation. It begins with man's attempt to recognize a particular extent of territory on this earth surface as his/her living space. Geography studies human being in relation to the natural environment in which he/she lives by evaluating all the factors which operate and influence in a particular environment or society. Geographical knowledge, skills and technology provide us a means to understand the rapidly changing physical and social environments of the world. According to J. Morgan (as cited in Hill, 2012) geographical knowledge can be considered as central to the understanding of the modern world. According to Bonnett (as cited in Hill, 2012) Indeed, if we can think about our past and present geographically, then only we will be better equipped to envisage our possible future (Hopkin & Lambert, 2010). It develops knowledge about different places, various environment and exploratory and problem solving skills among the learners.

Geography is important for all the people (whether visually impaired or not) to know about the places where they live and to interact with environment successfully. Geography has a long tradition of representing its findings in terms of maps, graphs, charts, images etc. Hence, the emphasis is on visualization. Geography is very important for them to have the direction to find out a location. According to Golledge (1993), the general quality of life of all the people whether congenitally blind or visually impaired or sighted, depends to a large extent on our capability to make spatial decision. Lack of vision creates significant hindrance for normal functioning in everyday environment. Lack of visual experience effects in severe disadvantages to the process of obtaining spatial knowledge. For gaining spatial knowledge maps are important and maps are traditionally considered as unique tools of Geography. Using maps is part of our everyday life e.g. route maps or location maps are used by pedestrians, revelers, travelers etc., cadastral maps by revenue department, topographical maps by surveyors, students, administrators etc. Map reading and map drawing are necessary skills related to the discipline of Geography and these skills demand visual ability. Sight plays a significant role in many aspects of Geography starting from mapping to field-work. Field-work is considered as a pivotal feature of Geography curriculum (Hall, Healey & Harrison, 2002). It is necessary for mapping, surveying, to observe the physical features and to understand the relationship between physical features and cultural landscape, to facilitate the students with experiential learning etc. The methodological base of field work is characterized by a natural supremacy of visual sense over the others. Hence, Geography has always differentiated itself from disabled specially the visually impaired. But field work, whether it is environmental or socio-cultural, is designed to provide a 'real-world experience' to the students. Henceforth, it should be designed as a multi-dimensional one (Hall, Healey & Harrison, 2002). Moreover, accessing GIS (Geographical Information System) is also difficult for the visually impaired learners.As a result, Geography as a discipline has always been very much challenging for the visually impaired learners.

Geography & Technology

The Oxford English Dictionary defines technology as, 'science applied to practical purpose' (Fox, 2005). We can describe technology as an application of science used to simplify our daily lives. The discipline of Geography has advanced, inherited and adapted abundant means to gather data about the earth's surface (Lemberg & Stoltman, 1999). In the contemporary world, technology has truly revolutionized Geography and has a significant impact on the teaching-learning of Geography. Today, geographers enjoy some unprecedented

technological advancement like electronically instrumented data sources, G.I.S. for learning and communication, Global Positioning System (GPS) to locate places for field observation, computer-based spatial and statistical analysis etc.It hasenabled the geographers toturn out to be the major users of the technology for research (Lemberg & Stoltman, 1999).

Now, the relationship between Geography and technology can be perceived from two perspectives-first, geographical dimensions of technology in society and secondly, technological dimensions of Geography in society. Geographical dimensions of technology in society means how technological ramifications have changed geographical understanding of the people in the society.It can be explained from important concepts in Geography and technology is reshaping the meaning of 'location', the significance of 'distance' by shrinking our globein terms of communication. In fact, technology has, sometimes, become the defining quality of the character of a place, e.g. Silicon Valley (Brunn, Cutter & Harrington Jr., 2004). Not only that, technology influences the work experience but, in turn the economy of a country by changing the skill requirements and escalating labour productivity. David Harvey (1989) has truly said that, technology can alter human life experience by compressing time and space (Brunn, Cutter & Harrington Jr., 2004). Technology has also transformed man-nature relationship as on one hand, it stimulates our demand for resources and contributes to environmental degradation (e.g. e-waste) and on the other hand, it develops measures for resource conservation and environmental protection (e.g. wind energy, solar energy, green technology etc.). The greatest advantage from GIS is the real-life applications of data and maps (Lemberg & Stoltman, 1999). Technology has made geographic communication more efficient and effective as electronic maps are readily available to the public for tracking weather, travelling, knowing the traffic conditions etc.

Technology: making the world an inclusive one

From its initiation, technology has remained focused on removing social barriers and discrimination from human society (Hersh & Johnson, 2010). Technology treats its users at par irrespective of their gender, caste, skin complexion or religion.Technology wipes out the limitations in performing day-to-day activities which exist due to impairment. Essentially, everyone gets benefit when products, services and their underlying technologies are planned and deployed having persons with disabilities in mind because, if technology makes a task easier for persons with disabilities, then those without disabilities will also find it easier (De Witt, 1991). Thus, technology binds the world to be inclusive in nature.

For centuries some simple technologies have helped persons with disabilities to gain access to the world around them for example, a walking stick, a wooden leg, wheelchairs or more recently, prosthetic limbs. When technology assists an individual with disabilities to perform major lifeactivities like hearing, speaking, seeing, moving body parts, interpreting information etc., it is called assistive technology (AT). Actually, assistive technology is an umbrella term which includes all the adaptive, accomodative and rehabilitative devices used for the people with disabilities and upholds greater independence by enabling people to execute tasks that they were formerly incapable to accomplish or would have difficulty in accomplishing them effectively. These devices have generated new opportunities for children with disabilities to learn, play and above all socialize in mainstream environment (Wisniewski & Sedlak, 1992). These assistive technology devices can be divided into two categories on the basis of their usefulness in a classroom having V. I. learners -

1. Assistive technology devices useful for learning in a classroom
2. Special assistive technology devices for learning Geography.

Assistive technology devices useful for learning in a classroom situation: Following are the assistive technology devices which are very much useful for V. I. learners-

Adaptive Calculator / Talking Calculator: Adaptive calculators can performfrom simple functions to even scientific functions.Generally adaptive calculators

have large displays and large keys, tactile or braille keys. Sometimes, they have braille displays (which are very expensive) and speech synthesizers. These are called talking calculators. In a talking calculator, the user can hear the digits pressed and calculations are spoken. Digital talking calculators are available for both computers and mobile devices.

*Braille Notetakers***:** A braille notetaker is a device like laptop. The difference between a laptop and a braille notetaker is that a laptop has a visual display which it doesn't have. Perkins-style braille keyboard or a standard qwerty keyboard is used for input and the output is generally produced through adjustable speech synthesizer and sometimes through refreshable braille displays.

CCTV/ Video Magnification (Closed Circuit TV): A video magnification camera allows a student with low vision to view their work through the use of a large monitor.Enlargement can be as much as sixty (60) times of the size of the original print.

Digital audio books: Digital audio books are auditory books in which human voice or computer synthesized voice is available in multiple formats. It can be played on a computer or a digital audio player. Here, we should know about DAISY (Digital Accessible Information System) which is a technical standard for digital audio books, reports, periodicals etc. DAISY is designed to be a comprehensive audio substitute for printed material.

Electric Braillewriters: Electric braillewriters are portable braille typewriters which run by electricity. With the help of this machine students can write longer and faster than manual braille typewriter.

Electronic Braille Embosser: Electronic braille embossers are a form of assistive technology as they print documents for the visually impaired users. A braille embosser is a device which is generally connected to a computer to produce printed materials in the braille writing system. Such an embosser not only can emboss braille quickly but also can work continuously. Thus, a blind individual can type braille and get an errorless printout.

Screen Reader: Screen reader is software programme which allows the V. I. users to read the text that is showed on the computer screen with the help of a speech synthesizer or braille display. A screen reader is the interface between the operating system, its applications and the user. The user commands by pressing different keys on the computer keyboard to instruct the speech synthesizer to read or spell a word, read a line or paragraph or full text. In addition, it permits users to perform more advanced functions e.g. reading highlighted text, reading pre-designated parts of the screen etc. Screen readers are presently available for use with personal computers having operating systems like Linux, Windows, Mac, IOS, Android etc.

Refreshable Braille Display: A refreshable braille display is an electro-mechanical device which provides access to information on a computer screen with the help of electronically raising and lowering different combinations of pins in braille cells. Such displays can be connected to tablets and smart phones. The screen is refreshable which means it changes continuously as the user moves the cursor around the screen. Braille display has advantages over synthetic speech as it provides direct access to information.

Reading Machine: A reading machine e.g. Kurzweil Reading Machine can convert many printed materials into speech. The conversion procedure is very simple. A small camera systematically scans the printed material. The scanning unit converts the signal into digital form. Then it is converted into speech. The reading machines can read out all common fonts found in books, magazines, reports etc. and at a much faster rate.

Special technological devices for learning Geography: Research studies have shown that pupils learn best when the subject matter is attention-grabbing to them and demands active engagement of the learners in the learning process (Rea 1999 as cited in Watson & Johnston, 2004).To ensure active engagement of learners, the teachers must use learning-teaching materials and these materials can be hand-made or technology induced. Special technological devices which can help the V. I. learners to learn Geography more effectively are as follow -

Talking Compass: For the blind pupils, it is a very convenient device as it uses advanced magneto-resistive technology. One can use it in the field, on the road or anywhere else. Generally such compass has multilingual facility.

Talking Globe: In such a globe, whenever the stylus touches the surface or the control panel (attached to it), a clear synthesized voice provides geographic and socio-cultural information about that place. The user can stipulate the type of information and level of details by touching the accessible controls. The user can even compare the set data between countries.

Talking Digital Map: Whenever an individual touches such map or a portion of it, she/he gets audio feedback. Generally used for navigation in a smaller area like university campus, society apartments etc.

Global Positioning System (GPS): Global Positioning System (GPS) is a satellite navigation system commonly used to determine position, direction and to assist with navigation. Such a device may help an individual with visual impairment to move more independently and safely whether within their surrounding environment or in faraway places.

Conclusion

Thus, it can be summarized that with the help of the latest technological devices in the classroom experience of pupils with visual impairment can be greatly enhanced for Geography. Only technological endowments can remove the hindrances of learning and retention processes. Though technology has extended its horizons in every spheres of life the V. I. learnersface cascades of problems like proper knowledge about the equipments, the non-availability of the technological devices in the market, limited selection or choice of alternatives from available options, the exorbitant cost of equipments and proper training procedures about the utilization.

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Tribal People of Purulia and their Quality of Life

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**Mrinal Mandal, Partha Modak,
Manas Karmakar & Debasis Ghosh**

Abstract

The villages of Ajodhya Gram Panchayat of Purulia district are basically dominated by the rural tribal people, and they still now experience a challenging life to manage two square meals in a day in this globalized 21st century for their livelihoods. Thus a study was carried out to investigate the socio-economic status of the concerned region. Their quality of life (QL) has been assessed using Quality of Life Index (QLI) taking 557 households randomly as sample from 25 villages out of 32 villages. The study reveals that the people are in distress condition with lack of adequate foods, healthcare facilities and employments. Overall condition of the people of all the villages in terms of QLI is very poor (0.199). Of the total villages, 16 villages are in very poor condition, and 9 villages belong to the poor condition in respect to QLI. An immediate step needs to be taken to uplift their socio-economic condition.

Keywords: *Tribal people, socio-economic condition, quality of life, villages, Purulia.*

Introduction

India is one of the fastest growing nations in the world in terms of its gross domestic product (GDP). Despite the vastness of area and diversification of cultures and languages of India, the country has to manage a huge number of populations in this globalized era. Population pressure on land is high; increasing food demand, unemployment, poor socio-economic conditions, improper education, lack of awareness, rituals and many more things are acting upon the nation negatively. Irrespective of all these things, each and every society in this world targets to improve its socio-economic condition in any case, but it is quite true that all the parts of an area cannot prosper at a same rate within a given time frame. A large proportion of populations of the country cannot manage two square meals in a day irrespective of their castes, creeds, religions, languages and cultures. Majority of the tribal people are still in a distress condition in our country. The people of the Ajodhya Gram Panchayat of Purulia district, West Bengal are mainly rural tribal poor living in the hilly tract of extended part of Chhotonagpur plateau area. The area is remote by its location and forested. The infertile soil along with inadequate irrigation facilities restricts them from round the year cultivation. People mainly depend upon forest resources, which are the main sources of income. Thus unemployment has been a serious issue to the people of the Ajodhya. The Ministry of Tribal Affairs mentions that traditionally, the tribes in India have been pursuing an economy, which is much closer to nature, and using indigenous technology. The livelihood pattern of tribal people is characterized by forest-based livelihoods, poor agricultural technology and a stagnant or declining population with very low literacy rate and a subsistence level

Mrinal Mandal, Department of Geography, Sidho-Kanho-Birsha University, Purulia, West Bengal,
Email : minal8628@gmail.com

Partha Modak, Department of Geography, Raghunathpur College, Purulia, West Bengal,
Email : parthamodak2013@rediffmail.com

Manas Karmakar, Department of Geography, University of Calcutta, West Bengal,
Email : manaskarmakar206@gmail.com

Debasis Ghosh, Department of Geography, University of Calcutta, West Bengal,
Email : drdebasisghosh@gmail.com

of economy. A variety of economic activities were practiced by the tribes of India, depending on the availability of resources in their respective habitats. The tribal people have been experiencing significant changes from pre-independence period to present day in their economy and livelihoods. They are basically dependent upon natural resources, and the rapid rate of urbanization and industrialization has made substantial alteration and depletion in case of natural resources. Thus some people were forced to migrate, and they managed new space to live in, and those who did not leave their native places, spend live managing different occupations round the year **(**Ministry of Tribal Affairs, Government of India, 2014, p.95). It was believed by the disciples of Malthus that the state of underdevelopment as well as poor socio-economic condition is resulted from low level of per capita income and population growth in case of underdeveloped countries. They also advocated that there must be parity between existing population and resources available in an area to kick up the socio-economic development. It is known to us that majority of the people of third world countries having a high fertility rate live in a society, where poverty persists. To accelerate the rate of socio-economic development of a society, women must come forward to join the hands of her male counter parts as active members, who will be treated equally with men. The illiterate lower section people love to have a baby boy instead of a baby girl. The notion of having more children in a family will secure the socio-economic life of the household as perceived by the downtrodden people (Roy and Das, 2011, p.412). Actually socio-economic condition can best be understood by the quality of life *(QL)* enjoyed by the people in an area. So income is not only the parameter to judge the *QL*. It has been defined by the WHO '*QL'* as *'individual's perception of their position in life in the context of the culture and value systems in which they live in and in relation to their goals, expectations, standards and concerns* (WHO, 1997, p.1). The parameters of *QL*, which are taken from social, health, environment and economic dimensions, help to prepare the quality of life index (*QLI*) and depending on that, four mentioned dimensions must be given more weightage to make it better for the people (Ontario Social Development Council, 1997, p.6). In relation to people's socio-economic condition, the term *QL* is measured by its two variables like objective and subjective parameters. Both the variables have seven parameters, such as material well-being, health, productivity, intimacy, safety, community, and emotional well-being (Cummins, 1998, p.4). A good *QL* cannot be enjoyed without a secure source of income; in addition with that literacy and consciousness are also required. Tribal people are lagging behind in compared to other main stream people especially in terms of *QL* enjoyed by them. The aim of *QL* is to fulfil the basic needs of people in a society along with liberty of people to enjoy life by choosing their own way to prosper in the society as an esteemed citizen maintaining mutual understanding, trust, equity, connectivity and integration with others (Phillips, 2006, p.242). Here we try to focus upon the socio-economic life and basic facilities enjoyed by the poor tribal people of Ajodhya, which is almost 55 km away from the Purulia town and surrounded by the natural forest with lack of transportation facilities. The status and relative positions of the villages in terms of socio-economic condition have been tried to explore in this paper. Thus in our present study we have prepared a *QLI* to determine the *QL* of each village taking few parameters of socio-economic condition.

Materials and Methods

The present study is done on Ajodhya Gram Panchayat of Baghmundi C.D. block, Purulia district of West Bengal to investigate the socio-economic status of the concerned region, and their *QL* has been assessed using *QLI.* A number of 557 households were randomly chosen as samples from 25 villages out of 32 villages. The primary data were collected based on a structured questionnaire survey mainly on socio-economic conditions. Health status of people was also assessed pertaining to frequency and types of occurrences of various diseases. To assess the *QLI* of people of the area, 10 basic parameters were taken into consideration, such as house type and room (*HTR*), source of water (*SW*), sanitary facilities (*SF*), health condition (*HC*), intake of food (*IF*), educational status (*ES*), fuel used for cooking (*FUC*), valuation of assets (*VA*), mode of

transportation (*MT*) and family income (*FI*). Each parameter has been assigned a score (in between 1 to 5) based on the performance of the household in case of that particular parameter. The best and the worst conditions are assigned the score 5 and 1 respectively. The map and census data have been collected from 18th All India Livestock Census, Agriculture Implements & Machinery, Fishery Statistics, Purulia, West Bengal, 2007 and District Statistical Handbook 2012 of Purulia respectively.

The *QLI* has been developed computing indicator index for each indicator adopting the following formula (1).

$$I_i = \frac{A_i - m_i}{M_{i-m_i}} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Where; = indicator index of indicator, = actual value of indicator, = maximum value of indicator and = minimum value of indicator.

We use 10 dimensional Cartesian space based on indicators indices to know the actual position of village. The Cartesian space vector 1 represents the best *QL* of the people residing at Ajodhya Gram Panchayat, and 0 indicates the worst *QL*. Here we have used normalized inverse Euclidian distance method to compute *QLI,* and formula (2) is developed stressing each indicator same weightage (Bagli and Adhikary, 2015; Ghosh and Mandal, 2015).

$$QLI = 1 - \sqrt{\frac{\sum_{i=1}^{10}(1-I_i)^2}{10}} \ldots\ldots\ldots (2)$$

To keep the range of *QLI* in between 0 to 1, here we have used normalization of Euclidian distance. The methodology used by United Nation Development Programme (UNDP) to measure achievement or deprivation Index is less advantageous than our distance based approach (Bagli and Adhikary, 2015). The values of *QLI* have been divided in to five sub-categories (Table: 1). Based on the *QLI* values, a ranking of all villages has been done to identify their hierarchical positions.

Table 1: Range value of Quality of Life Index (QLI)

QLI	*Remarks*
0 - ≤0.2	Very poor
>0.2 - ≤0.4	Poor
>0.4 - ≤0.6	Moderate
>0.6 - ≤0.8	Good
>0.8 - ≤1.0	Very good

Source: Authors' computation

Ajodhya Gram Panchayat

Baghmundi is not only one of the backward C.D. blocks of Purulia district, but also in West Bengal, and Ajodhya Gram Panchayat belongs to this C.D. block. The topography of this Gram Panchayat is undulating hilly track. The globalised world could not touch it properly. Poverty, illiteracy, unemployment and lack of minimum health care delivery system are the common phenomena of the area. Geographical extension of the study area is $23^0$10'25" N to $23^0$17'10" N and $86^0$1'44" E to $86^0$12'4" E (District Statistical Handbook, Purulia, 2012, p.1). Total households of the Gram Panchayat are 2326, and total population is 11468; where percentages of male and female population are 50.45 per cent and 49.55 per cent respectively as per the report of Census of India, 2011. The Scheduled Tribe (ST) population occupies 94.23 per cent of total populations. The literacy rate of the area is 35.94 per cent, where male-female ratio is 983 females per thousand males. Our primary data reveals that there are 967 females per thousand males (Table: 2). On contrary, dependency ratio of the Gram Panchayat is 51.46 per cent (District Statistical Handbook, Purulia, 2012, p.2-14). The condition of the area is hand to mouth.

Table 2: Age group wise distribution of male-female populations at Ajodhya Gram Panchayat

Age Group	*Male (%)*	*Female (%)*
0-5	212 (13.10)	201 (12.85)
6-10	205 (12.67)	199 (12.72)
11-15	186 (11.50)	186 (11.89)
16-20	169 (10.44)	173 (11.06)
21-25	156 (9.64)	142 (9.08)
26-30	137 (8.47)	138 (8.82)
31-35	133 (8.22)	107 (6.84)
36-40	113 (6.98)	103 (6.58)
41-45	95 (5.87)	97 (6.20)
46-50	79 (4.88)	62 (3.96)
51-55	56 (3.46)	68 (4.35)
56-60	51 (3.15)	54 (3.45)
60+	26 (1.61)	34 (2.17)
Total	1618	1564

Source: Based on field survey, 2015

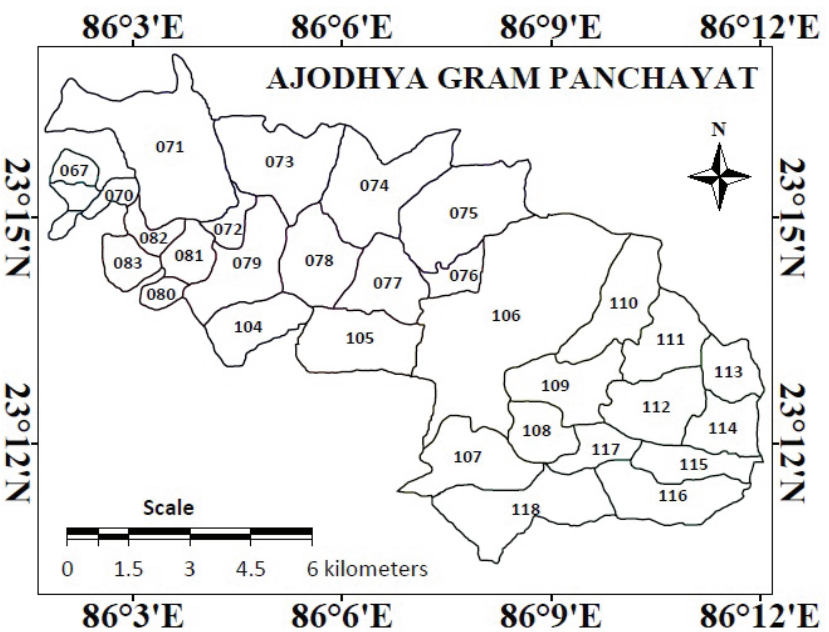

Figure 1: Location of the study area

Results and Discussion

Living Conditions

The study area is one of the poorest areas of the district Purulia. It is quite obvious that the people of the area will not enjoy a good *QL* (Table: 3). Majority of the households (70.74 per cent) live in katcha

houses, and about 33.57 per cent houses possess two rooms. Of the total, 97.66 per cent households did not receive any governmental aid for constructing houses. Even today nearly 11.49 per cent households access unconstructed and unsafe well for drinking water. At Ajodhya Gram Panchayat, about 74 per cent households are not electrified in present day. Moreover 90 per cent people go to open places for defecation, though the programmes like Swachh Bharat Mission by the Government of India, 2014 and Mission Nirmal Bangla, Government of West Bengal, 2014 are already in full swing to abolish the open area defection. Majority of the households (96.23 per cent) do not have any bathroom facility. Most of the households use wood for cooking purpose (90.48 per cent), and those who do not have any sewerage provision in their houses are 85.09 per cent.

Table 3: Living condition of the residents of Ajodhya Gram Panchayat

Variables	*Classification*	*Households (%)*
Govt. aid for constructing house	Yes	13 (2.23)
	No	544 (97.66)
Type of house	Pucca	37 (6.64)
	Semi Katcha	126 (22.62)
	Katcha	394 (70.74)
Number of rooms	One	53 (9.52)
	Two	187 (33.57)
	Three	147 (26.39)
	Four	170 (30.52)
Source of water for all purpose	Tube well	249 (44.70)
	Public tap	112 (20.11)
	Common well	124 (22.26)
	Dari (Unsafe and unconstructed well)	64 (11.49)
	Others	8 (1.44)
Availability of electricity	Electrified (Own)	26 (4.66)
	Electrified (BPL)	119 (21.36)
	Non electrified	412 (73.97)
Type of sanitation	Public latrine (Govt. aided)	32 (5.75)
	In house latrine	21 (3.77)
	Open place defection	504 (90.48)
Cooking device	Electric	2 (0.35)
	Gas	4 (0.72)
	Kerosene	43 (7.72)
	Coal	4 (0.7)
	Wood	504 (90.48)
Bathroom facility	Yes	21 (3.77)
	No	536 (96.23)
Sewerage	No	474 (85.09)
	Yes	83 (14.90)

Source: Based on field survey, 2015

Assets Possessed

Assets possessed by the households are mainly: fan, television, bicycle, two-wheelers, mobile, etc. which are presented in table: 4. In this present juncture of the modern society, the assets possessed by the Ajodhya's people are not good enough. In respect to total samples, only 4.13 per cent have the access of television, and 30.16 per cent households use mobile. In this case, we have noticed a point during our survey that the transportation and communication system is not so well to access other facilities (like electronic gadgets) due to the remote geographical location. Almost 17.77 per cent households, those who are well-off, use the two wheelers to roam around for works or other purposes.

Table 4: Details of assets possessed by the residents of Ajodhya Gram Panchayat

Variables	*Households (%)*
Electric fan	12 (2.15)
Mobile	168 (30.16)
Television	23 (4.13)
Cycle	426 (76.48)
Two wheeler	99 (17.77)
Refrigerator	2 (0.36)
Radio	17 (3.05)

Source: Based on field survey, 2015

Food Intake

The frequency of consumption of selected food items by the studied tribal households is shown in table: 5. Rice is only the daily common food item among the tribal households of Ajodhya. Besides rice, pulses, wheat and vegetables are consumed daily by less than 30 per cent of households. Fruits, fishes, meats and milk are taken by the people occasionally. The economic condition of the tribal people does not allow them to have a healthy and balanced diet regularly. Actually the location of the area also plays an obstruction for their backwardness and ill-health due to lack of facilities related to health and opportunities of employments.

Table 5: Frequency of consumption of selected food items by the Ajodhya people

Food items	*Respondents (%)*		
	Daily	*Once a week*	*Once in month*
Rice	557 (100)	557 (100)	557 (100)
Pulses	151 (27.10)	237 (42.54)	284 (50.98)
Vegetables	133 (23.87)	247 (43.34)	363 (65.17)
Wheat	211 (38)	229 (41.11)	257 (46.14)
Fruits	0	64 (11.49)	72 (12.92)
Egg	13 (2.33)	103 (18.49)	194 (34.82)
Fish	0	37 (6.64)	59 (10.59)
Chicken/Mutton	0	95 (17.05)	163 (29.26)
Milk	0	13 (2.33)	39 (7)

Source: Based on field survey, 2015

Health Status

Health status in last one year of the family members of each household was investigated, and it was found that the majority of the households (57.09 per cent) were out of diseases. Members of households suffered from common diseases (cold, fever, cough, headache etc.) were found to be 34.65 per cent. In contrast only 8.25 per cent households had been suffering from long term diseases (diabetics, blood pressure, heart attack, skin problem etc). From the table: 6 we observe that primary health centre (PHC) of Ajodhya Gram Panchayat does not have the minimum health facilities to extend to its people; if any serious medical emergency turns up, people need to visit either block primary health centre (BPHC) of Baghmundi or PHC of Shirkabad or Sadar Hospital Purulia. The tribal people still in this globalized world depend on indigenous medicines, and sometimes they do have apathy on conventional healthcare delivery system.

Table 6: Health facilities provided (from January, 2013 to December, 2014) by the Ajodhya public health centre (PHC)

Facilities	*Number*	*Facilities*	*Number*
No. of beds	5	No. of pathological tests done	0
Cabin	1	No. of endoscopies done	0
Emergency	3	No. of ECG done	0
Major surgeries performed	0	Bed occupancy	0
No of deliveries performed	0	No of emergency case received	1
No. of X-ray done	0	No of emergency case referred out	0
No. of USG done	0	No. of hospital acquired infection	0

Source: *Monthly report of Ajodhya PHC, under Baghmundi C.D. block Pathardi BPHC, BMOH Office*

Quality of Life Index (QLI)

An area can best be assessed mainly on the basis of income, level of calories intake, expenditure on consumptions, health and education status. Many researchers suggested that we should rely not only on income but also other suitable parameters to trace out the poor and their standard of living (Geetha and Malarvizhi, 2015). Here in this study, we reveal the village wise level of socio-economic condition of tribal households based on the selected 10 parameters of *QL* (Table: 7 & 8). It is found that out of 25 villages, 16 villages belong to the very poor condition in terms of *QLI*, and rest of the 9 villages experience poor condition. The average *QLI* value of all villages is 0.199, which indicates towards the very poor condition of *QL* of Ajodhya Gram Panchayat.

Table 7: Parameters used for the assessment of QLI

Sl. No.	*Indicators*	*Classification*	*Score*
1	House type and room	Pucca + 4 rooms	5
		Pucca + Katcha 4 rooms	4
		Katcha + 3 rooms	3
		Katcha + 2 rooms	2
		Katcha + 1 room	1

2	Source of water	Tube well	5
		Tap water	4
		Common well	3
		Dari (unsafe & unconstructed well)	2
		Other	1
3	Sanitary facilities	Own house latrine	5
		Public latrine (Govt. aided)	3
		Open place defection	1
4	Health condition	No disease	5
		Common diseases	3
		Long standing diseases	1
5	Intake of Food	Rice/Pulses/Vegetables/NV/Milk	5
		Rice/Pulses/Vegetables/Milk	4
		Rice/ Pulses/Vegetables	3
		Rice/Vegetables	2
		Rice	1
6	Education status	Higher secondary & above	5
		Madhymik	4
		Upper primary	3
		Primary	2
		Illiterate	1
7	Fuel used for cooking	Electric	5
		Gas	4
		Coal	3
		Kerosene	2
		Wood	1
8	Valuation of assets	>40000	5
		40000-30000	4
		30000-20000	3
		20000-10000	2
		<10000	1
9	Mode of transportation	Two wheeler	5
		Cycle	3
		No self Transport	1
10	Family income	>20000	5
		20000-15000	4
		15000-10000	3
		10000-5000	2
		<5000	1

Source: Authors' computation

Table 8: QLI of Ajodhya Gram Panchayat in Baghmundi C.D. Block, Purulia district, 2015

Village name	*Mean QLI*	*Rank*	*Remarks*
Lahadungri	0.277	2	Poor
Ajodhya	0.301	1	Poor
Kuchrirakha	0.228	8	Poor
Kushumtikri	0.180	19	Very Poor
Bhitpani	0.256	3	Poor
Kalha	0.199	15	Very Poor
Andhra	0.178	17	Very Poor
Bhunighara	0.237	6	Poor
Sahajuri	0.255	4	Poor
Sonahara	0.200	14	Very Poor
Bongada	0.191	12	Very Poor
Shilingda	0.167	18	Very Poor
Garur jhama	0.123	25	Very Poor
Edelbera alias simulbera	0.157	21	Very Poor
Chhatni	0.209	11	Very Poor
Saldi	0.132	23	Very Poor
Kurupahar	0.229	7	Poor
Telia bhasa	0.152	20	Very Poor
Punia shasan	0.151	22	Very Poor
Kalijharna	0.206	9	Poor
Alkusi	0.227	10	Very Poor
Ranga	0.241	5	Poor
Ushuldungri	0.186	13	Very Poor
Pitidiri	0.128	24	Very Poor
Susnidi	0.175	16	Very Poor
Average QLI	**0.199**		**Very Poor**

Source: Authors' computation

Conclusion

The tribal communities of Ajodhya are the aboriginals of the district. With the passage of time society progresses towards the new developments and achievements, but history reminds us that the pace of advancement or development is not always same at all part of the society. Some of the people always lag behind. Sometimes it is because of lack of concern and lethargy of the community, or sometimes we the educated people never tried to bring them ahead to merge them with the mainstream population. Tribal community has been a deep bondage with the nature, mainly with the forest. They feel safe in the hand of nature, and also know how to protect the nature. But over the years,

the rate of depletion of forest has been increasing significantly due to illegal and unscientific cutting of trees. They are in helpless condition because in one hand, dependency on forest has started to decline, and on other hand, the agricultural activity is hindered by the existence of almost infertile soil as well as scanty irrigation facilities. The region does not provide any other employment opportunities. Thus the inadequate agriculture practices for few months of a year and forest woods are only the main sources of income of the tribal people. Now few people of the area move to different parts of India, mainly in Maharashtra, Gujrat, Kerala, Tamil Nadu, Andhra Pradesh, Orissa etc. for employments. But majority of the tribal people live a life of hands to mouth. We observed that the majority of the children are undernourished in the area. In the month of September, 2000 the United Nations Millennium Declaration was signed by the 191 United Nations members countries to achieve the eight millennium development goals by 2015. The first goal was to eradicate the curse of hunger and extreme poverty. If we look into Ajodhya, certainly we find the hunger and poverty, like two sides of a coin. The globalized 21st century has been witnessing the cry and shout for foods of Ajodhya people. The situation must be addressed immediately without fail. The concerned authorities need to give more attention in this region to uphold the socio-economic condition of people to live a minimum standard of live.

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Spatial Analysis and Assessment of Child Health Risk and Vulnerability in West Bengal: A Geo-Medical Study

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Pritam Ghosh

Abstract

Children are the future and most important asset of a society as well as a nation, and good health status of children is the wealth of that nation. Therefore, to ensure the progress of a healthy nation child health must keep protected. In this context main focus of the study is to identify spatial inequalities and variations and spatial pattern of different health risks among children of different districts of West Bengal. Fourth round District Level Household Survey (DLHS-4) data has been used here to make this analysis. These filtered secondary data has been transformed into tertiary data set and then various statistical calculations, cartographic techniques have been made by using Microsoft Excel 2013, IBM SPSS 23 software and different mapping have been created by using Q-GIS 2.12. In this study, health vulnerability has been considered based on three main index parameters like malnutrition, morbidity and immunization. The districts, which are consider as most vulnerable or moderately vulnerable in child health, are not equally poor from each aspects of these three parameters. Government must take adequate measures to mitigate these risks or health problems and to resist the prevalence of these risks. Beside this general people or parents of the study area must aware regarding the causes and effects of malnutrition, morbidity and immunization.

Keywords: *Malnutrition Index, Morbidity Index, Immunization Gap Index, Child Health Vulnerability Index*

Introduction

Children are the future and most important asset of a society as well as a nation, and good health status of children is the wealth of that nation. Therefore, to ensure the progress of a healthy nation child health must keep protected. In this context, it is globally recognize that nutrition and health status, both are indispensable part of each other. Therefore, the investment in health and nutrition may counted as another mode of great human capital investments for low-income social group or developing countries (Grossman, 1972; Becker, 1975; Edward and Grossman, 1978; Behrman and Deolaliker, 1987; Behrman, 1988). This nutritional and health status of children is can be represented by infant mortality rate. During last decade, the rate of infant mortality is declining, but still it is estimated as 57 deaths per thousand live birth. (DLHS 3, 2007-08). This rate is much higher in rural area than urban in India. The position of West Bengal is becoming good year by year among other state. It is now 31 death per thousand live birth (Census of India, 2011). Therefore, the health status is becoming better in West Bengal during last decade. Nevertheless, not all districts of the state are developing from this aspect in it very equally. Variation in socio demographic, eco-cultural and political condition as well as difference in regional development over the study area have made the difference in health status of children. Some district has developed the health status of under-five children. But some district are lagging behind in different health issues of children. Therefore, to ensure secure good health condition of under-five children of entire state, backward districts must bring out from different health risk of their children.

Objectives

Focus of the study is to identify spatial inequalities and variations among different districts in the study

Pritam Ghosh, Department of Geography, University of Calcutta
Email : mr.ghosh.pritam@gmail.com

area from the aspects of different dimension of health risk and health vulnerability. There is also an attempt to assess different types of health risk among the children of different districts of West Bengal and classify those districts into different level of child health risk. Therefore, based on all these risk factor the districts of the study area have to classify into different category of health vulnerability and to identify most vulnerable districts from this angle.

Study area:

Although the study area comprises of twenty-three districts at present, but when the survey was done there were only nineteen districts. Therefore, the data has been collected on nineteen districts. Hence, this study has been done on nineteen districts.

Since the last decade, west Bengal is developing year by year from the aspect of child health in the whole country. Till now West Bengal have not reach at the satisfactory position in this matter. On the other hand, regional imbalance in socio economy, culture, demography as well as overall development has created different kind of health risk among under-five children of the study area. Although, some districts have come out from severe health vulnerability of child, some are not. This scenario lay behind to analyze health risk and vulnerability of children of these nineteen districts.

Database and Methodology

The data on child nutrition, morbidity and immunization have been collected from fourth round District Level Household Survey (DLHS-4), conducted in 2012-13 by International Institute for Population Science (IIPS) in collaboration with Ministry of Health and Family Welfare, Government of India. The survey was made on a total sample of 6322 children for nutritional status, 1627 children for immunization status and 7358 children for morbidity status. In this context, the children only who were born and surviving since 01.01.2008, selected as sample child. The data regarding low birth weight baby has been collected from Ministry of Health and Family Welfare, Government of India.

These filtered secondary data has been transformed into tertiary data set and then various statistical calculations, cartographic techniques have been made by using Microsoft Excel 2013, IBM SPSS 23 software and different mapping have been created by using Q-GIS 2.12.

To show spatial inequality in different indicators of child malnutrition, morbidity and immunization gap of the study area Lorenz Curve and Gini Coefficient has been created.

Beside this, inter district variations of these selected indicators have been determined by coefficient of variation.

$$\text{Coefficient of Variation} = = \frac{(\sigma_j \times 100)}{X_j}$$

Where, Standard deviation of the j[th] variable and, = Mean of the j[th] variable.

In this study child health risk and vulnerability has been determined by different indices. To construct malnutrition index, morbidity risk index and immunization gap index, values of each selected indicators of every dimension have been standardize by the given formula.

$$\text{Standardized Index} = \frac{\text{Actual Value (X)} - \text{Minimum Value } (\bar{X}_{min})}{\text{Maximum Value } (X_{max}) - \text{ Minimum Value } (\bar{X}_{min})}$$

These standardized values of every selected indicator of each dimension of different districts of the study area have been combined with certain weighted to construct some indices like, Child Malnutrition Index, Child Morbidity Index and Immunization Gap Index. Therefore, Child Health Vulnerability Index has been determined by certain formula.

Child Health Vulnerability Index (CHVI) =

$$\left[\left\{(X)^{2/5}\right\} * \left\{(Y)^{1/3}\right\} * \left\{(Z)^{1/4}\right\}\right]$$

Where, X= Child Malnutrition Index; Y= Child Morbidity Index; Z= Immunization Gap Index

Result and Discussion

Child Health Risk

Malnutrition

Under nutrition or Malnutrition is a serious health risk of children. It is strongly connected with child

mortality rates (WHO, 1983). Malnourished children are trend to face simultaneously different risk of morbidity and mortality (Mosley & Cowley 1991; Griffiths et al. 2002).

In early stage, children who are surviving with malnutrition, most likely being affected with chronic illness and different physical or mental disabilities (Smith & Haddad 2000; Rajaram et al. 2007). Here Nutritional status of a child is determined through (NCHS and WHO, 1995) different anthropometric indices (Strauss et el., 1995; Kakwani et al., 1997; Ulijaszek, 1997; Pal, 1999; Svedberg, 2001; Cogill, B. 2003;) which are derived by specially height/length, weight in combination with age. These indices are further categorize into Z-score classification system (Onis de M. et al., 1997; Cogill, B, 2003). Thus, the children whose height/length for age (HAZ), weight for age (WAZ), and weight for height/length (WHZ) are less than -2.0 standard deviation from its mean, identified as mal nutrition affected children.

In this context less than 3.0 standard deviation Height for age (HAZ), Weight for age (WAZ) and weight for height (WHZ) of a child from the mean of total surveyed children of each district has been identified as severely malnutrition affected child. In addition, the children whose HAZ, WAZ and WHZ is laying between 3.0 standard deviation to 2.0 standard deviation are consider as moderately mal nutrition affected children. In this study these three measures of malnutrition has been represented by three malnutrition indices. Like, Stunting Child Index, Underweighted Child Index, and Wasting Child Index. These three index has been constructed by aggregating standardized value of severely malnutrition-affected child with two third weight and moderately malnutrition-affected child with one-third weight. Therefore, six indicator have been selected primarily to construct this malnutrition index. These are, 1. percentage of children whose height for age are less than 3.0 standard deviation from its mean; 2. percentage of children whose height for age are laying between 3.0 standard deviation to 2.0 standard deviation from its mean; 3. percentage of children whose weight for age are less than 3.0 standard deviation from its mean; 4. percentage of children whose weight for age are laying between 3.0 standard deviation to 2.0 standard deviation from its mean; 5. percentage of children whose weight for height are less than 3.0 standard deviation from its mean; 6. percentage of children whose weight for height are laying between 3.0 standard deviation to 2.0 standard deviation from its mean.

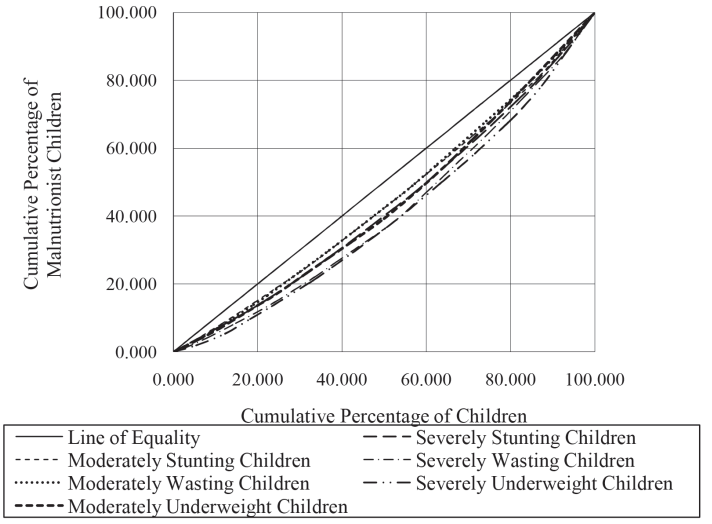

Fig.1 Spatial inequality in different indicators of mal nutrition in West Bengal, 2012-13

Spatial inequality and variation in malnutrition

Inequality and variation of the above-mentioned variables are noticeable in the study area (Figure no.1). It has been observed that inequality in case of severely malnutrition-affected children is higher than moderately malnutrition affected children in the study area. Gini coefficient values of each indicators (Table No.1) are also representing that.

On the other hand, variation in each indicator is also noticeable (Table No.1). Variation in severely malnutrition-affected children is higher than moderately malnutrition affected children over the study area.

Table No. 1 Spatial variation and inequality in different indicators of malnutrition in West Bengal, 2012-13

Indicator	*Mean*	*Standard Deviation*	*Coefficient of Variation*	*Gini Coefficient*
HFA_<3SD (Severely Stunting)	20.6895	5.6157	27.1430	0.1406
HFA_3SD_2SD (Moderately Stunting)	17.2632	3.5132	20.3508	0.1121
WFA_<3SD (Severely Underweighted)	15.1053	5.3906	35.6867	0.2011
WFA_<3SD_2SD (Moderately Underweighted)	22.0737	5.4342	24.6186	0.1353
WFH_<3SD (Severely Wasting)	14.4579	4.8706	33.6880	0.1804
WFH_<3SD_2SD (Moderately Wasting)	12.8053	2.6871	20.9844	0.1088

Spatial pattern of malnutrition

Malnutrition index has been determined to represent level of malnutrition over different districts of West Bengal. Malnutrition index of child is just a simple geometric mean of Underweighted Child Index, Stunting Child Index and Wasting Child Index. It can be pointed out from the map (Figure 1) that the district situated on Ganga delta, like Nadia, North 24 Parganas, Hooghly, Kolkata and South 24 Parganas represent low vulnerable condition in comparison to other districts of the study area. In this context, the situation of Jalpaiguri, Birbhum and Murhidabad is very poor. Rest of the districts are representing relatively moderate condition in malnutrition.

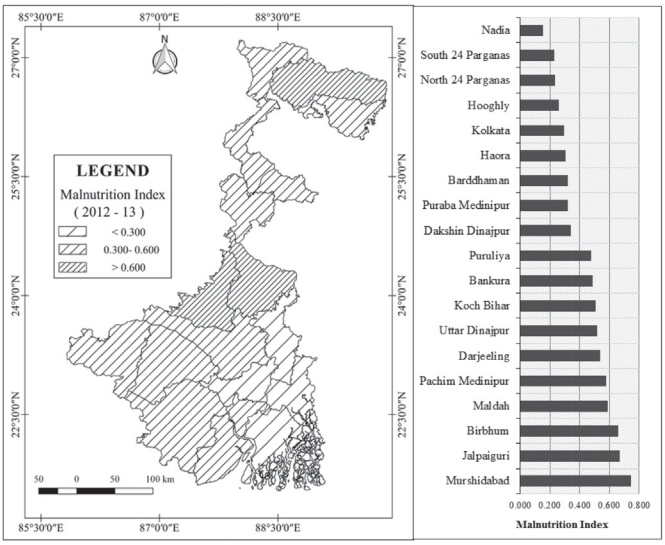

Fig. 2 Spatial pattern of Malnutrition among under five children in different districts of West Bengal, 2012-13

Childhood Morbidity

Different types of short term and long term physical illness or disease determine morbidity of a child. Just after birth an infant, go through different kind of health risk. This is the crucial period to protect their health from any type of health problems, complications, disease and ailments. But in West Bengal, influenced by different socio-demographic, eco-cultural and religious condition every parents cannot provide them adequate medical and healthcare service and facilities. Moreover, many times they ignore serious health complications of their child due to lack of knowledge. Therefore, an infant have to face different health risk, which affects their physical and mental health up to age of 5 years.

Anemia is most harmful long-term disease faced by children due to malnutrition and lack of adequate food intake in different socio-economically backward region of West Bengal. 86.4 percent of child in the state are surviving through any kind of anemia (<11.0g/dl) and 6.3% are surviving with severe (< 7g/dl) anemia (DLHS 4). Different research works have been shown that this anemia during childhood is associated with different harmful serious health risks including changes in immune response, deprivation in behavioral and cognitive development (Lozoff, B, et al., 1991, Irwin, JJ et al., 2001, McCann, JC, et al., 2007) growth reduction and morbidity and mortality increase (Passi, S.J. et al., 2001, Brabin, BJ. et al., 2001)).

In addition, acute respiratory infection (ARI) and diarrhoea, which can cause infant death, are most common short-term disease affected by under five children in different parts of the study area. Diarrhoea is a leading cause of under-five child mortality and morbidity (Pahwa S. et al., 2010; Kotloff, KL. et al., 2013; Walker, CLF. et al., 2013; Akanda AS.et al., 2014).

These three types of disease here taken under consideration to analyze the morbidity index of children. To determine morbidity profile of a district four indicators have been selected. These are 1. percentage of children suffered from severe anemia and 2. moderate anemia 3. percentage of child got affected by diarrhea and 4. acute respiratory infection (ARI).

Spatial inequality and variation in morbidity

There are a remarkable inequality and variation among the indicators of morbidity over the study area (Figure no. 3). In case of child affected by diarrhoea and severe anemia, the inequality is more or less same in the study area and much higher than moderate anemia, ARI affected child. (Table No. 2). Therefore, a trend has been found among the children of West Bengal to be affected generally by moderate anemia. Comparatively prevalence of severe anemia and diarrhoea is low in the study area.

Coefficient of variation values (Table No. 2) of

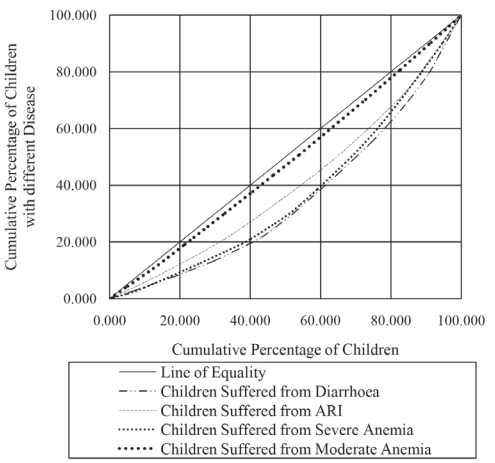

Fig. 3 Spatial inequality in different indicators of Morbidity among under five children in West Bengal, 2012-13

these four indicators also tells that a huge variation is found in case of prevalence of severe anemia and diarrhoea than the other indicator among the children of different districts of West Bengal.

Table 2 Spatial variation and inequality in different indicators of child morbidity in Wet Bengal, 2012-13

Indicators	*Mean*	*Standard Deviation*	*Coefficient of Variation*	*Gini Coefficient*
Severe Anemia	6.752632	3.288763	48.70343	0.267504
Moderate Anemia	79.17895	6.351166	8.021281	0.043158
Diarrhoea	3.278947	1.814319	55.33237	0.297178
ARI	10.56316	3.804852	36.02003	0.19909

Spatial pattern of morbidity

The standardized value of selected indicators have been aggregated with a certain weighted to determine Child Morbidity Index (CMI). Therefore,

Child Morbidity Index =

Where, SA= Severe Anemia; MA= Moderate Anemia; D= Diarrhoea; ARI= Acute Respiratory Infection.

To construct this index more weightage has been given on percentage of anemia-affected children as it is most harmful, common long-term disease, among under five children in the study area and influences other short-term disease to grow easily in infant body. There are variation in level of morbidity among different district of West Bengal. According to this morbidity index, all districts of the study area have been classified into three category to represent their different level of morbidity among under five children (Figure 4). In this case South 24 Parganas, Purba Medinipur, Hooghly, Haora, Maldah, Kolkata and Jalpaiguri are representing very poor and vulnerable situation comparatively whereas, Koch Bihar, Birbhum and Darjeeling relatively not in too vulnerable position in this matter. Other than these mentioned districts, whole area represents moderate morbidity risk.

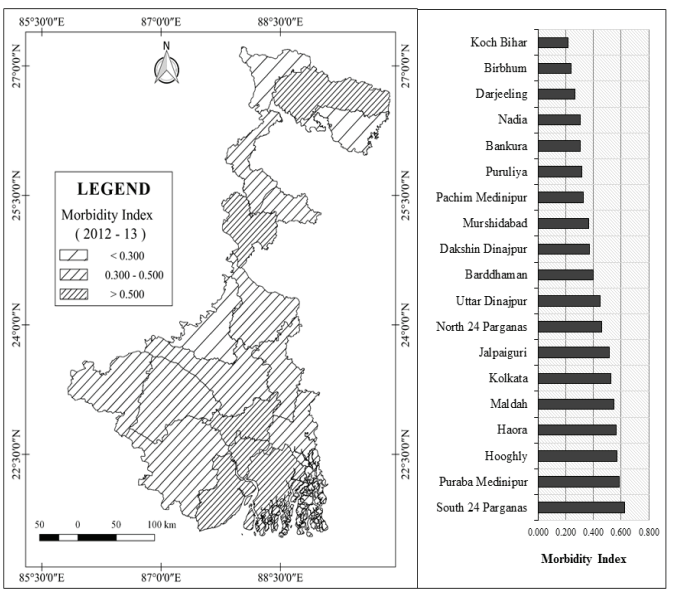

Fig. 4 Spatial pattern of Morbidity among under five children in different districts of West Bengal, 2012-13

Immunization Gap

Immunization protects child's health from different dangerous diseases, (UNICEF) impair illness, disabilities and saves many lives per year (Odusanya, O.O., et al., 2008). This immunization process gets success, when a child be received full course of recommended vaccine. (Mustafi, M. A. et al., 2013) To reduce infant morbidity and mortality, universal immunization of child has been considered to fight against six disease like tuberculosis, diphtheria, whooping cough, tetanus, polio and measles (NFHS-3, 2005-06). According to the guideline of World health organization a fully immunized child is consider when he or she has been received one dose of BCG, three dose of diphtheria, Whooping cough and tetanus (DPT), three dose of poliomyelitis and one dose of measles within the age of 12 months. Nevertheless, among many parents in different rural region of West Bengal, an unconsciousness and legacy has been noticed to immune their children fully. That is why many child of the study area have to survive with different risk of various diseases. Although, the percentage of fully immunize children has increased during last decade.

To determine immunization gap index three indicators have been selected in this study. These are 1. percentage of child who had not given any vaccine 2. percentage of children who had not given full course of vaccine and 3. percentage of child who had not receive any dose of Vitamin-A[2].

Spatial inequality and variation of immunization gap

A huge inequality is found here in case of the selected indicators of immunization gap. In case of the children had been given none of any vaccine the inequality is highest in the study area. It reveals that major portion of the children of West been has been taken under immunization. Whereas these children of the study area, have not been fully immunized and brought under immunized by any dose of vitamin A[2]. The situation has been found to be too close in case of partly immunized children and the children receiving no dose of vitamin A[2] in the study area.

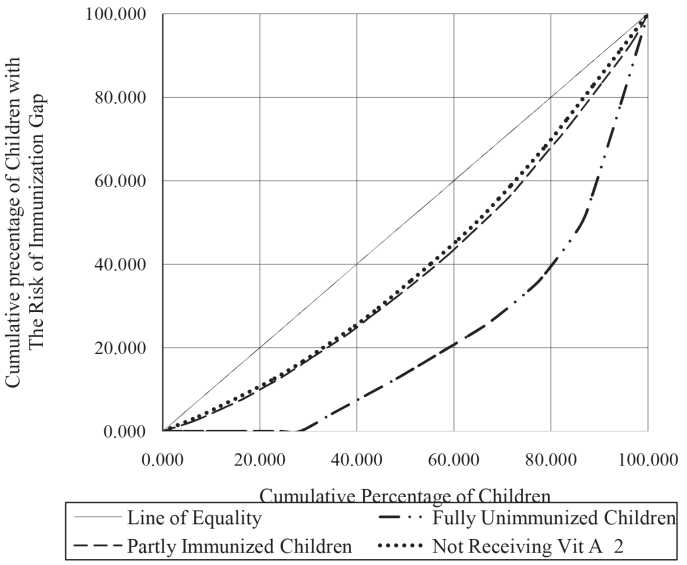

Fig. 5 Spatial inequality in different indicators of immunization gap in West Bengal, 2012-13

Therefore, among the people of west Bengal a legacy is being found to immune their children fully and with any dose of vitamin A[2]. Beside this, inter district variation in case of fully unimmunized children and partly immunized children is higher than the children receiving any dose of vitamin A[2] in the study area (Table No.).

Table 3 Spatial variation and inequality in different indicators of immunization gap in Wet Bengal, 2012-13				
Indicator	*Mean*	*Standard Deviation*	*Coefficient of Variation*	*Gini Coefficient*
No Vaccine had been given	1.5789	1.9147	121.2664	0.5603
Not Fully Immunized	21.3737	9.0511	42.3468	0.2259
Not receive any dose of Vitamin A^2	37.8736	13.1482	34.7161	0.2012

Spatial pattern of immunization gap

Immunization gap index has been determined by aggregating standardized values of these three indicators with certain weighted. Therefore,

Immunization Gap Index=

$$\left[\left({}^{1}/_{2}\ NoV\right) + \left({}^{2}/_{7}\ NoFV\right) + \left({}^{1}/_{5}\ NoVitA2\right)\right]$$

NoV= None of any Vaccine; NoFV= No full Vaccine; $NoVitA^2$ = No dose of Vitamin-A^2

Immunization gap index has been prepared to understand how many children are surviving in the study area with a risk of not receiving full course of essential vaccine. Barddhaman, Birbhum and Kolkata are such districts where immunization gap index is higher than other are. It reveals in these two districts, parents are not aware about vaccine or they cannot access or avail vaccination for their children. Therefore, these children are surviving through the high risk of being affected by different chronic disease. On the other hand, Koch Bihar, Uttar Dinajpur, Murshidabad and North & South 24 Parganas are representing as moderately risk porn districts for immunization gap. Rest of the districts are in better situation in this matter comparatively.

Child Health Vulnerability

Therefore, it is clear that not every index parameter are equally harmful for the child health vulnerability in every district of the study area. Mainly the prevalence of malnutrition among under five children is high in the districts of northern part of West Bengal comparatively. On the other hand, the prevalence of morbidity among children is relatively higher in most of the districts of southern part of the study area. Here districts wise risk level of these three indices parameter have been shown (Figure 7).

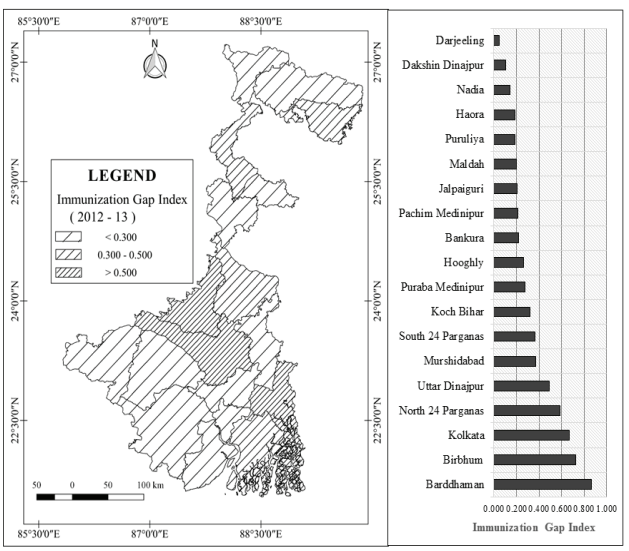

Fig. 6 Spatial pattern of immunization gap among the children in different districts of West Bengal, 2012-13

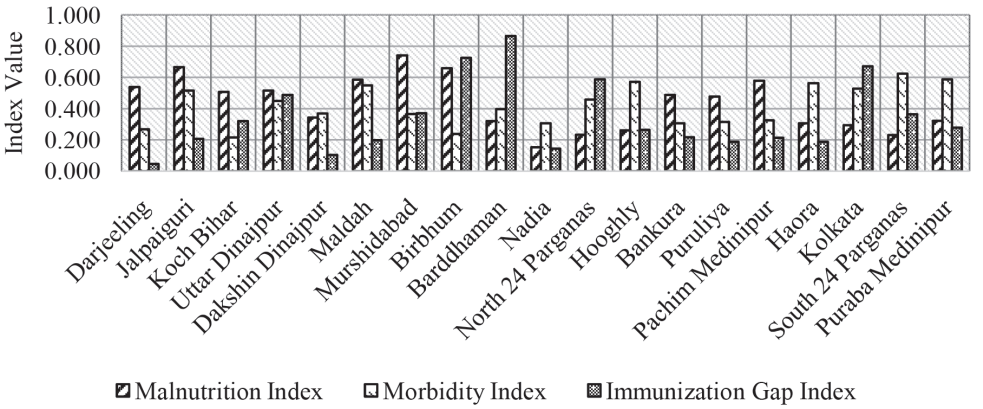

Fig. 7 Level of different health risk in the districts of West Bengal, 2012-13

To analyze health vulnerability among under five children in West Bengal an index has been derived based on malnutrition, morbidity and immunization gap indices through certain formula.

Child Health Vulnerability Index =

$$\left[\left\{(X)^{2/5}\right\} * \left\{(Y)^{1/3}\right\} * \left\{(Z)^{1/4}\right\}\right]$$

Where, X= Child Malnutrition Index; Y= Child Morbidity Index; Z= Immunization Gap Index.

Spatial distribution (Figure 8) of this index value shows level of health vulnerability among children in the study area.

Through this index Murshidabad, Uttar Dinajpur, Birbhum, Jalpaiguri, Barddhaman, Kolkata and Maldah have come out as most vulnerable district from all these aspects of child health in comparison to other district of the study area. Whereas, Nadia, Darjeeling and Dakshin Dinajpur are not that much of

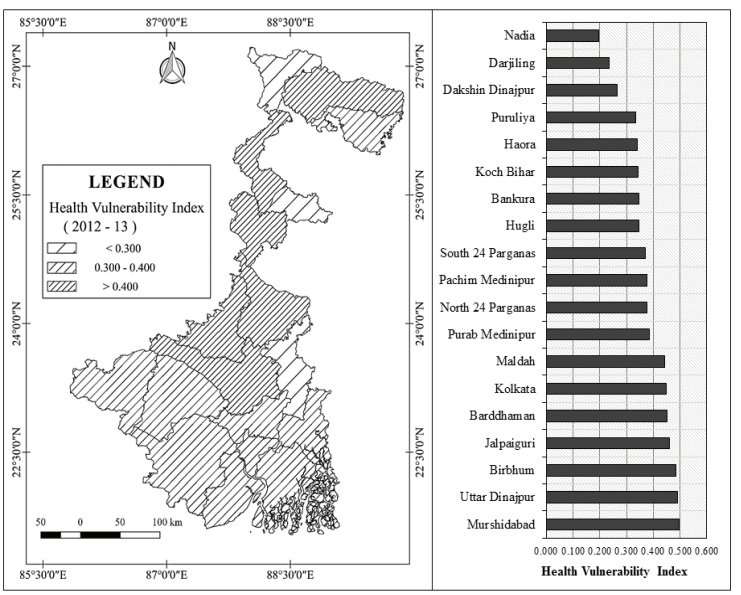

Fig. 8 Spatial pattern of health vulnerability among under five children in different districts of West Bengal, 2012-13

vulnerable district, in case of under-five child health comparatively. A moderate health vulnerability has been noticeable in rest of the districts of the study area.

Major Findings

Spatial inequality is higher in case of moderately malnutrition-affected children than severe, from the aspect of stunting, underweight and wasting in the study area. Apart from some district of Ganga delta region, districts of entire northern and western portion have been considered as malnutrition affected district in the study. Among them Jalpaiguri, Birbhum and Murshidabad represents poorest situation in this case.

Moderate anemia is identified as common problem among under five children in the study area.

In case of immunization gap, the districts that situated in western and northern portion of the study area, are considered as backward districts since independence, shows better condition comparatively. Whereas Kolkata despite of being a metropolitan city represents very bad condition with Barddhaman and Birbhum from this aspect.

It is quite alarming that Kolkata has come out as a vulnerable district from the aspect of under-five child health. Beside this Murshidabad, Uttar Dinajpur, Birbhum, Jalpaiguri, Barddhaman and Maldah have also been identified as vulnerable districts in this matter. In case of Jalpaiguri and Murshidabad Malnutrition is the most significant factor for health vulnerability whereas, in case of Kolkata and Barddhaman prevalence of morbidity and effect of immunization gap are accountable. Thus in the district of Uttar Dinajpur and Birbhum malnutrition and immunization gap among the children are most responsible for under-five child health vulnerability.

Conclusions

In this study, health vulnerability has been considered based on three main index parameters like malnutrition, morbidity and immunization. The districts, which are consider as most vulnerable or moderately vulnerable in child health, are not equally poor from each aspects of these three parameters. Government or different have to identify first which parameter is more influential for the vulnerable situation; therefore, they should have taken adequate stapes to resist or to stop each risk factor or indicator of the index parameter. As an example it can be say that in this study Jalpaiguri, Uttar Dinajpur, Birbhum, Murshidabad, Barddhaman and Kolkata have been identified as most vulnerable districts in case of under-five child health. Government have to take policy to bring out these districts from that situation. In this way, firstly government must identify which index parameter of child health is most harmful for a particular vulnerable district and have to take necessary stapes to mitigate this cause first. Thus it can be analyze that in case of Jalpaiguri, prevalence of malnutrition among the children is most significant. Therefore, government must stapes forward to save the children from the outbreak of malnutrition in this district.

Some risk indicator of these three index parameter are affecting more to the under five children of the entire study area. Government have to take adequate measures to mitigate these risks or health problems and to resist the prevalence of these risks. Beside this general people or parents of the study area must aware regarding the causes and effects of malnutrition, morbidity and immunization. And they must also come forward to bring out their children from different kinds of health risk. In this way, through some balanced collaborative activities with different Governmental & non-governmental organization and child health conscious parents, children of the study area may bring out from vulnerable health situation.

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Acid Attacks: A Threat against Women- Measure the Effectiveness of Existing Legislatures to Curb Acid Violence

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Priyanka Biswas
& Dr. Nilanjana Das Chatterjee

Abstract

Acid attacks', the most notorious forms of atrocities against women unfold its wings such a dreadful way that it has become a great issue of concern throughout the world. It is most predominant in the third world countries. In India, as per NCRB 2016 report, West Bengal holds the leading position regarding acid violence. Very often, the suitors do such vengeful acts against women with an intention to defacement out of jealousy or revenge. The present study focuses on to determine the magnitude of acid violence in West Bengal, its social psychological consequences and try to measure the effectiveness of existing legislatures to curb acid violence. It reflects that the districts of Paschim Medinipur, North and South-24-Parganas, Murshidabad have been faced the majority of incidences. The easy availability of acid in an open market is considered a catalyst to encourage the offenders to do such vengeful acts. Yet government introduce strict rules on selling of acid still, acid is easily available in open market. So, Government have to be strict and make people aware to make this society free from acid attacks.

Keywords**:** *Acid attacks, vengeful acts, suitors, social psychological consequences, open market.*

Introduction

Today's world is witnessing an alarming rate of incidences of 'Crime against women' which is prevalent in all human societies irrespective of age, religion, socioeconomic status, and culture. Perhaps the most painful devaluation of women is the physical and psychological violence that stalks women's lives from cradle to grave. One of such dreadful forms of violence against women is the 'acid attacks', legitimately renowned as 'Vitriolage'. The advanced research conducted by UNICEF revealed that violence of acid attack is very burning matters of concern around the world even children become the victims of many incidences (Nair, 2014). According to Cambodian Acid Survivors Charity (2010), acid attack or throwing of corrosive substance on an individual 'with an illicit goal to disfigure, maim, torture or kill' is a kind of vile act. Whereas Welsh (2009) considered acid violence as 'Intimate terrorism' as because of it engages in the premeditated throwing of chemical liquefied onto another person with an intention to defacement out of jealousy and/or revenge. This kind of awful crime is following a mountaineering altitude in present days and mainly the young innocent women become the sufferers of such violence. Very often the perpetrators use harsh chemicals as a weapon to give punishment to the women for spurning their suitor's proposals of marriage, denying dowry, domestic fights, property related disputes etc., (Yeasmeen, 2015). Thus, want to see the victim to live and bear the scar of physical, psychological and emotional pain for the rest of their life which seem to be fiercer than murder. The perpetrators often use Sulphuric acid, Nitric acid and hydrochloric acid phosphoric acid, muriatic acid, carbolic acid etc., to attack their target. Exposure to strong corrosive substances may result in dreadful consequences like serious burns, poisoning, serious injury and severe excruciating pain. The exothermic reaction of acidic substances with organic substance i.e. living cell of human skin

Priyanka Biswas, Department of Geography and Environment Management,Vidyasagar University, Midnapore, West Bengal, India, Email: pbpriyanka486@gmail.com

Dr. Nilanjana Das Chatterjee, Department of Geography and Environment Management,Vidyasagar University, Midnapore, West Bengal, India, Email: nilanjana_vu@mail.vidyasagar.ac.in

turn to damage the cells immediately, melts human flesh even bones and could lead to extreme cost i.e. death. Apart from these physical consequences, permanent or partial blindness, scaring, pulmonary disorder and paralysis may also be the result of acid attacks. Thus, the victims die a hundred deaths physically as well as psychologically throughout her lifespan because of her horrific physical appearance.

Scenario of Acid Violence In India

Incidences of acid violence are most predominant in third world countries. Bangladesh, Pakistan, Cambodia, India are the most predominant countries facing acid violence, especially against women. Even though Study conducted by Avon Global Centre for Women and Justice in 2011 at The Committee on International Human Rights of the New York City Bar Association, Cornell Law School, The Virtue Foundation, The Cornel Law School International Human Rights Clinic reveals that throughout the world including the developed countries like Great Britain and the United States, incidence of acid violence becomes the major human rights violation issue to be concerned (Avon Global Centre for Women and Justice 2011). Among the third world countries, India has been witnessed so many forms of violence against women such as foeticide, infanticide, eve-teasing and sexual harassment, cruelty by husband or his relatives or allegedly known as domestic violence, dowry death, kidnapping and abduction, women trafficking and so on. Recently from past decades, the violence of acid attacks has been grown up in a vivid way. As per National Commission for Women, violence of acid attack is referred to as "an act of throwing acid or using acid in any form on the victim with the intention of or with the knowledge that such permanent or partial damage or deformity or disfigurement to any part of the body of such person". According to Bhullar (2014), the so-called male dominated society in India never accept the attitude of women and strongly believe that throwing acid on her may give her lesson to 'put her in her place'. As per data released by the National Crime Record Bureau (NCRB) reveals that since 2014 to 2016 total 708 number of incidences of acid violence has been occurred and a total number of victims was 781. Whereas only in 2016, the reported numbers of incidences were 283 and the numbers of victims were 307. Yet this is not the actual number of reported incidences as many cases go unreported. According to Bhullar (2013), since the last decades in India, incidence of the chemical attack has been following an ever increasing trend. Even in total 153 numbers of cases were published in print media from January 2002 to October 2010 also. Some NGO's such as Acid Survivors Foundations, Bangalore based CSAAAW (Campaign and Struggle against Acid Attacks on Women), Kolkata based Acid Survivors Foundation India (ASFI) are also works rigorously with the government to support acid survivors and collects statistics. As per statistics published by NCRB, in 2016 West Bengal holds leading position with 76 numbers incidence followed by Uttar Pradesh (57 incidences), Delhi UT (21 incidences). So far, it is very clear that West Bengal and UP lies in the leading position in terms of notoriety.

Scenario of Acid Attack West Bengal

Considering the real-time situation in West Bengal it is noticed that violence of acid attack against women is very predominant in this state. To fulfil revenge, men merely use corrosive substances to disfigure women as they show dare to refuse men's proposal for marriage or love. As per the National Crime Record Bureau (NCRB), in 2016 West Bengal holds the 1st rank with 83 numbers of reported incidences of acid attacks. In case of cities in India, Kolkata (West Bengal) rank 2nd after Delhi UT (NCRB, 2016). According to district wise open government data, West Bengal (2014), (Table 1) intensity of acid attacks is much higher in the district of East Medinipur, Hugli, North-24–Parganas, South-24-Parganas, Bardhaman, Uttar Dinajpur and Dakshin Dinajpur (Figure 2). It also reveals that in North Bengal prevalence is rare compared to South Bengal.

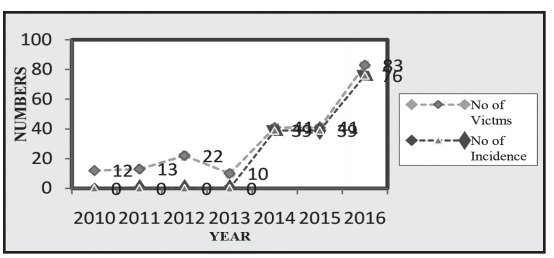

Fig. 1 Trend of acid attacks in West Bengal (2010-2016)

Source : 326A IPC & 326B IPC

The trend analysis (figure 1) reveals that since 2010 to 2016 violence of acid attacks in West Bengal has been following an ever increasing trend with 12 number of victims in 2010 to 83 in 2016 and % change in 2016 over 2015 was 102.44% in terms of victims affected and 94.87% in terms of reported incidence (statistics released by NCRB) (table 2). It is estimates that if this violence continues with this crucial manner, in 2020 (table 3) the figure would be 103 numbers of cases.

Table 1 District Wise Incidence of Acid Violence in West Bengal in 2014

District	*Year*	*Acid attack 326A IPC*	*Attempt to Acid Attack 326B IPC*
Bankura	2014	0	0
Birbhum	2014	0	0
Burdwan	2014	3	0
Coochbehar	2014	0	0
Dakshin Dinajpur	2014	1	1
Darjeeling	2014	0	0
Hooghly	2014	5	1
Howrah	2014	1	0
Jalpaiguri	2014	1	0
Kolkata	2014	0	0
Malda	2014	1	0
Murshidabad	2014	1	0
Nadia	2014	0	0
North 24 Pargana	2014	2	1
Paschim Medinipur	2014	1	0
Puraba Medinipur	2014	7	0
Purulia	2014	1	0
South 24 Pargana	2014	3	0
Uttar Dinajpur	2014	1	1

Source: Ministry of Home Affairs; Data.gov.in; 2014

Table 2 Tabulation of Incidence of Acid Attack in West Bengal (2010-2016) and Percentage Change in 2016 over 2015

Year	*2010*	*2011*	*2012*	*2013*	*2014*	*2015*	*2016*	*% change in 2016 over 2015*
No of Victims	12	13	22	10	41	41	**83**	102.44
No of Incidence	-	-	-	-	39	39	**76**	94.87

Source NCRB report

Table 3 Projected Incidence of Acid Violence

Year	*2016*	*2017*	*2018*	*2019*	*2020*
No of Victims	83	72	83	83	**103**

Source Tabulated by Authors

Yet, this figure is not the real statistics as many incidences go unreported. Sometimes law enforcement agencies nab the culprits but the charge sheet built so flimsily that the offenders get bail easily. The first, not the least reported case of acid violence in West Bengal was the Geeta Geyen's (40-year-old) case who became the victim of the acid attack on January 13, 2014, for spurning the love proposals of the convict at Swarup Nagar, North 24 Parganas district. The apex court by introducing the Criminal Act (Amendment), 2013 strictly mentioned regulation about the sale of acid in the market. The retailers must maintain the log or register copy regarding sales of the acidic substance. But in West Bengal, this rule does not always maintain properly by the retailers. Acid is easily available in the open market at a very cheap rate of 15-20 rupees (Indian currency). Social activist conveys that the easy availability of acid is the main reason for acid attacks in West Bengal. As per reputed Kolkata based NGO Acid Survivors Foundation India (ASFI), who works in regards to prevent acid violence and providing supports and services to victims recommend that a weak judiciary and policing system, poverty, illiteracy as well as gender discrimination is responsible for such horrible consequences. So far, considering this situation present research study trying to determine the spatial distributional pattern of acid violence in West Bengal, social psychological consequences and measure the effectiveness of existing legislatures and strategies undertaken by the government to curb acid violence from West Bengal.

Research Objectives

1. To identify the spatial distributional pattern of incidence of acid attacks in West Bengal
2. To understand the social and psychological consequences of acid attacks
3. To determine the effectiveness of existing legislatures and strategies to curb acid violence

Research Methodology

Situational analysis method has been solely adapted to conduct this present research. Both primary and secondary datasets have been used to continue this research work. We have conducted fact-finding interviews with some survivors and their families, College going female students, General public, Lawyers, and NGOs to make sound information about the magnitude of acid attacks, possible socio-ecological factors regarding this issue in West Bengal. Total numbers of respondent were 240. Apart from these primary data sources, databases have been collected from reliable secondary sources like National Crime Record Bureau (NCRB), Open Government data (data.gov.in), Kolkata based NGO Acid Survivors Foundation India (ASFI) records, and newspaper report (The Times of India, Anandabazar Patrika) from 2010 to 2017. These also help to understand the present scenario of acid violence in West Bengal. To recognize the socio-psychopathological trouble that's the survivors face due to the result of acid attack we do direct interviews with the survivors, taking help from ASFI's coordinator Dibyaloke Rai Chaudhuri and newspaper reports. The situational analysis also used

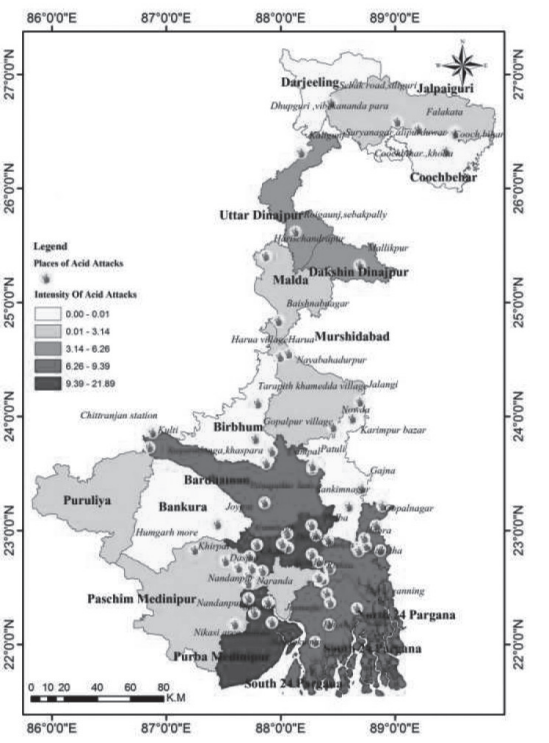

Fig.2 Spatial Distribution of incidences of Acid Attack in West Bengal

to evaluate the effectiveness of existing strategies in reality to minimize such a heinous offence. We use ARC GIS 10.1 software to generate crime mapping.

Analysis of Data

Spatial Distributional Pattern of Incidences of Acid Attacks in West Bengal

As per NCRB reports, in 2016 numbers of reported incidences and affected victims under section 326 A IPC and 326 B IPC, particularly committed against women were 54 and 60 respectively. Data obtaining from newspaper reports (Table 4) reveals that total 81 numbers of incidences have been published in print media from 2010 to 2017 in West Bengal. Figure 2 illustrates the spatial distributions as well as the hotspots of acid violence in West Bengal which reflects south Bengal, especially the districts of Paschim Medinipur, North- 24-Parganas, South-24-Parganas, Nadia, Bardhaman, Murshidabad etc has been faced the majority of incidences. Table 4 represent since 2010 to 2017 district wise total number of incidences of acid attacks. It reflects that in Burdwan, Hooghly, Paschim Medinipur and South-24 Parganas incidence occur at a higher rate compared to other districts. In 86% of cases women become the target of acid attacks by the strangers and about 14 % of such inhumane activities occur against the male. Against 81 numbers of incidences, total numbers of victims are 106 out of which female victims are 81% and male victims are 19% (table 5).

Table 4 Year Wise Incidence of Acid Attack in Districts of West Bengal

Districts	*2010*	*2011*	*2012*	*2013*	*2014*	*2015*	*2016*	*2017*	*Total*
Alipurduwar					1			1	2
Bankura					1			1	2
Birbhum		1			2			1	4
Burdwan					2	1	3	3	9
Coochbehar						2			2
Howrah		1						1	2
Hooghly			1	1	4	1	1		8
Jalpaiguri					1			1	2
Kolkata	1			1	1			1	4
Malda			1		1	1			3
Murshidabad		1	2		2		1		6
N-24 Pargana	1			1	1		2	2	7
Nadia			1		1		3		5
Paschim Medinipur						2	2	5	9
Purba Medinipur				1	3			1	5
South- Dinajpur					1		1		2
S-24 Pargana	1		1		1	1	1	3	8
Uttar Dinajpur					1				Total 81

Source: Anandabazar Patrika and ASFI records

Table 5 Summary of Incidence

Crime Head / *Acid attack and Attempt to acid attack*	*Number of Incidence*	*%*	*Number of victims*	*%*
Male	11	13.58	20	18.87
Female	70	86.42	86	81.13
Total	81	100	106	100

Source: Anandabazar Patrika

Consequence of Acid Attack

Physical Consequence

Data collected from newspaper reports reflects horror physical consequences of acid attacks. Physical consequences of acid attacks may be in different forms. Common physical injuries of acid attack are as follows:

- Skull: Partly destroyed or distorted and partial hair loss.
- Ear: Cartilage of the ear may be partly or totally destroyed- hearing impairment.
- Eyelids: Burned off or distorted with ectropionise eyelids.
- Eyes: Dry eyes or loss of sight in one or both eyes.
- Nose: Shrunken and deformed of the nose. The respiratory problem may arise.
- Mouth: Became shrunken and tapered-lips partially or totally destroyed.
- Other body parts injury: Debilitating scarring of the neck, genitalia, trunk and extremities causing restraint in the movement of the affected area.
- Forced ingestion: Vocal cords and trachea and oesophagus may affect.
- Inhalation: May cause respiratory problems
- Death: Very rare in such cases. Occur mainly by renal failure and septicaemia.

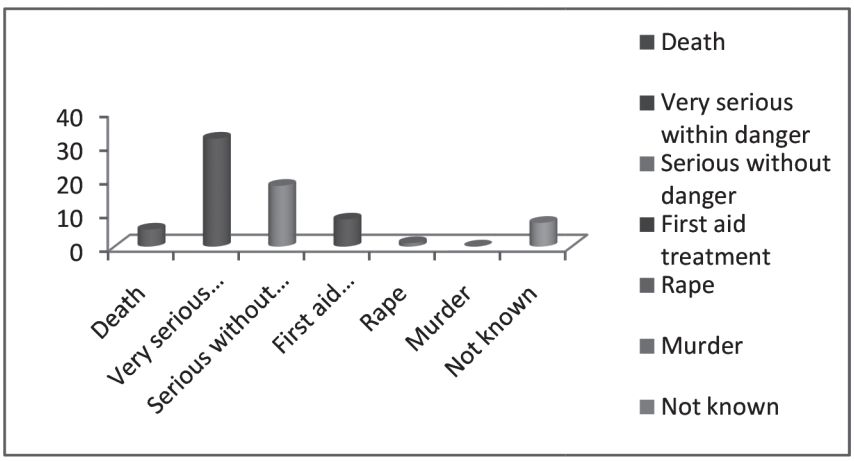

Fig. 3 Consequences of acid attacks

Since 2010 there were 5 female victims died due to the extreme upshot of acid attack. Figure 3 shows that 32 victims injured very seriously even they are not out of danger. About 80% of their face and body become disfigure by acid. Many cases they lose their vision permanently. They suffer from a respiratory problem even many of them cannot eat any solid food. One incidence occurs at Machlandapur station, North-24 Parganas in 30th November 2010 where perpetrator raped the victims many times after attacked her by acid.

Psychological and Social Consequences

Acid attack not only disfigures victims physically it's also scar or damage her psychologically and socially. Survivors faced kinds of mental disorder like a high level of anxiety, stress, and core depression. Her physical appearance, stigmatization, social isolation and severe financial distress due to medical treatment accountable for such psychological cost of the survivors. A victim in Titagarh kept herself at home near about twelve years after being persecuted by the neighbour, who want to take revenge as she showed dare to reject his proposal for marriage. Her mother runs Amritsar to Mumbai for treatment of her daughter. But she does not continue due to the poor financial condition of families. Another victim in Joynagar, South-24 Pargana still bothered as main accused not arrested till now and other accused got bail from the court and continue pressurised her family to wipe out the case. Even the main accused through social media continues to intimidate her but police could not arrest him. Acid not only disfigures her face rather society blemishes her character also. In a personal interview, she said when she was lying down in a hospital bed with tremendous pain some so-called well-wishers who came to saw her said: "women belong to good families never face such violence in life". She also said that in a train journey a co-passenger after heard the whole incidence from her asked her *"Only Acid? Are you not raped"?* Such behaviour annihilates self-esteem of the survivors in kinds of way.

Undertaken Legal Actions

Incidences of acid attacks in India have been spread like a Blaze of fire in present days. Social activists convey for limiting the sale of acid and acidic substances in the open market by posing strong restrictions. Until 2013, this heinous crime was dealt with under section 326 IPC which deals with 'Voluntarily causing grievous hurt by dangerous weapons or means and/or using corrosive substances'. After the brutal incidence of 'Delhi Gang Rape case' on 16 December 2012; Supreme Court of India ordered parliament to straighten existing laws. Hence in 2013 'The Criminal Law (Amendment)' had been introduced headed by Justice A. R. Lakshmann. By virtue of The Criminal Law (Amendment), section 326A and 326B has been added to IPC and made acid attacks as a specific offence under IPC. The provisions under section 326A and 326B IPC is stated in table 6.

Table 6 IPC Provisions Regarding Acid Attack

IPC Section	*Crime Head*	*Sub Head*	*Provision*
Sec. 326A	Acid Attack	1.Hurt by Acid Attack	▪ Imprisonment which shall not be less than 10 years but may extend to lifetime. ▪ Non bailable. ▪ With fine Rs.10 lakh.
		2. Intentionally throwing or administering acid	▪ Imprisonment which shall not be less than 5 years but may extend to 10 years. ▪ Non bailable. ▪ With fine Rs. 5 lakh.
Sec. 326B	Attempt to Acid Attack	1. Penalizes the attempt to throw acid	▪ Imprisonment which shall not be less than 5 years but may extend to 7 years. ▪ Shall also liable to fine

Though there are provisions under IPC but still many times legislative framework does not address properly against the offenders in case of acid attacks. Many incidences go unreported because of unawareness and withdrawn of cases are also noticed as a result of repercussion from the offender and his family members.

As per newspaper reports, in West Bengal in respect of 70 cases of acid attacks on female victims, numbers of perpetrators were 85. In 71%

of cases, offenders are in police custody. But still, charge sheets are not prepared for many cases. For three cases the court sentence suitors for life imprisonment. For Machlandapur acid attack case, North-24 Parganas is the first one where the accused punished life imprisonment ordered by Barasat court. For Coochbehar acid attack case (held in 2015) Alipurduwar additional district and session court sentenced the accused for life imprisonment. This is the first case for the punishment of offender of an acid attack in North Bengal also. And for Mou Rajak case Krishnanagar first track court punished the offender by sentenced him for life imprisonment. For two cases, Dipabali Rajak case of Baishnabnagar, Malda and Dhanekhali case accused punished for 10 years imprisonment with fine. It also found that about 7% of cases victims' family does not lodge any complaint in police station due to fear of threats from suitors. Many times perpetrators come in motorbike covered their face with cloths and who seat on the back side of rider throw acid on victims face and run away (Goswami, 2017). So that it is very difficult for the survivors to identify the offenders.

Sale of Acid in open Market Vs. Supreme Court Regulation on Sale of Acid

To prevent acid attacks the Supreme Court of India on 18th July 2013 announced regulations on the sale of acid and other corrosive substances in the open market under 'The Poison Possession and Sale Rules, 2013' (Writ Petition order dated 18 July 2013) in the context of Laxmi vs. Union of India case (W.P.(Crl.)No.129/2006). By this rule, the higher court directed the Government of India to circulate all the regulations related to the sale of acidic substances to all states and UT's. Until such rules are made operational in all states and UT's the Chief Secretaries of concerned states/ Administrators of the UT's shall ensure the compliance of the rules which embodies the following-

1. Over the counter sale of acid is completely prohibited unless the seller maintains a log / register recording the sale of acid which will contain the details of the person (s) to whom acid (s) is /are sold and the quantity sold. The log / register shall contain the address of the person to whom it is sold.
2. All seller shall sell acid only after the buyer has shown

i. A photo ID issued by the govt. which also has the address of the person.

ii. Specifies the reasons /purpose for procuring acid.

3. All stocks of acid must be declared by the seller with the concerned Sub Divisional Magistrate (SDM) within 15 days.
4. No acid shall be sold to any person who is below 18 years of age.
5. In case of undeclared stock of acid, it will be open to the concerned SDM to confiscate the stock and suitability impose dine on such seller up to Rs. 50,000 /-.
6. SDM may impose fines up to Rs. 50,000/- on the person for breach of any of the above directions.

Under 'The Poison Possession and Sale Rules, 2013' the Supreme Court also directs that the educational institutes, research laboratories, hospitals, government departments and departments of public sector undertaking who are required to store and keep acid shall follow the underlying regulations-

7. A register of usage of acid shall be maintained and the same shall be filed with the concerned SDM.
8. A person shall be made accountable for possession and safekeeping of acid in their premises.
9. The acid shall be stored under the supervision of this person and there shall be compulsory checking of the students/personnel leaving the laboratories or place of storage where acid is used.

Besides these regulations acid is easily available in the open market of West Bengal. In Ghatal subdivision maximum people engage in gold work. For these purpose acid is necessary. It is so astonishing that most incidences of the acid attack in Ghatal subdivision area, the delinquents are gold

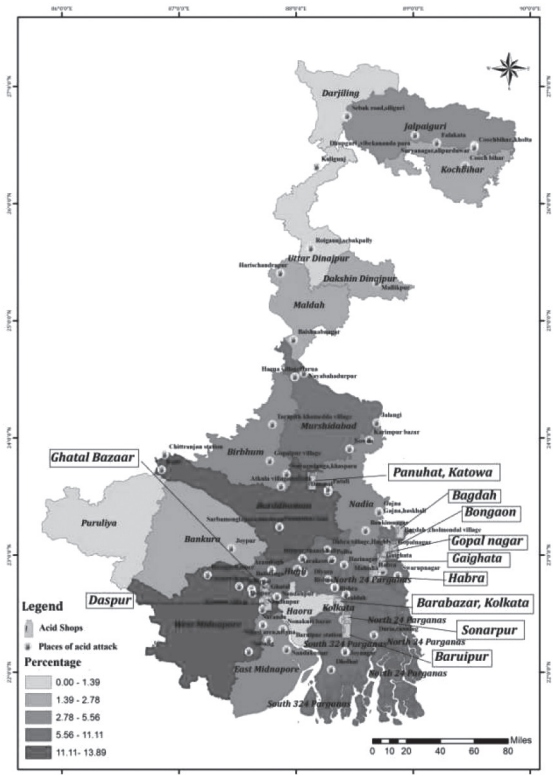

Fig. 4 Availability of Acid in Open Market- Some Identified Places in West Bengal

mechanics. In the sagarpur area of Daspur CD block `acid is also available in gold shops. The sellers have no licence even they never ask the buyer for reason of buying. But one drop of acid is enough to burn a human body. On 10 November 2017 CID arrest a broker from 'Panuhat Barujibipally' of Katowa subdivision of Burdwan district with 2200 litre acid. In March 2017 raid was done in Sonarpur and Baruipur bazaar area by police personnel supervised by SDPO (Baruipur) and sub-divisional magistrate (Baruipur) of South-24-Parganas district. It was so awful that police seized so many sulphuric acid and nitric acid bottles from hardware shops in Baruipur and Sonarpur market. Empty beer bottles are used for storing acid in shops. A hardware businessman said *"we sold acid for toilet cleaner and for gold works. But what happens then how could we know"*. Most of the sellers are not aware of government rules of the sale of acid. A police officer of South-24 Parganas district said that recently police seized 200-litre acids from a battery industry in 'rathtala' area of Sonarpur subdivision. Kolkata 'Barabazar' area is the main source of acid. The battery retailers, hardware retailers of suburban region buy acid from a wholesaler of Barabazar area of Kolkata and sell in the local market. Acid is easily available in Murshidabad and Nadia district also. In 'Bongaon', 'Habra', 'Ashok Nagar', 'Gaighata', 'Bagda' area of North-24-Parganas and 'Gopal Nagar' area of Hooghly district acid is available effortlessly not only in bazaar area but also in grocery shops, food corners, hardware shops and other retail shops of town or villages of these areas. All of these areas retailers sale acid in the open market without any permission. In Bagnan, Uluberia subdivision of Howrah districts so many gold shops and heavy industries are there. According to government statistics, there are total 80 hardware shops in Uluberia for supplying acid in the whole subdivision. Yet as per nongovernmental statistics, the number is twice. But most of the retailers have no legal licence. From local panchayat or from municipality they only manage trade licence for these. Some identified places where acid is available easily in the open market are represented in figure 4.

Conclusion

The dreadful offence of acid attacks in West Bengal has now become a modern threat of violence committed especially against women. It is considered the easiest way to take revenge against women once they show courageous to refuse of love or marriage proposal, deny dowry etc., and take past revenge. Sometimes Baruipur, sometimes Canning, sometimes Purbasthali or in Ghatal, everywhere acid attack scar the life of teenagers and women. The easy and cheap availability of acid in open market encourage the offenders to do such vengeful acts which burnt victims like living crops and seek to sentence her to a dilemma worse than death. Most cases husband of victims, disgruntled lovers, close relatives and neighbours become the suitors as so-called 'male's ego' can't bear his insult and loss of honour and such frustration enthuse him to take such revenge. Yet central and state government have been taken so many initiatives like provide compensation, better treatment, trauma care facilities, insurance,

rehabilitation and job facilities to the victims and also propose towards control on the counter sale of an acidic substance above 20% concentration in the open market to stop such violence but this crime is continue. Apart from strong legislative measures and other aftercare conveniences government in collaboration with NGO's should undertake initiatives to make people aware and make the society free from acid attacks.

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Socio- Spatial dimension of Gender Inequality in Paschim Medinipur: A Block Level Analysis

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Tanmay Patra, Dr. Uday Chatterjee & Santu Guchhait

Abstract

Gender means a stereotype mentality, a system of belief that placed women to a subordinate position in a family or in a society. Gender as a system of social practices within society that constitutes distinct, differentiated sex categories, sorts people into these categories, and organizes relations between people on the basis of the differences defined by their sex category (Ridgeway and Smith-Lovin 1999)[1] .Gender inequality addresses the unequal access to resources and opportunities that makes life more meaningful, just and desirable for her. Paschim Medinipur district in West Bengal is one of the most diversified in respect to its physiography as well as socio-cultural set up. Social value, custom, religious prejudices and relationship among member of a society create gender biasness. Gender Inequality Index (UNDP) has been used to measure the inequality between female and male achievement in three dimensions –reproductive health, empowerment, economic activity.

Keywords: *Stereotype, Gender Inequality Index. Religious prejudices, Gender biasness, Unequal access.*

Introduction

One is not born, but becomes a woman. No biological, psychological, or economic fate determines the figure that the human female presents in society: it is civilization as a whole that produces this creature, intermediate between, male and eunuch, which is described as feminine. Only the mediation of someone else can establish an individual as another" De Beauvoir (1949). The term gender refers to the economic, social and cultural attributes and opportunities associated with being male or female. In most societies, being a man or a woman is not simply a matter of different biological and physical characteristics. Men and women face different expectations about how they should dress, behave or work. Relations between men and women, whether in the family, the workplace or the public sphere, also reflect understandings of the talents, characteristics and behaviour appropriate to women and to men.

Gender inequality addresses the unequal access to resources and opportunities that makes life more meaningful, just and desirable for her. So far as social justice and human welfare as well as development are concerned the gender inequality is the most vital issue. The meaningful development depends on the involvement and commitment of the members of the society especially women, men and youth. So gender inequality gives the emphasis on gender-based discrimination, disparity and oppression of women in their lives. As a result of such kind of discrimination and disparity women persistently achieve poor outcomes in lives. This poor achievement is the most fundamental cause becomes excluded consistently and persistently from meaningful participation in every aspect of society as well as developmental process. Where gender inequality exists, it is generally women who are excluded or disadvantaged in relation to decision making and access to economic and social resources. Therefore, a critical aspect of promoting gender equality is the empowerment of women, with a focus on identifying and redressing power imbalances and

Tanmay Patra, Vidyasagar University, patrananu@gmail.com
Dr.Uday Chatterjee, Bhatter College, Dantan, raj.chatterjee459@gmail.com,
Santu Guchhait, Ravenshaw University, guchhaitsantu2014@gmail.com

giving women more autonomy to manage their own lives.

Relevancy of the Study

As major concern of geography is to study the spatial distribution and relationship of phenomenon, in this respect gender inequality plays a vital role to make sharp differences in socio-economic development of a place. We may get a vivid picture of such differences in our society which is nothing but an expression of various levels of women participation in labour market, their educational attainment and political participation in decision making process. So the gender inequality is one of the most important causes which make the spatial variability between the rural society and urban society. More women participation in socio-economic activities is necessary to eradicate such socio-spatial differences and to make sustainable development. It is well known fact that female makes the half of human society so, if we neglect or wanted to suppress forcibly the potential power of women it may be an indication of foolishness of our knowledge. So the present study is very relevant from three important aspects.

Firstly, it is very use full to make comprehensible the relationship between the spatial variability of socio-economic status and gender inequality of a place.

Secondly, in our previous study we have already explained various type of factor to indicate the socio-economic development of a place, now we want to measure the intensity and magnitude of gender inequality to determine this variability of development.

Thirdly, to make it cognizable that how gender biasness of a society creates a socio-economic variation, or it is an outcome of spatial differences in socio- economic condition.

This study is also very relevant from the ethical point of view because every human being must have an equal right to access the proper educational opportunity, political and personal freedom to take decisions and make choices in life.

1. Location of the Study

Paschim Medinipur is the southernmost district of West Bengal. It has been come out from the then Medinipur as separate district in 1st January 2002. It is located between 22º57' 10" and 21º36' 35" North latitude and between 88º12' 40"and 86º33'50" East longitude. Bankura district is located in the northern side and Purba Medinipur is in the south eastern. The southern side of this district is bordered by Balasore and Mayurbhanj district of Orissa. Western side is bounded by Singbhum district of Jharkhand. The present population of the district is 59 lakh with 18.05 % SC and 14.87 % ST population. Geographical area of the district is 9295.28 Sq. Km. The district is further divided into four Sub-divisions, 29 blocks and 8 municipalities. Paschim Medinipur district is

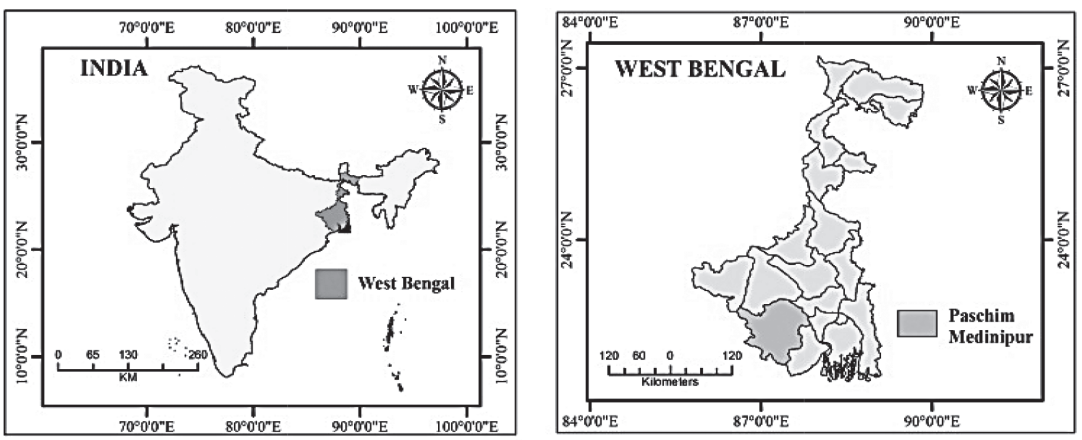

Fig. 1 Location of the stuy area

Fig. 2: Location of Pachim Medinipur District

full of regional diversity in terms of physiographic, agro-climatic characteristics, economic development and social composition etc.

Objectives

1. To analyse the nature of spatial variation in gender inequality of Paschim Medinipur district.
2. To search out the major areas of inequality.
3. To find the correlation among various indicators and to measure the association sensitivity among them.
4. To categorise the blocks according to their respective GII.

Database and Methodology

United Nations Development Program proposed Gender Inequality Index (GII), new gender related index in the Human Development Report (HDR), 2010. GII has been planned to catch up women's disadvantages in three dimensions – economic activity, empowerment and health. These three dimensions consist of a set of indicators. Mainly secondary data has been used to construct this index. Some modification has been done for the application of this index at block level. A detail table of dimensions and indicators have been depicted bellow

Table No.1 -Component of the Gender Inequality Index-

Dimensions	*Indicators*
Women's Reproductive Health	Maternal mortality ratio (MMR)
	Adolescent fertility rate (AFR)
Empowerment	Share of parliamentary seats held by each sex (PR)
	Attainment at secondary and higher education (SE)
Labour Market Participation	Labour market participation rate (LFPR)

$$\overline{HEALTH} = \left(\sqrt{\frac{10}{MMR}.\frac{1}{AFR}+1}\right)\Big/_2$$

$$\overline{EMPOWERMENT} = \left(\sqrt{PR_F.SE_F}+\sqrt{PR_M.SE_M}\right)\Big/_2$$

$$\overline{LFPR} = (LFPR_F + LFPR_M)\Big/_2$$

$$G_{\overline{F.M}} = \sqrt[3]{\overline{HEALTH}\,.\,\overline{EMPOWERMENT}\,.\overline{LFPR}}$$

$$G_F = \sqrt[3]{\sqrt{\frac{10}{MMR}.\frac{1}{AFR}}.\sqrt{PR_F.SE_F}.LFPR_F}$$

$$G_M = \sqrt[3]{1.\sqrt{PR_M.SE_M}\,.LFPR_M}$$

$$\text{HARM}(G_F, G_M) = \left[(G_F,^{-1} + G_M{}^{-1})\Big/_2\right]^{-1}$$

$$\text{GII} = 1 - \frac{\text{HARM}(G_F,G_M)}{G_{\overline{F.M}}}$$

Besides dimensions and indicators some equation has also been used for this index.GII has fundamentally been constructed on the basis of normative assumptions- symmetry in gaps and association sensitivity. Here symmetry in gaps means the gender gap of men and women should be treated equally. On the other hand association sensitivity (Seth, 2009) is very much responsive to those changes in indicators those are very much associated to one another.

The value of GII will be equal to be 0, when the male and female fare equally well in each dimension. On the contrary to this, if there exist a huge gap in achievement between male and female, then the value of GII will tend to be 1.

Result and Discussion

An attempt has been made through this paper to find

Table 2- Block wise Gender Inequality Index and their ranking

S.L. No.	*Name of the Blocks*	*Health*	*Empowerment*	*LFPR*	G_F	G_M	$G_{F.M}$	*Harm* (G_F,G_M)	*GII*	*Rank*
1	Binpur - II	0.533	55.20	47.85	5.05	15.07	10.98	7.560	0.311	19
2	Binpur - I	0.532	55.35	39.75	5.04	13.63	10.53	7.350	0.302	16
3	Garbeta - II	0.541	57.58	45.94	5.48	14.02	11.26	7.890	0.299	15
4	Garbeta - I	0.536	54.84	38.82	4.30	15.04	10.44	6.680	0.556	29
5	Garbeta - III	0.538	56.95	42.60	4.90	13.80	10.94	7.230	0.339	22
6	Chandrakona - I	0.540	59.31	38.95	4.27	14.50	10.76	6.590	0.545	28
7	Chandrakona - II	0.540	57.03	37.95	4.26	14.90	10.53	6.060	0.424	25
8	Ghatal	0.567	60.57	38.70	4.96	14.60	10.95	7.390	0.325	20
9	Daspur - I	0.589	61.12	40.76	6.00	15.00	11.36	8.590	0.243	1
10	Daspur - II	0.600	63.22	38.15	5.68	15.08	11.31	8.252	0.246	2
11	keshpur	0.549	57.58	38.22	4.78	13.44	10.65	7.050	0.338	21
12	Salbani	0.538	51.06	45.53	5.08	14.16	10.77	7.470	0.306	18
13	Midnapore	0.564	54.64	40.98	5.56	13.70	10.8	7.900	0.268	7
14	Jhargram	0.554	56.67	45.95	5.91	14.01	11.29	8.310	0.264	6
15	Jamboni	0.550	57.76	45.00	5.83	13.75	11.26	8.190	0.273	10
16	Gopiballavpur - II	0.545	56.25	42.16	5.25	13.62	10.89	7.580	0.304	17
17	Gopiballavpur - I	0.550	52.26	43.08	5.41	13.94	10.73	7.790	0.441	26
18	Nayagram	0.551	52.56	49.22	6.08	13.41	11.25	8.360	0.257	4
19	Sankrail	0.552	57.14	45.29	5.78	14.28	11.26	8.220	0.269	8
20	Kharagpur - I	0.568	57.60	37.65	5.36	14.02	10.71	7.760	0.275	11
21	Kharagpur - II	0.555	57.75	43.24	5.62	14.55	11.15	8.110	0.273	9
22	Debra	0.560	60.42	45.57	6.06	14.60	11.55	8.560	0.258	5
23	Pingla	0.547	62.59	50.65	6.15	14.83	12.01	8.690	0.276	12

24	Sabang	0.552	62.57	59.05	7.00	15.23	12.68	9.590	0.245	3
25	Narayangarh	0.548	59.31	44.55	5.57	14.35	11.31	8.025	0.29	14
26	Keshiary	0.549	57.95	44.90	5.64	14.23	11.26	8.078	0.283	13
27	Dantan - I	0.547	57.55	36.54	4.51	13.67	10.47	6.780	0.352	23
28	Dantan - II	0.545	60.30	35.47	4.10	14.07	10.52	6.350	0.396	24
29	Mohanpur	0.546	60.94	33.53	3.62	13.93	10.37	5.740	0.446	27

Source- computed by author.

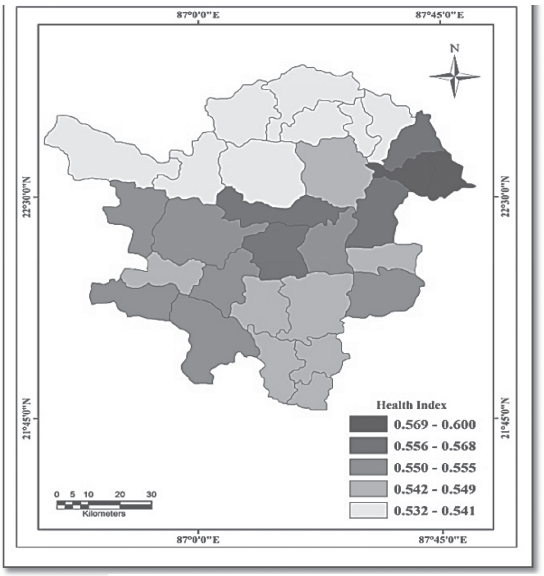

Fig. 3 : Blockwise Health Index of Paschim Medinipur

Source- Prepared by author from table no-2

out the major areas of inequality in respect to gender achievement in three important aspects of life.

6.1. Dimension 1: Reproductive Health

This is an important dimension to up hold the well-being level of men and women in society. Two indicators have been selected here. These are the maternal mortality ratio and the adolescent fertility rate. So, these two indicators indicate the risk among child bearing age group of women, health condition, future opportunities in life, and autonomy. This diagram clearly depicts the picture of block wise spatial variation of health index in Paschim Medinipur. Daspur-I, and Daspur-II achieve a good health condition. Contrary to this some blocks like Binpur – I, Binpur – II, Chandrakona – I, Chandrakona – II, Garbeta – I, Garbeta – II, Garbeta – III, Salbani show very low achievement in health status. So women reproductive health is worst in these afore stated blocks. A detail categorical table of blocks in respect to their health status is given bellow.

Table No.3 - Categories of blocks according to their health index

Blocks	*Health Index*				
	0.532 - 0.541	*0.542 - 0.549*	*0.550 - 0.555*	*0.556 - 0.568*	*0.569 - 0.600*
	Binpur - I	Dantan - I	Gopiballavpur - I	Debra	Daspur - I
	Binpur - II	Dantan - II	Jamboni	Ghatal	Daspur - II
	Chandrakona - I	Gopiballavpur - II	Jhargram	Kharagpur - I	
	Chandrakona - II	Keshiary	Kharagpur - II	Midnapore	
	Garbeta - I	keshpur	Nayagram		
	Garbeta - II	Mohanpur	Sabang		
	Garbeta - III	Narayangarh	Sankrail		
	Salbani	Pingla			

Source- Prepared by author from table no-2

Dimension 2: Empowerment

Empowerment is the second dimension of Gender inequality index. It consists of two indicators, namely Share of parliamentary seats held by each sex (PR), Attainment at secondary and higher education (SE) .Empowerment and political participation are deeply complementary and can be considered both means and ends, processes and outcome (Cornwall and Brock, 2005). On the other hand education brings empowerment because it strengthens people's capacity to question and act on one's condition and increases accessibility to the information needed to do so (P. Inaki, 2016). Women political participation largely depends on socio-demographic, socio-cultural practices, education and caste perception among particular community (Agarwal 1997, Gleason 2001, Banerj 2003). Crook and Manor (2000) define political participation as; citizens' 'active engagement with public institutions' including voting, campaigning, and pressuring either individually or through a group" (Gleason, January 1, 2001). Daspur-II, Pingla, Sabang these three blocks show high rate of women's political participation and attainment of higher education. But contrary to this other than these three block indicate very low rate in participation in decision making process due lack of proper information and education.

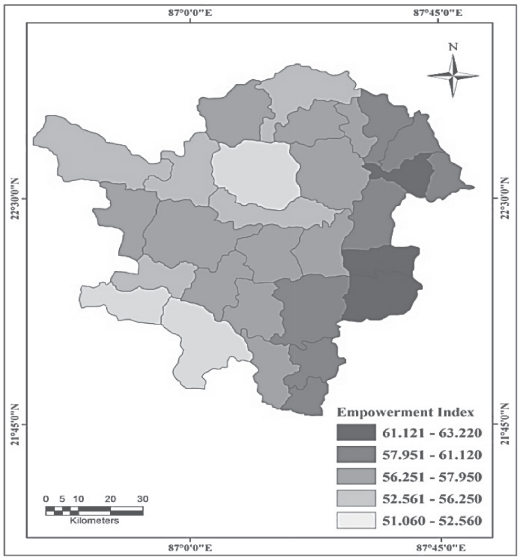

Fig. 4: Blockwise Empowerment Index of Paschim Medinipur
Source- Prepared by author from table no-2

Table No.4 - Categories of blocks according to their health index

Blocks	*Empowerment Index*				
	51.060-52.560	*52.561-56.250*	*56.251-57.950*	*57.951-61.120*	*61.121-63.220*
	Gopiballavpur - I	Binpur - I	Chandrakona - II	Chandrakona - I	Daspur - II
	Salbani	Binpur - II	Dantan - I	Dantan - II	Pingla
		Garbeta - I	Garbeta - II	Daspur - I	Sabang
		Gopiballavpur - II	Garbeta - III	Debra	
		Midnapore	Jamboni	Ghatal	
		Nayagram	Jhargram	Mohanpur	
			Keshiary	Narayangarh	
			keshpur		
			Kharagpur - I		
			Kharagpur - II		
			Sankrail		

Source- Prepared by author from table no-2

Dimension 3: Labour force participation.

Gender discrimination in work is related with the sectoral shifting from agricultural and manufacturing toward services. (Oded Galor, 1996) Offer a model. In their model they introduce two fundamental types of works one is physically intensive work and another is mentally intensive work. Women take more in advantages in mentally intensive work. Participation in economic activity is the sole determinant in gender inequality index. Labour force participation, as traditionally measured, ignores the important contributions of women in unpaid work and many perpetuate the undervaluing of these critical activities (Gaye et al.2010). There are large differences in participation of male and female labour participation rate. The participation rate of female is highest in Sabang block. Dantan-I, Dantan-II, and Mohanpur blocks exhibit lower participation rate of female in economic activity. Mainly scheduled cast and scheduled tribe concentrated blocks show high participation te.

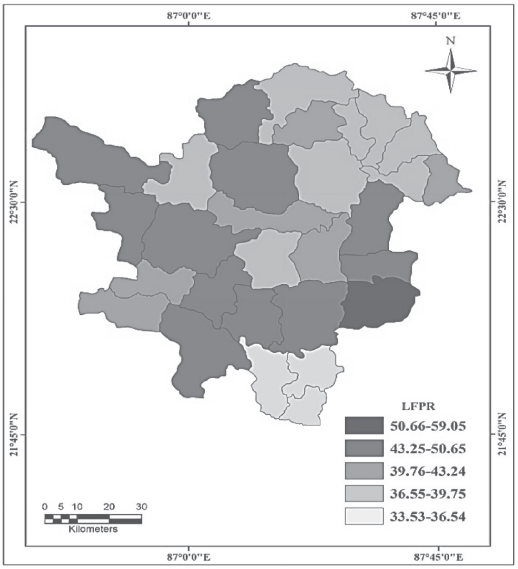

Fig. 4: Blockwise Labour force participation rate of Paschim Medinipur

Source- Prepared by authors from table no 2

Table No.5 - Categories of blocks according to their Labour force participation rate

Blocks	*Labour Force Participation Rate*				
	33.53-36.54	*36.55-39.75*	*39.76-43.24*	*43.25-50.65*	*50.66-59.05*
	Dantan - I	Binpur - I	Daspur - I	Binpur - II	Sabang
	Dantan - II	Chandrakona - I	Garbeta - III	Debra	
	Mohanpur	Chandrakona - II	Gopiballavpur - I	Garbeta - II	
		Daspur - II	Gopiballavpur - II	Jamboni	
		Garbeta - I	Kharagpur - II	Jhargram	
		Ghatal	Midnapore	Keshiary	
		keshpur		Narayangarh	
		Kharagpur - I		Nayagram	
				Pingla	
				Salbani	
				Sankrail	

Source- Prepared by author from table no-2

Dimension 4: Gender inequality index

Gender inequality index is an achievement based index which indicates the gaps in possession in life. Daspur-I, Daspur-II, Debra, Nayagram and Sabang blocks exhibit lower gender inequality index which indicate wellbeing state of female in these area. But on the other hand Chandrakona-I, Garbeta-I show high GII which depict the presence of disparity in various aspects in life. Rest blocks represent a medium level of inequality. Various socio-economic nd geographical factors are responsible for this kind of gender inequality. The western part of Paschim Medinipur shows greater inequality index then the eastern part. Some important cultural factors such as dowry system, religious ritual and old age support from son and patrilocality all these have significance and deep rooted impact to shape a life of women. Because the afore stated element are the important component of socio-cultural system of Paschim Medinipur district. These elements have separate role to give more vale to the son.

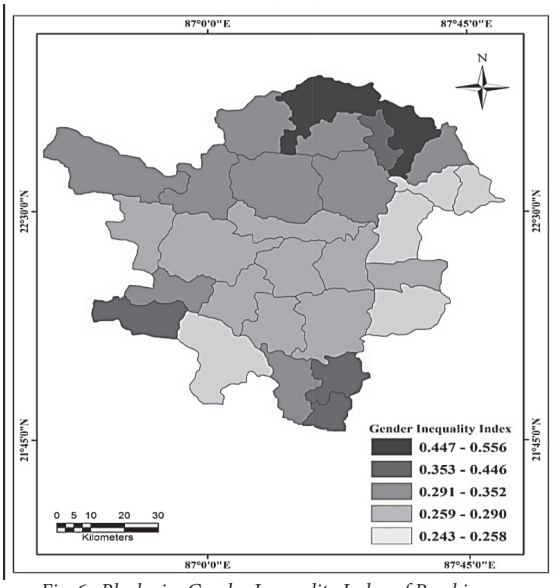

Fig. 6 : Blockwise Gender Inequality Index of Paschim Medinipur

Source- Prepared by author from table no-2

Table No. 6 - Categories of blocks according to their Gender inequality index.

Blocks	*Gender Inequality Index*				
	0.243-0.258	*0.259-0.290*	*0.291-0.352*	*0.353-0.446*	*0.447-0.556*
	Daspur - I	Jamboni	Binpur - I	Chandrakona - II	Chandrakona - I
	Daspur - II	Jhargram	Binpur - II	Dantan - II	Garbeta - I
	Debra	Keshiary	Dantan - I	Gopiballavpur - I	
	Nayagram	Kharagpur - I	Garbeta - II	Mohanpur	
	Sabang	Kharagpur - II	Garbeta - III		
		Midnapore	Ghatal		
		Narayangarh	Gopiballavpur - II		
		Pingla	keshpur		
		Sankrail	Salbani		

Source- Prepared by author from table no-2

Relational aspect GII with health, empowerment and labour force participation rate

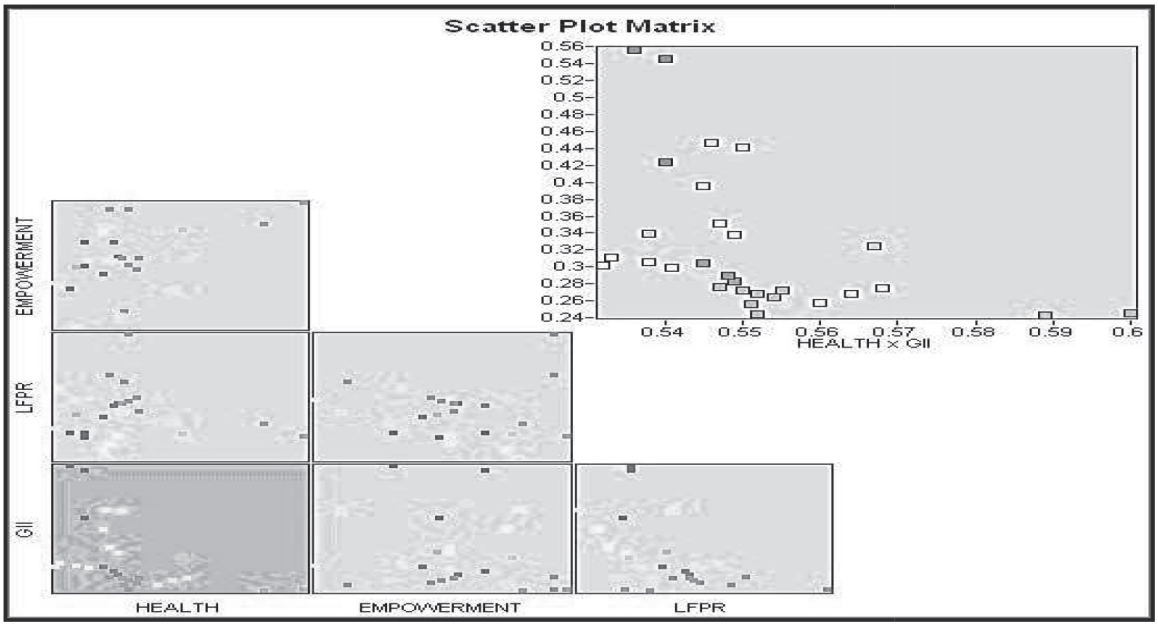

Fig. 7 : Relationship of GII with Helath

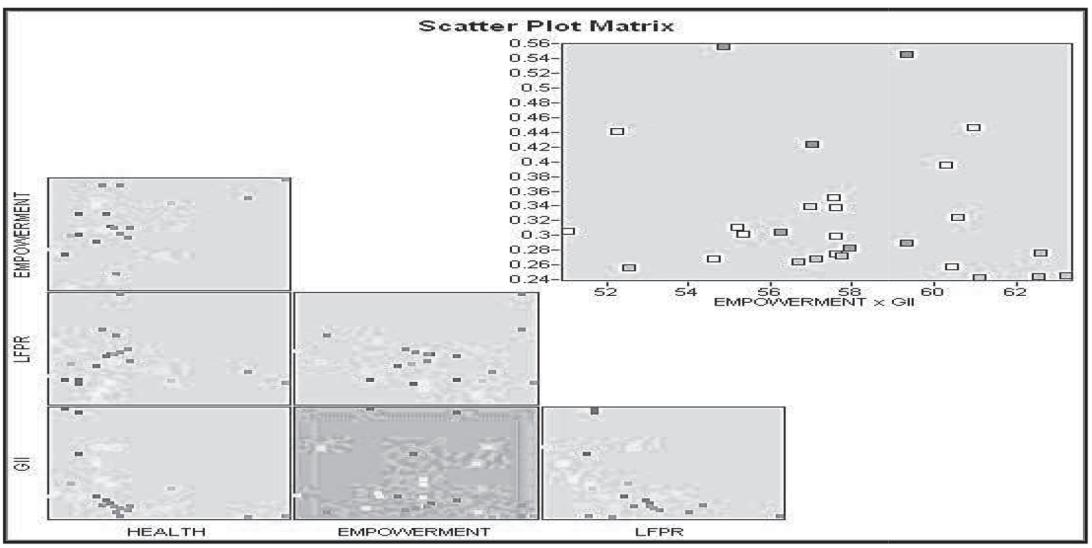

Fig. 8 : Relationship of GII with Empowerment

Source- Prepared by authors from table no-2

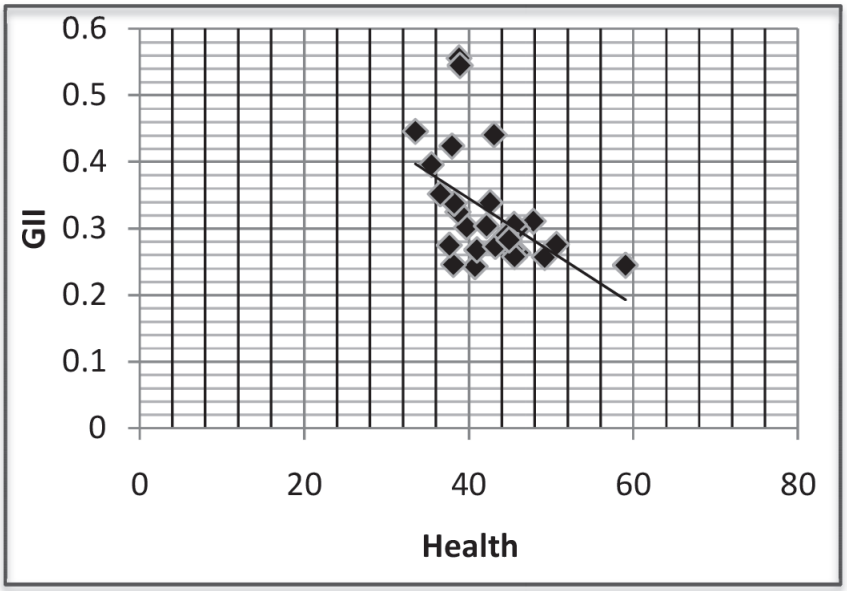

Fig. 9 : Relationship between Health and GII

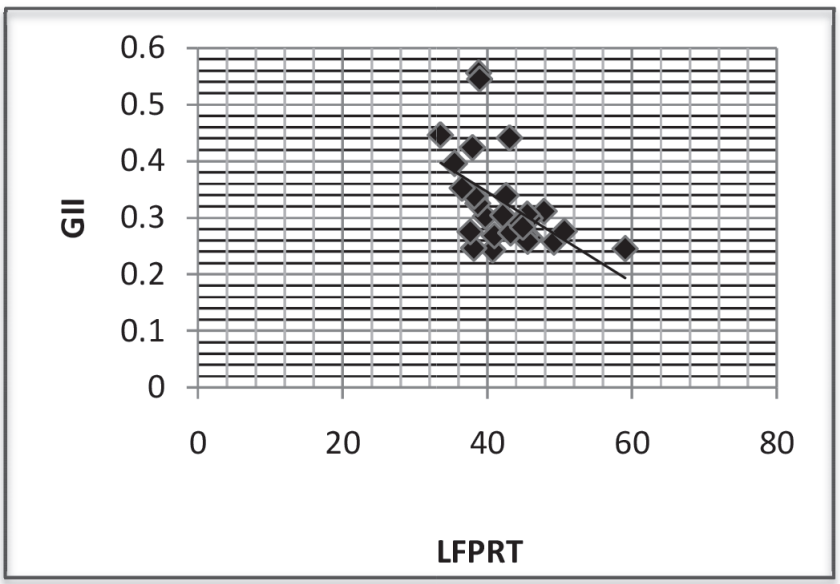

Fig. 10 : Relationship between LFPRT and GII

Source- Prepared by authors from table no-2

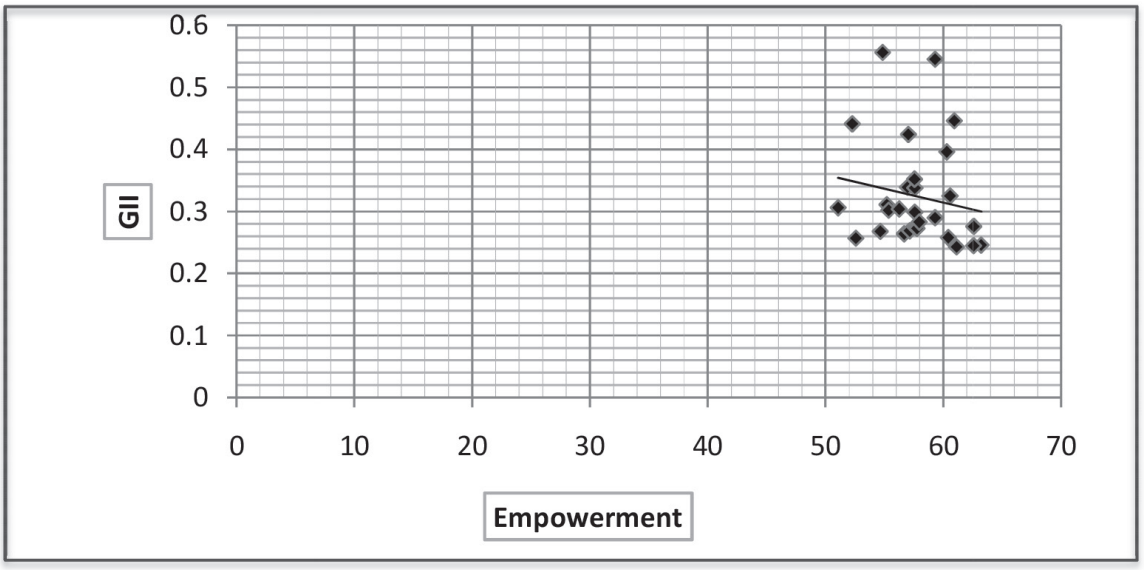

Fig. 11 : Relationship between Empowerment and GII

Source- Prepared by authors from table no-2

Major Findings

Important findings are come out from the overall analysis of the study.

1. There exists a socio- spatial variation in gender achievement in many aspects of life. As this study is basically done to find out the status or present condition of inequality so, its cause and affect analysis may be evocative in nature.
2. This study reveals that Gender inequality index have a negative relation with the three dimensions (Agarwal, September 1997)because greater the achievement and participation lower the inequality will.
3. Geographical factors such as terrain condition, soil type, agricultural practices all these factors have direct influence on gender inequality in various aspect of life. Coarse soil with a low density of clay is suitable for deep tillage, which uses more male labour (Qian, 2008).
4. Social aspects like custom, tradition, belief, prejudices all these things create barrier in participation in different facets of society. For this reason the female participation rate is high in western sides and low in the eastern sides of Paschim Medinipur district.
5. Women's participation in economic activity reveals a high variability. Among the three dimensions, range of economic participation is 25.25.

Suggestions

On the basis of the above findings some important suggestion may be considered.

1. As study reveals that there exists a sharp socio spatial variation in gender inequality. So we have to find out the reason of this variation and make some initiative to eradicate this inequality.
2. Government should take some important steps to involve the women in every process in administration and meaning full political participation.
3. Special privileges should be provided to the women to spread education and job opportunity among them.
4. Community awareness campaign is essential to change the traditional and stereotype mentality towards the women.

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An Opaque Impending of Swelling Dependency in the City Kolkata: A Fright

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Labani Sarkar

Abstract

From time immemorial it has always been a concern of dispute that 'is science a benediction or blasphemy?' Certainly, it's a stuff of blessing to the societal refinement. On the contrary, at times, the situation is vice versa too. But apart from the said outlook, scientific advancement is highly anticipated from any aspect for the wellbeing of society. A revolutionary progress in the world of modern medications has been amplified the usual life expectancy across the world one in the trunk. The access to get such medicines is at the ease to almost everyone irrespective of economic consideration. Consequently, the worldwide dependency ratio, particularly the ageing population is being increased steadily. It seems a high time to magistrate the said event from a critical viewpoint. Ageing persons in our society face quite a few problems such as safety, reverence, healthiness and so on. They undergo from isolation, melancholy, emotional and physical vulnerability. Keeping such concerns in mind the present study has been carried out on some selected wards under the jurisdiction of Kolkata Municipal Corporation, based on primary and secondary information as well. The selection of wards (95, 96, 97, 98, 99, 100, 112) has been done on the number of elderlies recorded in the District Census Handbook of Kolkata, 2011. In fine, some precarious outcomes will be given the goose bumps for sure to the bibliophiles.

Keywords: *Ageing population, prevailing condition, geriatric, income, surroundings, problems, urban life style, family, in-secured condition, road condition, health condition.*

Introduction

Population ageing in simple words is the increase in the proportion of the aged population of a region due to declining fertility rates and or rising life expectancy. The size and age composition of a population are determined jointly by three demographic processes: fertility, mortality and migration. Population ageing is an increasing median age in the population of a region due to declining fertility rates and or rising life expectancy. More countries have rising life expectancy and an ageing population (trend that emerged first in more economically developed countries, but which are seen now in less economically developed countries). This is the case for every country in the world except the 18 countries designated as "demographic outlines" by the UN. The aged population is currently and at highest level of human history. The UN predicts the rate of population ageing in the 21st century will exceed that of the previous century. The number of people aged 60 years and over has tripled since 1950 reaching 600 million in 2000 and surplusing senior and geriatric population will reach 2.1 billion by 2050. Countries vary significantly in terms of the degree and pace of ageing and the UN expects populations that begun ageing later will have less time to adopt to its implications.

Ageing Around The World: Population ageing is one of the most significant trends of the 21st century one in eight people in the world are aged 60 over. As long as fertility rate continues to decline and life expectancy continues to rise, older people will steady increase a portion of the population.

Asia and Europe are the two regions where a significant number of countries face population ageing in the near future. In these regions within twenty years may countries will face a situation

Labani Sarkar, Department of Geography, Sarsuna College, Kolkata, E-mail: labanii.sarkar@gmail.com

where the largest population cohort will be those over 65 and average age approach 50 years old.

Eldery in Indian: (March 2012) India's older population will increase dramatically over the next four decades. The share of India's population ages 60 and older is projected to climb from 8% in 2010 to 19% in 2050, according to the United Nations Population Division (UN2011). By mid-century India's 60 and older population is expected to encompass 323 million people a number greater than the total US population in 2012. In 2011, there were 98 million senior citizens in India, and the number is expected to swell in India to 143 million by 2021, being 51% being women. This profound shift in the share in the share of older Indians- taking place in the context of changing of relationship and severely limited old age income support bring with it a variety of social economics, and health care policy challenges.

In 2011, there were 98 million senior citizens in India, and the number is expected to swell in India to 143 million by 2021, being 51% being women.

West Bengal Scenario of Ageing Population: There are 74, 90,514 (51.4% males and 48.6% females) above 60 years of age according to the census 2011. The National Commission on Population, indicates in this state population of 60+ age groups will rise by 170 percent by the year 2026 (Central Statistics Office 2011).

Ageing has significant impact on society as people of different ages tend to differ in many aspects such as legal and social responsibilities, outlook in life and self-perception. Young people tend to have fewer legal privileges, they are more likely to push for political and social change, to develop and adopt new technologies, and to need education. Older people have different requirements from society and government, and frequently have differing values as well such as for property and pension rights. Older people have different aspirations and likings for different aspects of urbanization and technological development.

Literature Review

Population ageing is an inevitable outcome of the demographic transition. Primarily, as a result of declines in fertility and, secondarily, mortality declines, the age structure of a population becomes older, with a growing number and proportion of elderly persons. In recent years, the issue of population ageing has received renewed attention in many countries, especially those in the more developed regions, owing to the continuance of fertility below the replacement level and on-going trends towards lower mortality. While there is great variation among them in terms of the level and pace of population ageing, this demographic process is expected to increase further in these countries, and eventually their populations are projected to level off and decline in the foreseeable future. These changes have profound consequences and far-reaching implications, especially for pension schemes, heath-care systems, education programmes and housing plans, as well as for the economic vitality and growth of a country. The author reviewed selected literature that concerns the impacts of migration on the size and age structure of population. Whereas existing studies have paid a great deal of attention to population ageing and its social and economic implications, there is comparatively less work found on the state of elderly in urbanized environment, especially of developing world. Phillipson, C, 2011, analyzed the process and state encountered while growing older in urban environments in Japan and the UK. Howse K, 2017 questioned and analyzed whether urban environments are best for an ageing population. OECD 2015 Policy Highlights on Ageing in Cities threw light on trends in ageing societies, challenges and opportunities, policy strategies, governance and case studies of different cities. Priest, G.E, 1970, made an investigation of the elderly in urban environment with special reference to housing.

Location of The Study Area

The study has been conducted in a selected part of Kolkata, including ward nos. 95, 96, 97, 98, 99, 100 and 112. This is a part of south Kolkata. These seven wards of south Kolkata have been selected for this paper because these areas have been changing rapidly since past few years. Due to the gradual development in the study area few challenges have been noticed recently which has affected the natural

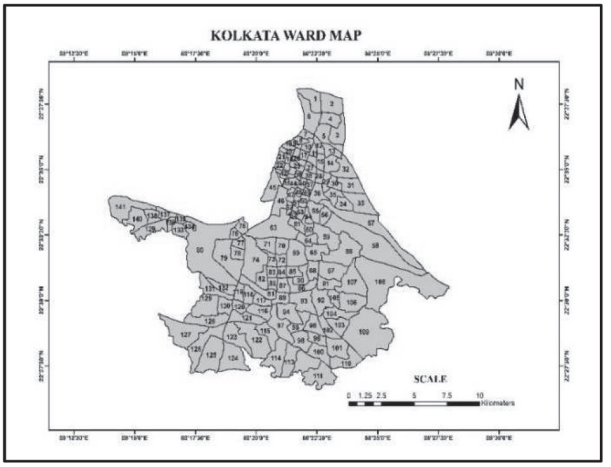


Fig.1: Location of Kolkata Municipal Corporation

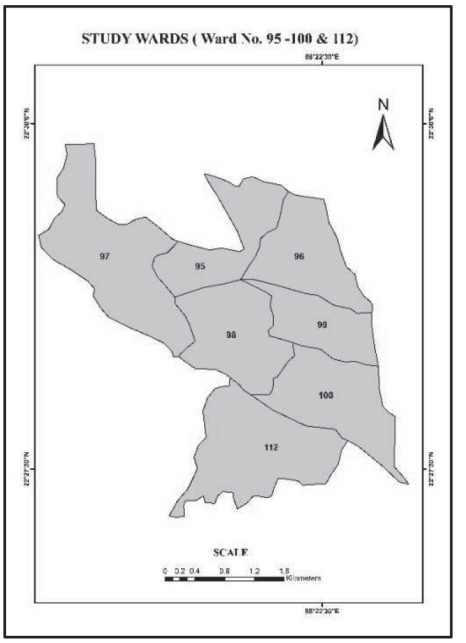


Fig.2: Location of the study area

as well as social life of the city but the utmost impact has been noticed on the senior citizens.

Aims and Objectives

The paper shall aim to understand, analyze, modify and optimize the relationship between the ageing person and their social surroundings as well as the physical surroundings. Healthy ageing is about development and maintenance of optimal mental, social and physical well-being and function in older adults. This main aims is to illuminate the present situation of elderly people, the various problems which they faced in new city life. The problems are arising due to environmental degradation as well as social problem.

The paper aims at how much the present condition of the city is ideal for elder people and if the city is ideal for elder people and if they are facing any problem then are they getting any solution to it or not. The paper shall also analyse the condition of the surrounding environment of elderly people in a city area, what they feel about their surrounding social and physical environment and how they get affected or benefitted by the changing surroundings in their area. This paper intends to know how decreasing open space is creating a discomfort among old people. This analysis will also aim at knowing how strongly do they feel integrated with their family and if there are any problems. This work will analyse to what extent the grown-ups are taking care or looking after their parents or the old aged members of their family. This work aims at finding how the aged and the senior citizens are adapting to the changing life style of the city life. The study questions how much the elderly are adaptive to the present situation and to the present city life and its new features and new technologies like increasing transport modes and whether all these improved livability of the aged.

Methodology

In order to achieve the above objectives qualitative as well as quantitative methodologies have been adopted. The project has been accomplished through the following steps. Stratified random sampling of data collection method was used for questionnaire survey. The data was then represented, mapped and analysed.

Discussion and Findings

Age Structure of Surveyed Old People: As can be found that aged people between 60 years and 65 years and between 65years and 70 years count highest in the study wards. Age group of 85-90 is very low and above 90 is negligible.

Percentage of Pensioned Elderly and Amount of Pension: Pension is the major source of the income among the elderly, most of the surveyed elderly are fully dependent on their pension for their monthly expenditures. In this map the percentage of surveyed people who are getting pension have been shown with the help of choropleth and bar graph have been plotted to show the amount of pension received by the old people.in ward number 112 we can see maximum amount of pension received below 10000 because the area is less developed in compared with the other wards. (Fig. No. 2)

Percentage of Working Elderly and get Pension: Most of the ageing people are not working or retired but it can be seen very few percentage of elderly people are working for income or refreshment and the percentage is higher in the age group of 60 to

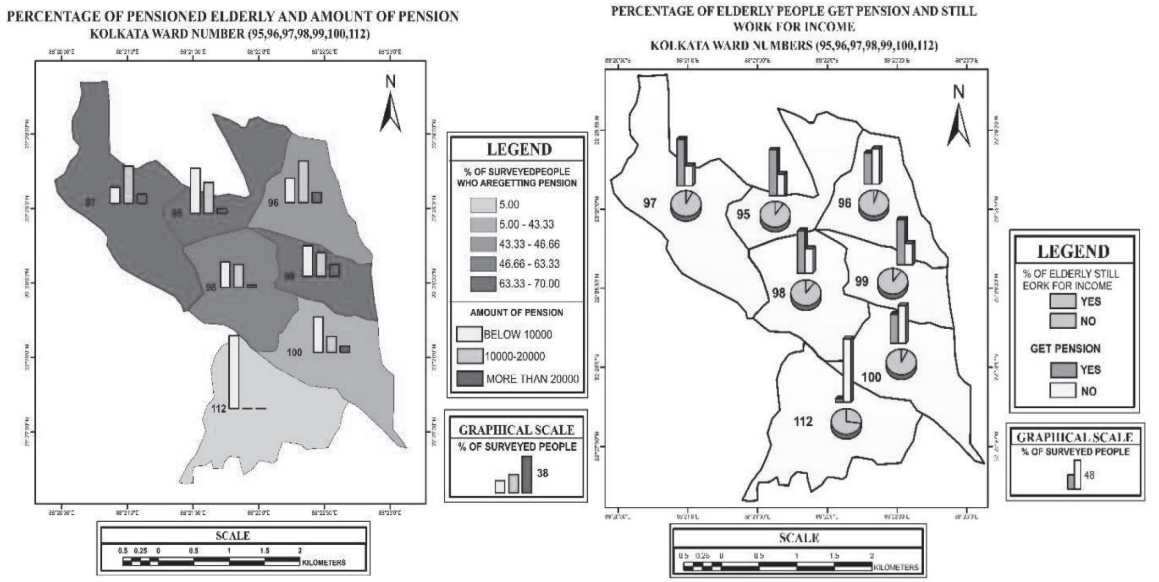


Fig. 3, 4: Pensioned percentage of elderly and amount of pension, Percentage of working elderly and get pension

70. In this map respective bar diagram have been drawn to show the percentage who get pension and pie graphs are drawn to show the surveyed people who still work for income. In ward no. 112 we can maximum number of people who do not get pension that's why they have to work for income. Whereas in other wards we can see more or less equal distribution of people who receive and don't receive pension. (Fig. No. 3)

***Percentage of Dependent Elderly and With Savings*:** One of the major issue of the elderly people is their financial dependency, the dependency ratio is in turn much dependent on the saving habits of the elderly people. In the ward number 112 can be seen the least saving habits of people, where as in other wards can be seen more or less good saving habits of the elderly people. A negative relation between percentage of dependent elderly and their savings can be seen in the study area that suggests positive change of mentality towards saving over time. (Fig. No. 4)

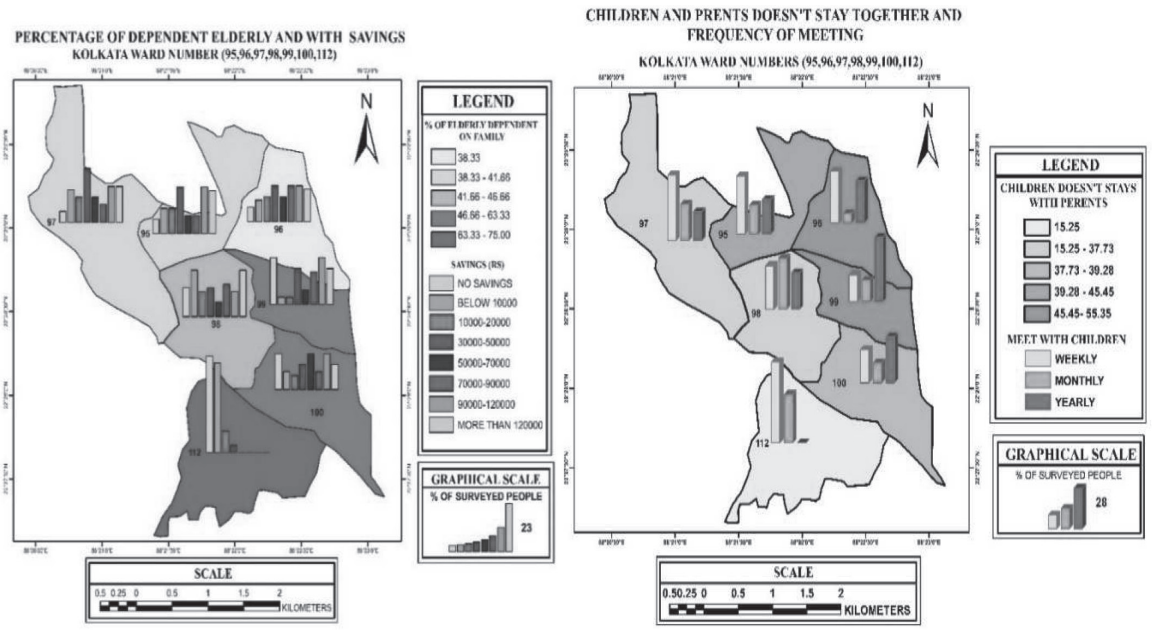


Fig. 5,6: Percentage of dependent elderly and with savings, Children and parents does not stay together and frequency of meeting

***Children and Parents Does Not Stay Together And Frequency of Meeting*:** It has become a very common situation in city environment that after a certain age mainly after marriage children do not live with their parents. In the ward no. 112 we can see maximum weekly meeting with children. Those, who have children living in foreign country mainly, usually meet their children once in a year. A positive relationship between the percentage of children staying separate and percentage of children meeting at larger gaps i.e. yearly or monthly can be seen in the study area that suggests that the wards showing higher percentage of children staying separate from elderly parents are the wards where the children of the elderly people stay further (other state or other country) from the house. (Fig. No. 5)

Different Aspects of Household Work Done By Elder People: In the so called middle class families or economically weaker classes the aged members are to engage themselves in different household chores. Sometimes they are compelled, sometimes they do it voluntarily as a return of the help they are getting from their families and even sometimes they do it to keep themselves engaged. The common things they are made to do are shopping (usually for males), cooking and some other household chores (usually for females). The work pattern suggests that they usually work in the day time and night and afternoon are their resting time whereas in evening is spent in recreation (usually watching T.V. or chatting with people of same or near age).

Percentage of Elderly Person's Contribution in Family and Amount of Pension: In many households it can be seen that elderly people has to contribute in their family for different resons. In this map percentage of elderly contribution in family shown by choropleth map and the amount of contribution shown by bar graphs. In the ward numbers 95 to 99 there are much more contribution because of the developed life style, job sectors, pensions and a good savings. In the ward no. 112 we can see less contribution in the family because less development and poorness. (Fig. No. 6)

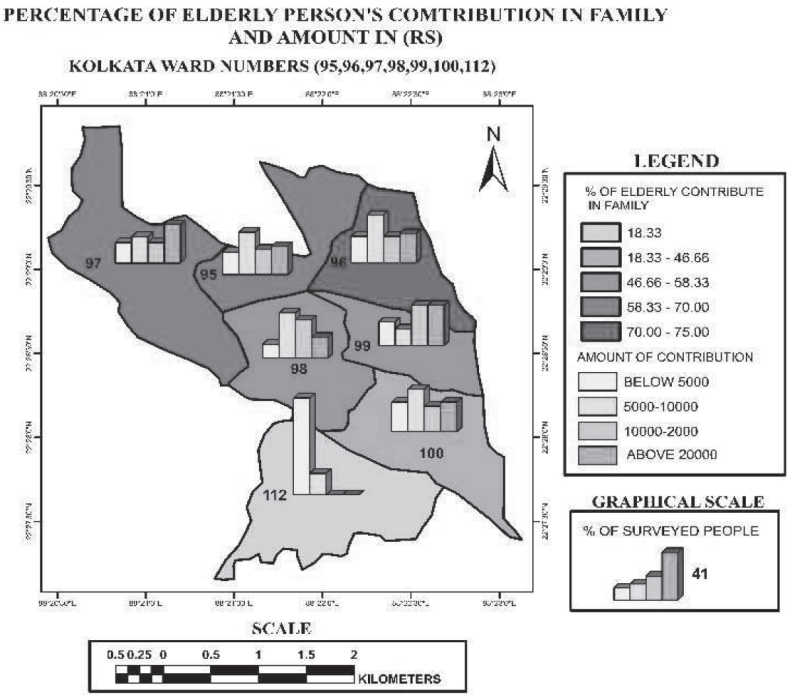


Fig. Nos. 7: Percentage of elderly person's contribution in family and amount of pension

***Changing Family Type and Preferences of the Surveyed Elderly*:** It can be seen that has been changing drastically from past few years and one of the main reason is the changing life style in city area. In this map respective horizontal bar diagram have been drawn for analyzing the changing family type and preferences of the surveyed elderly. In ward no. 112 we can see maximum joint family type in preferred family, previous family and present family. The wards 95 to 100 there are more nuclear family at present but it can be seen that in previous years there were much more joint family types and the elder people preferred joint families much more than nuclear family type because in old age they need more family support care love from the family members. (Fig. No. 7)

Nuclear Family Distribution: Nuclear family distribution is the most common scenario in present urban area. Joint family breaking has its utmost effects on elderly people. The study reveals that the more developed wards like ward no. 95, 97 and 98 have more nuclear family. It is not that development is a cause of nuclear family but in developed area the elder persons are more financially independent and their children get separated from them because of many reasons like marriage, job in other city or country, etc. Ward no.97 and 95 has highest number of nuclear family because there is highest number of elderly people who have their children living separately in different places. Though there are many reason of family break ups and nuclear family structures but according to quite a few respondents modernization is the main reason behind nuclear family structures. A notable share of respondents in ward no. 95, 96 and 99 think the same way though an inverse picture is seen in ward no. 112. (Fig. No. 8)

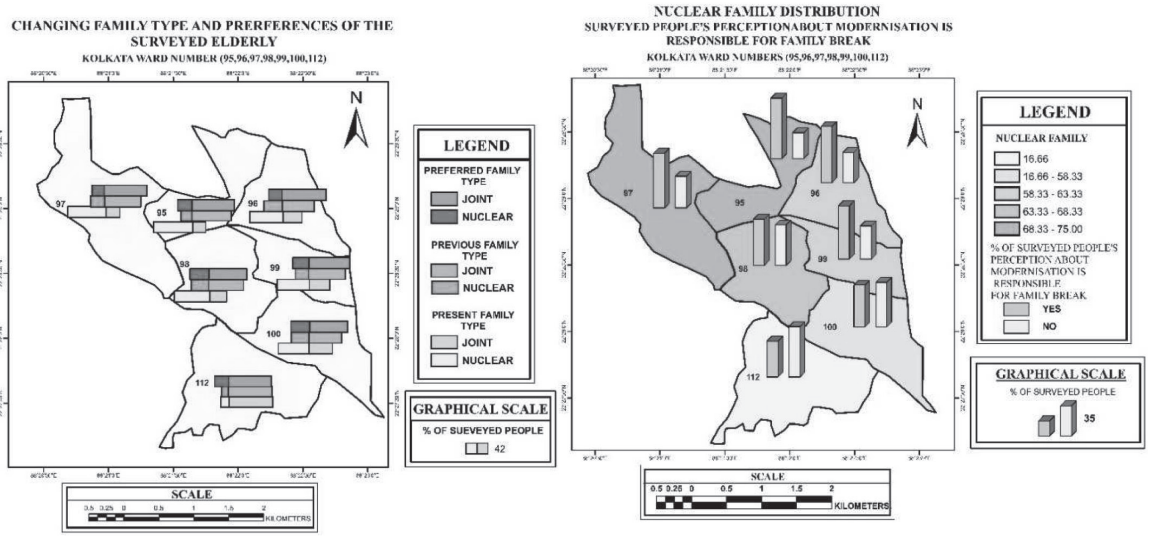


Fig. 8, 9: Changing family type and preferences of the surveyed elderly, Nuclear family distribution

***Percentage of Elderly People Having Attendant and Behavior from them*:** In this map percentage of elderly people having attendant have been shown with the help of choropleth and horizontal bar have been plotted to show the behavior Of the attendants .In ward number 112 we can see maximum disrespect shown to the elderly person by the attendant but the percentage of surveyed elder people who have attendant is very low because in this area most of the surveyed elder people is not economically privileged so they cannot afford a personal attendant. Where as in other wards we can see maximum respect shown to the elderly people by the attendants and the % of having attendant is much higher. (Fig. No. 9)

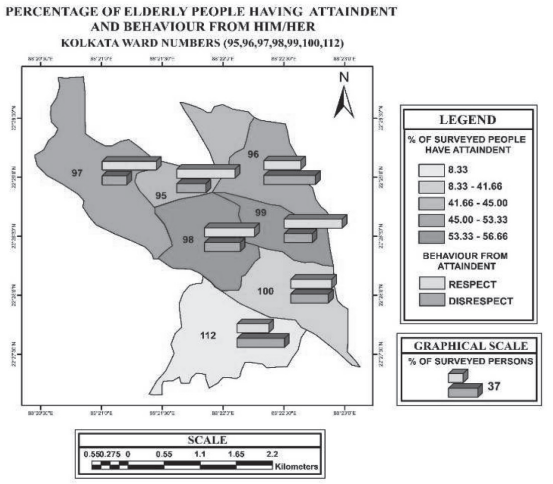


Fig. 10: Percentage of elderly people having attendant and behavior from them

Nature of Surrounding Area and Level of Congestion: The study also shows the level of congestions in the study area as a discomfort factor of elderly people. Most of wards except ward no, 112 are highly congested according to the surveyed aged. These areas have hardly open space, pond and greenery so the aged people feel very congested. Whereas ward no.112 is not fully developed so there are more open space, pond and small house instead of multi storied building, thus having more friendly environment for the elderly people.

Buffer Of Parks: The multiple ring buffer map has been plotted around the parks of the study area and parks have been plotted with the help of google aerth. The multiple rings of the buffer map are created with the distance of 100m,200m and 300m. Here it can be seen in ward no. 112 has the highest numbers of parks because this particular ward has comparatively less congestion and more open spaces but the other wards has very less number of parks. Three different rings according to distance has been created to show how much area is easily accessible. The miltiple ring buffer is plotted to show how much area's ageing people will be benefited by the parks as they can reach their easily for morning or evening walk. But it can seen that the number of parks in the study area is very few and it can be said that the urbanisation, growing number of multi storied building and growing urban population is main cause behind it. That's why the parks has declined and it's creating it's utmost negetive effect upon the eldrely people. Here it can be seen ward number 99 has the lowest number of parks. (Fig. No. 10)

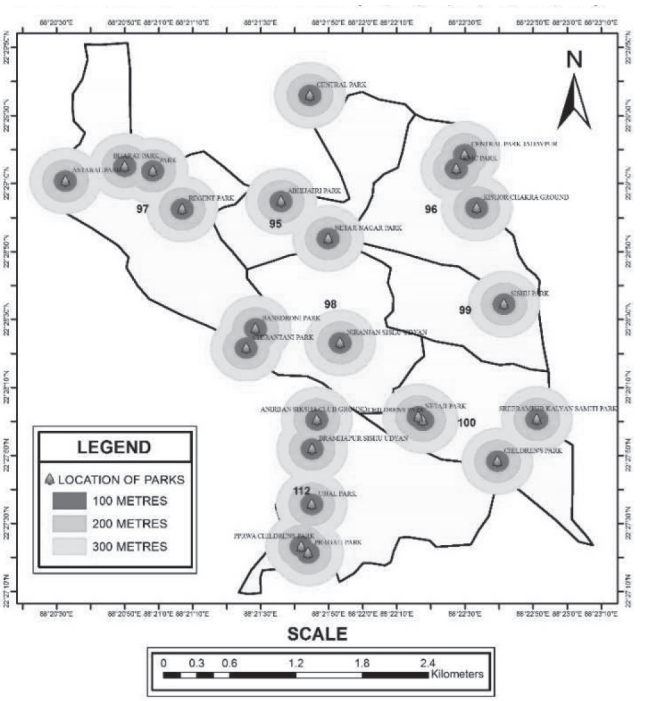
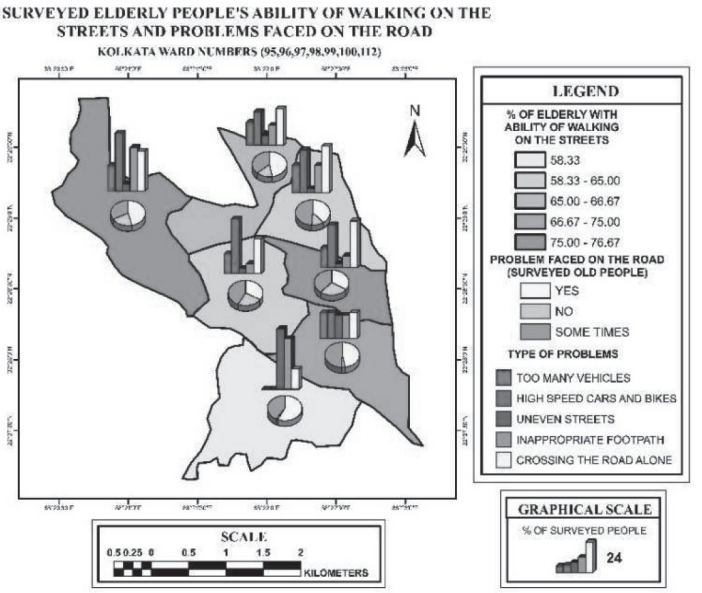


Fig. 11: Buffer map

Surveyed Elderly People's Ability of Walking on The Streets: In present days one of the major problems for the elderly people is the bad condition of roads and the traffic congestion. The percentage of elderly with ability of walking on the streets is highest in the ward nos. 97 and 99 whereas it is lowest in ward no 112. The type of problems are more or less same in all the wards except ward no 112. (Fig. No. 11)



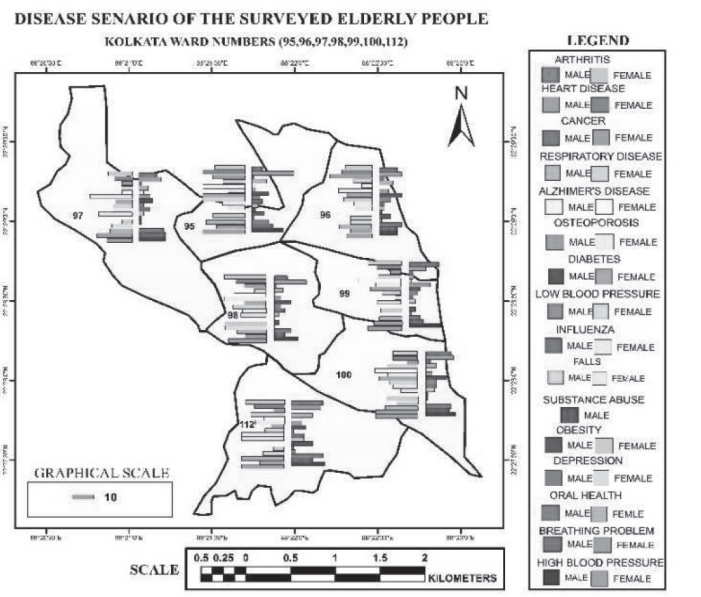


Fig. 12, 13: Surveyed elderly people's ability of walking on the streets,Various health problems among surveyed old people

Various Health Problems among Surveyed Old People: Elderly people faces various health problems. In this map, horizontal bar graphs have been plotted to show various health problems among surveyed old people. Most of the health problems among the people are found to exist in ward no 112 because of less awareness, poverty, proper medication and unavailability of hospitals, doctor and clinic in locality. Other wards have more or less similar amount of health problems. Percentage of Arthritis is higher in surveyed female respondent and high blood pressure and heart disease is higher in male respondents whereas osteoporosis, breathing problem, oral health problem is more or less same among male and female. Substance abuse is mainly seen in ward no.112. Alzheimer is mainly faced by people who are above 75. (Fig. No. 12)

Conclusion

From the various surveys it has been conclude that the old aged people are suffering from acute problem due to acute problem such as they face the insecurity. Nowadays the youths and other members of the family are sometimes sending their old parents to the old homages due to which the societal disorder is been observed. It is also seen that due to the increasing nature of the nuclear family the old people are facing acute problems. The deteriorating condition of the roads and various other roadside activities the old people are suffering are also facing some acute problems. Nowadays the old people are even facing the problems and lack of security from their own family members. The old aged people are considered as a burden in some parts of the society.

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Assessment of Traffic Noise Pollution in Selected "Silence Zones"of Kolkata, West Bengal

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Subhankar Naha

Abstract

Noise is generally known as the unwanted sound from different sources that can disrupt quality of life. Along with the increasing rate of water & air pollution, noise pollution level also becoming a great concern for people of Kolkata. With the increasing number of motor vehicle noise pollution level also getting higher day by day. Ambient noise level monitoring was carried out at various silence zones of college street and its surrounding area in morning (9.30 am to 11.30am) and evening (4.00 to 6.00 pm) rush hours of a day. The comparison of the collected data with prescribed CPCB standard shows that maximum selected places of the whole study area are above the standard limit. Vehicular volume found to be the major condition for noise level increase. This study also examines the effects of noise pollution facing by different people of the study area. Evaluation of the relationship of different factors of noise pollution by Fuzzy logic System also done in Matlab software.

Keywords : *Traffic noise pollution, silence zones, Kolkata*

Introduction

Noise pollution may be defined as the state of discomfort and restlessness caused to humans by unwanted high intensity sound from different aspect. Due to rapid growth in pollution there is a fast growth in vehicles, and change in the travel pattern. Road traffic is a complete system which wide comprises of varieties of road user, vehicle and environment interact the congestion of road intersections is due to motorization from & increase in single occupancy vehicle number.Motor vehicles, which are significant part of the urban environment, are the main source of noise emission, contributing about 55%to the total noise pollution (Bhattacharya et al. 2003).

Study area

Kolkata also known as Calcutta is the capital of the Indian state of West Bengal. In 2011, the city had a population of 4.5 million, while the population of the city and its suburbs was 14.1 million, making it the third-most populous metropolitan area in India.

College Street is a 1.5 km long street in central Kolkata in the Indian state of West Bengal. It covers an area from Ganesh Chandra Avenue Crossing in Bow bazar area to Mahatma Gandhi Road crossing. Its name derives from the presence of many colleges, housing many centers of intellectual activity especially the Indian Coffee House, a café that has attracted the city's intelligentsia for decades.It also surrounded by many Well-known academic institutions include Presidency University, University of Calcutta, Medical College and Hospital, Kolkata. Sanskrit College, Indian Institute of Social Welfare and Business Management, Hare School, Hindu School, etc. College street area has been selected as the silence zone as it has number of institute educational (Presidency University, Calcutta University, Hindu College, Hare school, Tropical School of Medicine Health Medical college hospital).

Research Objectives

1. To quantify the levels of noise pollution in selected silence zone of Kolkata and to compare the result with CPCB standards.

2. To assess the relationship between noise level & vehicular volume in the study area.

3. To evaluate the impacts of noise pollution on individuals in the study area .

4. To establish the relationship between different factors that are increasing vulnerability of people for noise pollution by applying fuzzy logic.

Subhankar Naha, Presidency University, Kolkata, Email : subhankarnaha7@gmail.com

Methodology

Some selected parts of College Street & its surrounding area as silence zone has been selected to quantify noise level. Noise level has been collected in morning (9.30am -11.30 am) and evening (4.00pm-6.00pm) hours. In each point of the whole area 6 readings of noise level has been taken in one minute interval by sound level meter. From the six recorded value average value has been taken for analysis of spatial distribution of noise level. A and C sound level meter type sl-4001 with the capacity of measuring noise level from 30 dB to 130 dB has been used for measurement. A comparison has been made to see the Exceedence level of those areas in terms of CPCB standards.To find the noise level differences in different roads number of motor vehicle passing in that selected areas also counted to see if there is any relation between them. A structured questionnaire has been made to know about the various effects felt by people of selected areas like students, patients, book sellers, workers etc. After collecting different health effect related data different weightage has been given to different condition of health in terms of severity. Analysis has been made by fuzzy logic to establish the relationship between factors of noise pollution by using mat lab.

Table-1 Input and Output Variables with their fuzzy values and fuzzy intervals

Systems	*Linguistic*	*Linguistic values*	*Fuzzy intervals*
Input		Normal	<65
		Medium	60-75
	Noise level	High	73-100
		Very high	>95
		Very young	0-16
	Age	Young	15-35
		Mature	32-55
		Old	>52
		Very few hours	0-2
		Few hours	1.8-4.5
	Exposure time	Medium hours	4-6
		Numerous hours	>5.5
	Distance from the source	Less	0-35
		Medium	30-60
		Far	55-100
		Very Far	>100
Output	**Health effect**	**Low risk**	**0-15**
		Medium risk	**12-50**
		High risk	**40-65**
		Very high risk	**>60**

According to the fuzzy structure different inputs & one output has been selected to get result. Noise level, age factor, exposure time, distance from the source has been taken as inputs & health effect has been as output in this study. With the help of the fuzzy interference system different rules has been set between four consecutive rules & output. Finally different surface has been made which explains the relationship between inputs & output.

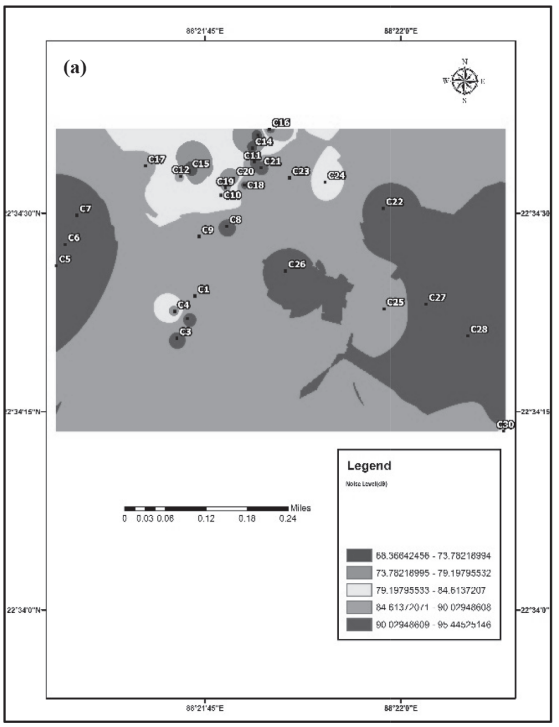

Fig 1 : Fuzzy Index 1

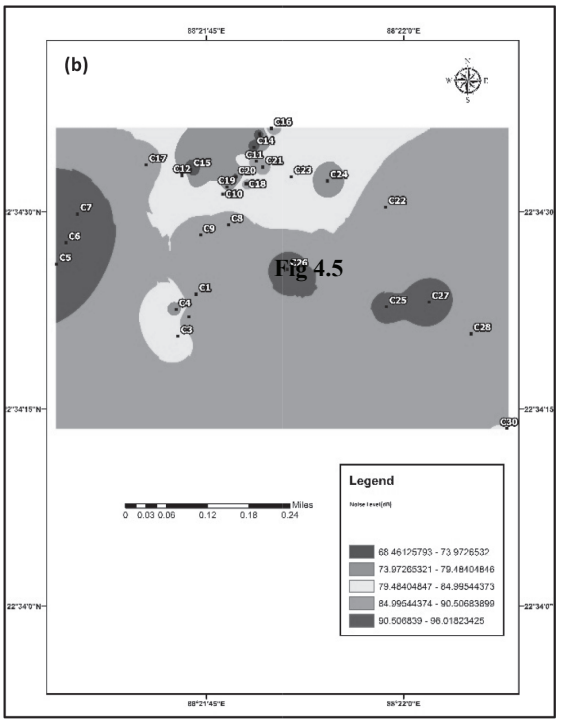

Fig 2 : Fuzzy Index 2

Result and Discussion:

Noise level variation of selected silence zone of College Street & surrounding area

• As college street is an educational zone so this area also considered as silence zone. But if we look at the average noise level of this area then it can be seen Many areas like College Street beside Medical College, Presidency University, Calcutta University, Hindu School, Hare School, M. G. Road beside Surendranath College, Mitra Institution, Chittaranjan College are experiencing higher noise level which is more than 90 dB mainly in morning rush hours. This may be attributed to very busy road , congested traffic condition, higher vehicle number crossing the road but main annoying cause is the unnecessary honking from the cars mainly from busses, motor bikes, auto's that creates noisy situation in the whole area. Even traffic rules are not properly maintained. None of the selected places of the silence zone has recorded less value than 50 dB.

Comparison of CPCB standard & Existing Noise Level of selected silence zone of College Street & surrounding area•

According to the primary survey mainly roads besides Presidency University, Calcutta University, Sanskrit College, Hare School, Hindu School, Surendranath College are among them which are moistly experiencing extremely higher noise level than CPCB standard. So this condition has made this area more vulnerable for students specially. If we look at the spatial condition of exceedence level it shows that areas like Surendranath College, Mitra institution, Chittaranjan College, M. Jubille Institute, Medical College gate 5, 6 are getting more than 40

dB exceedence level. Some other areas 1, 2 gate of Medical College, Main gate of Presidency College, Hare School, Hindu School, Calcutta University. sound level ranges from 62.9 to 110.6 dB during morning hours and 63.5 to 110.3 during evening hours. If we look at the exceedence condition 97.5 % of exceedence of prescribed standard of CPCB was observed during morning rush hours and 94.17 % exceedence during evening hours of the day. 96 observations were made during the time of data collecting

Health Related Condition of Individuals Of selected Silence Zones (College Street and Surrounding Area)

According to above data it can be said that as selected parts of college street & surrounded area is covered by busiest road (M.G. Road) from different sides so people are saying that number of motor vehicle are more annoying than other sources. So people specially college students also finds that volume of motor vehicle throughout the day is the major cause of higher noise level in this area. But here one more thing noticed especially from the students & teachers that in recent days many political programs, rallies, social function during day hour also creating a major noise problem, which is not permissible at all in this silence zone according to CPCB rules.

In the present study among the all affected people maximum percentage of getting all kind of effects are young people who are 15-35 years in age. Children's also have greater percentage of getting affected in terms of headache, irritation, lack of concentration in study, insomnia. As in this silence area there are many college , universities are present so mainly students are facing many problems during their classes for high noise level as told by the reports. Many patients from medical college hospital also have many issues with this noisy condition in morning & evening rush hours. Almost 60% people have concentration problem among them most are students, For this condition they become less tolerant, irritated many times

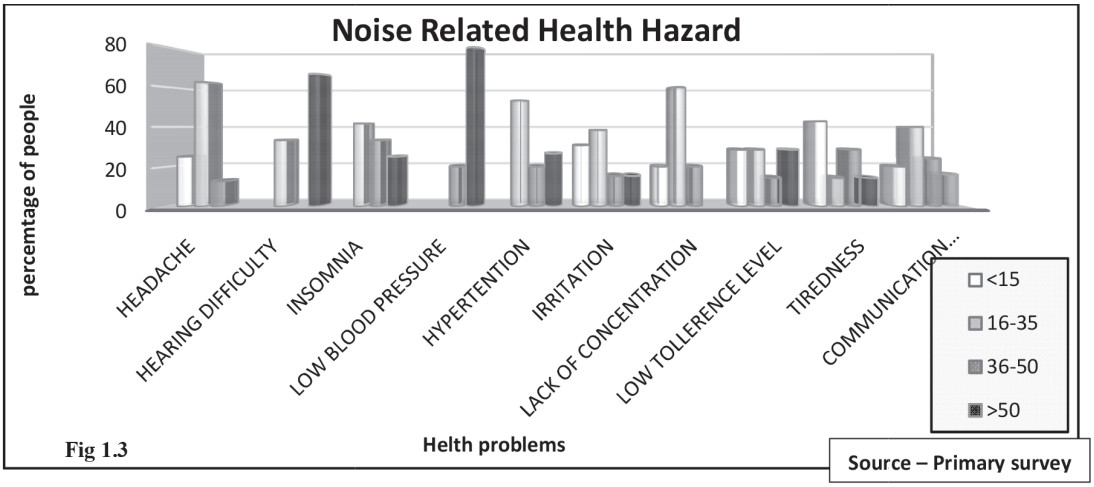

Fig 3 : Noise related health hazard

Source : Primary Survey

Fuzzy Rule Base Modeling

Boole (1958) introduced a beautiful notion of binary numbers, which is the foundation of modern digital foundation of modern digital computer but Boolean logic is unable to model the human thinking process. Because of its two abstract, rigid boundaries, the two valued logic is not so efficient for mapping of real world situations properly. So for handling the real world situations (yager et al.1994) Zadeh (1962) introduced the mathematics of fuzzy followed by his paper "Fuzzy Sets". Generally this logic used in two different sense (Tong et al, 1979) in the narrow sense fuzzy logic generally refers to the logical system that generalizes classical two valued logic for reasoning under uncertainty. This model is further developed by other researchers. The model is basically based

on collections of IF-THEN Rules with different functional consequent, essentially they are a combination of both fuzzy & non fuzzy models. The main benefit of this model is computational efficiency (Emami et al.) An important part of fuzzy logic is uses of fuzzy algorithm, which is knowledge based algorithm. This fuzzy knowledge based system is contains four major parts: Fuzzier, knowledge base, interference engine and defuzzier.

Noise induced health effects

People become vulnerable to high level noise. In this case noise level vulnerability not only depends on the level of noise itself but it also depends on the other factor like Age of people, Exposure time, Distance from the source. There are different techniques to see the combine effects of this factor in health effect of people. Here fuzzy logic is the best way to show the relationship among all factors in terms of noise induced health effect because of its usage of continuous Degree of Membership.

Noise induced Health effect indicators

This parameters used for defining the health effect on people are: Age factor, Exposure time in higher noise level, Distance from the source. The effect of this parameters can be described as follows

Noise level : Noise that create annoyance to human as there is limit of human ear to resist the sound but when it crosses that limit then it creates negative effects .

Age factor: Age is important factor because especially children's, old people are more prone to noise level effect.

Exposure time: If any people exposing himself in high noise level for a long time then he will definitely have an effect of that.

Distance from The Source: Distance from the source mean from where the noise is creating, so if your house is very much near to that source then you definitely have an effect of your housemate.

Input and output membership function

There are 4 inputs and every inputs described using different membership function such as high, low moderate according to their ranges. Output variable which is health effect also have different membership function like Low risk, medium risk, high risk & very high risk. These functions represent a degree of a binary value, 1 being the highest and 0 being the lowest. All the inputs and output are described by using trapezoidal membership function. It will create uniformity in the system. All the membership functions are shown in the following figures.

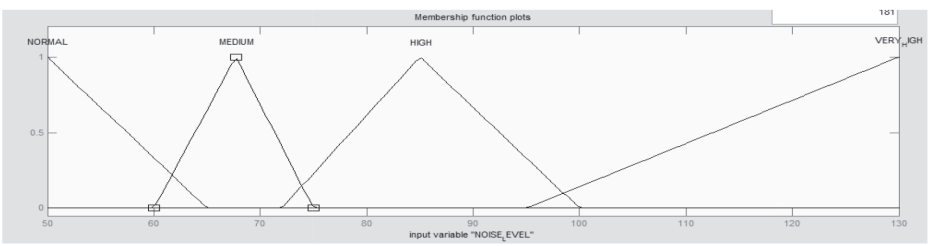

Fig .4 : Membership Function of Noise level As Input Variable

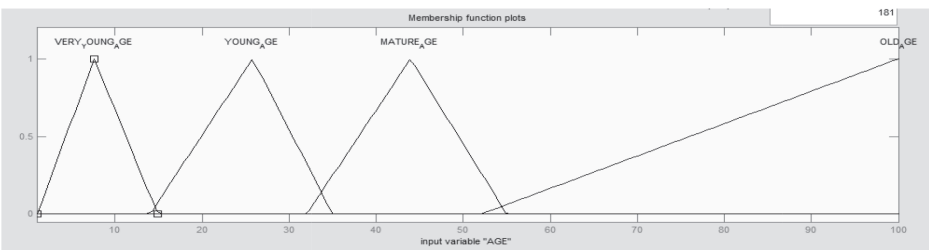

Fig 5: Membership Function of Age as Input Variable

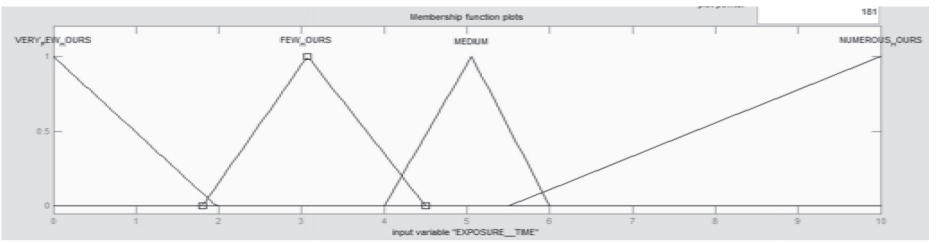

Fig 6 : Membership Function of Exposure Time as Input **Variable**

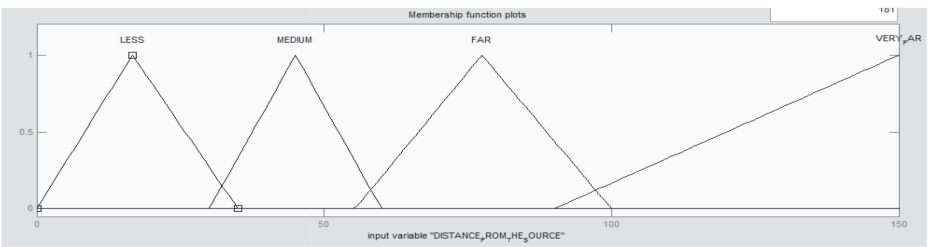

Fig 7 : Membership Function of Distance from the Source as Input Variable

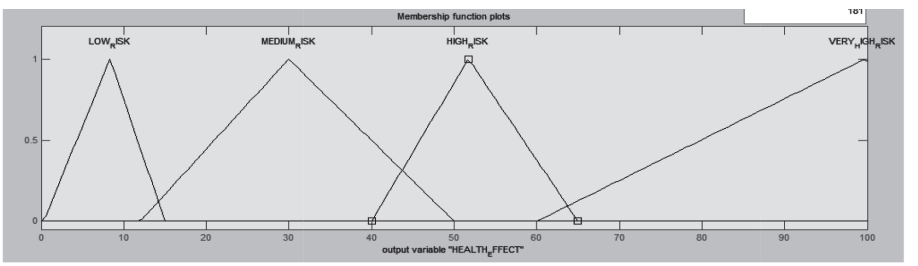

Fig 8 : Membership Function of Health Effect as Output VariableSource - Matlab

Fuzzy Rules

Fuzzy rules play the most important part in the fuzzy system. These rules can be decided on the basis of one's knowledge or understanding. As here, we are using the standardized data for all the inputs; fuzzy rules are dependent on them. The fuzzy rules basically are in the form of IF x then y. In the Matlab Fuzzy Logic Toolbox, there is a rule editor to enter the rules and edit them if required.

A total 90 rules were developed on the basis of the available datasets & expert interference.

Finally through IF-THEN Rules designed to predict noise generated health effects .This rules are the result of relationship between input & output variables. Different rules are mentioned below-

- 1. If (Noise Level is Normal) or (Age is Very Young Age) or (Exposure Time is Very Few Hours) or (Distance From The Source is Very Far) then (Health Effect is Low Risk)
- 2. If (Noise Level is Medium) or (Age is Young Age) or (Exposure Time is Few Hours) or (Distance From The Source is Far) then (Health Effect is Medium Risk) (1) ……
- 3. If (Noise Level is Very High) or (Age is Mature Age) or (Exposure Time is Numerous Hours) or (Distance From The Source is Less) then (Health Effect is Medium Risk) (1) ……
- 4. If (Noise Level is Very High) or (Distance From The Source is Far) then (Health Effect is High Risk) (1)

• After setting different membership function into fuzzy interference system has given different crisp output from the rules. Crisp values also shows the relationship among different input variables (noise level with age, exposure time, distance from the source). Here rule viewer shows that when noise level

Surface Viewer

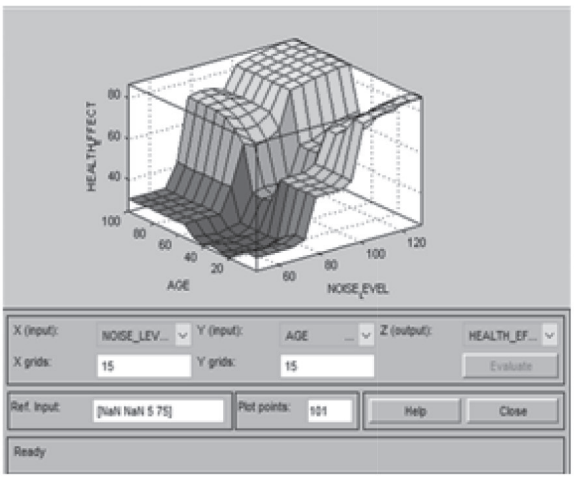

Fig 9 Surface viewer for input Noise level & Age

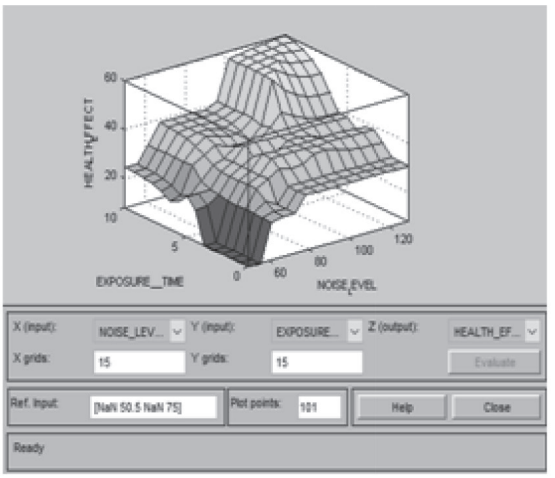

Fig 8 Surface viewer for noise level & exposure time

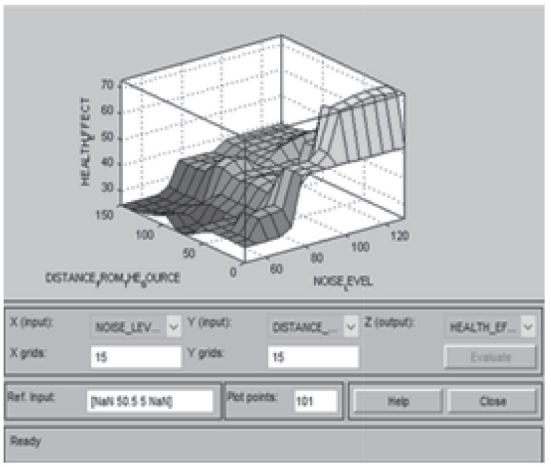

Fig 10 Surface viewer for input Noise level & Distance from the source Source-Matlab

is very high and age is more then health effect also getting high , when noise level is high and distance is less from the source then health effect also getting very higher, on the other side when noise level high but distance from the source is very far then health effect also low, when noise level is high exposure is more then health effect also high.

Rule viewer of all Inputs & Outputs with Crisp Result

Rule viewer showing different crisp output which is health effect in terms of percentage which also giving the idea of quantitative relationship between different inputs which are Noise level, Age level, Exposure Time (in hour), Distance from the source (in meter). Fig shows that when noise level is higher, age is high, exposure time is high & distance from the source is very less then health effect also getting higher. There are different types of relationship among all input variables like when noise is higher, age is medium, exposure is less, distance from the source is nearer then the effect is low to medium**.**

Fig 11 Rule viewer of all inputs and outputs with crisp result

4.Conclusion

The present study in terms of growing population reveals some interesting facts. Though many existing reports have given different ideas about noise pollution, but the present study based on primary data shows that different silence zones of Kolkata (College Street and surrounding area) has recorded higher noise level than prescribed environmental noise level limit during every rush hours of any day. Study shows that how vehicle volume effecting noise level in different areas and the relationship between vehicle number and noise level is very much possitive. Even silence zone area which has to maintain some rules & regulation are also getting high noise level due to continuous honking in the area.The presents study shows that how peoples are getting affected by noise pollution .Mainly older people & younger children are having more effects like hearing problem, blood pressure problem, insomnia, as they are more susceptible to high noise. Students in silence zone having problem like hypertension, lack of concentration, irritation, mental disorders so it's finally affecting their overall performance.

There are also some recommendation regarding prevention of noise pollution

1. Control traffic condition
2. Limitations in vehicle speed
3. Increasing road width & creating buffer zone between source and effective area
4. Ban on horns in important areas like residential & silence zone
5. Growing awareness among the people about noise pollution

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