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# GIRLS' SUPERIORITY OVER BOYS– A FEW AREAS IN MATHEMATICS EXPLORED AT SCHOOL LEVEL

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**Abstract**: In the past and the present, most of the researchers found boys superior at school level. Thus it is a socially constructed myth that boys are better than girls in mathematics. The researcher has attempted to disprove this myth in the present scenario. This paper takes an endeavour to compare the achievement in mathematics between girl students of active delta area and boy students of matured delta area of south 24 Parganas and to analyse whether there is indeed boys' superiority over girls in the achievement level of mathematics at school level. A survey was conducted among 210 students in 12 schools of South 24 Parganas, West Bengal by random sampling technique. A standardized achievement test in mathematics prepared by the author was exercised as a tool. Data was analyzed by mean, standard deviation, t-test and graphical presentation. It was noticeable that the girl students of active delta area had done better in mathematics than the boys students of the matured delta area. The mean value of the achievement test of girl students was found 28.43out of 50 and that of boy students was 20.62. In geometry, mensuration and statistical representation groups, girl students secured the position higher than boys, but in arithmetic and algebra groups, boys had achieved the higher percentage. The achievements in mathematics differed by grade average due to students background characteristics of ethnicity, and SES, motivation, beliefs about mathematics of both students and teachers etc.

**Keywords:** Mathematics, Achievement in mathematics, School level, Comparison among Boys and Girls students , Active Delta area and Matured Delta area.

## Introduction

Gender is a complex, dynamic force that affects every social interaction, including interactions in educational settings. Its effects are woven into educational outcomes, and at times contribute to complicated disparities, specifically in the field of mathematics education. Sex differences research shows us that it is difficult to separate innate from learned behaviours, or to understand to what extent stereotyping influences individuals' perceptions and behavioural or cognitive sex differences. Research shows that, in general, the range of differences is small compared to the similarities existing between the sexes. Gender-related results from cross-national surveys on performance are able to provide indicators of how a national education policy is working in terms of equity in comparison with others, but usually are not able to provide an analysis of particular causal factors, or what should or could be done to create a more equal gender system. Teachers' perceptions of male- and femaleness are crucial for their relations with pupils and can be an important factor in generating gender equity in schools. Gender stereotypes are also likely to be reinforced or weakened by text books and reading material provided in schools. In mathematics and science, there are no gender differences amongst low achievers in most countries. Gender is only one of the factors that affect achievement in various subject fields. Socioeconomic status is a very strong factor; thus it is important to consider family background alongside gender when supporting children who are under-achieving or over achieving.

## Objectives

This paper aims to

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- Compare the gender difference in achievements of mathematics of girls students of active delta area and boys students of matured delta area.
- Explore the areas of girls' superiority in mathematics at school level.
- Investigate the reason behind the differences in achievements in mathematics

**1 .Methodology**

**1.1 Operational Definition**

**Active Delta Area**

The area in which formation of delta is still an ongoing process is called the active delta. Here the Sunderban Delta area has been treated as active delta area of South 24 Parganas.

**Matured Delta Area**

The area in which formation of delta is complete but the rivers are slow and meandering and frequently shift their courses is called the matured delta area.

**1.2. Sample and Sampling Technique**

Stratified random techniques were adopted for the study. 210 students were taken from nineteen schools. Out of these 80 were girls students of active delta area and 130 students were boy students of matured delta area.

**1.3. Tools**

An Achievement test in mathematics for class VIII was made and standardized. The test was comprised of 40 items and the researcher found the reliability by Split half method. The reliability by the methods was 0.91.

**1.4. Collection of data**

The author visited 12 schools and administered the achievement test in mathematics on 210 students of these schools and collected data from the students with' the help of the teachers of the respective schools.

**1.5. Statistical Treatment**

Both qualitative and quantitative analysis has been done for variables yielding quantitative results, percentage, mean standard deviation, t-value, and co-relation, were calculated and graphically presented. Qualitative analysis was made on the basis of visit to nineteen schools and discussion with the students and teachers of the concerned schools.

**2. Findings**

The researcher classified the response of the students into four categories namely 'no response', 'wrong response', 'partially correct response' and 'correct response' Also the researcher followed the grading system of evaluation according to West Bengal Board of Secondary Education for class VIII which is shown below in table 4.1.

Table 4.1: Grading System according to West Bengal Board of Secondary Education

| **Grading System according to West Bengal Board of Secondary Education** (out of 50) | | |
|---|---|---|
| **45-50** | AA | Outstanding |
| **40-44.5** | A+ | Excellent |
| **30-39.5** | A | Very Good |
| **22.5-29.5** | B+ | Good |
| **17.5-22** | B+ | Satisfactory |
| **12.5-17** | C | Marginal |
| **Below 12.5** | D | Disqualified |

The researcher has gone through the syllabus of Mathematics upto class VIII of prescribed books of West Bengal Board of Secondary Education (WBBSE), Central Board Secondary Education (C.B.S.E) and Indian Council of Secondary Education (I.C.S.E.). After analyzing the content the researcher has broken the whole content into fourteen components which is shown in table 4.2.

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Table 4.2 Classification of Components

| | |
|---|---|
| **Component 1** | Number |
| **Component 2** | Ratio and Proportion |
| **Component 3** | Unitary method, Percentage |
| **Component 4** | Time and distance |
| **Component 5** | Perimeter and area of Plane figure |
| **Component 6** | Variable, Algebraic Expressions |
| **Component 7** | Identities and factorization of algebraic expressions |
| **Component 8** | Linear Equation |
| **Component 9** | Fundamental geometrical concept |
| **Component 10** | Axioms on straight lines , triangles , polygons etc. |
| **Component 11** | Similarity and congruence |
| **Component 12** | Construction |
| **Component 13** | Geometrical transformation |
| **Component 14** | Statistical representation |

Table 4.3 Component wise achievement in mathematics of girl students of Active Delta Area and boy students of Matured Delta Area

| Component | Girls students of Active Delta Area | Boys students of Matured Delta Area | Component | Girls students of Active Delta Area | Boys students of Matured Delta Area |
|---|---|---|---|---|---|
| Component 1 | 48.75 | 39.48 | Component 8 | 46.25 | 45.38 |
| Component 2 | 48.75 | 40.76 | Component 9 | 70.23 | 41.02 |
| Component 3 | 33.33 | 10.25 | Component 10 | 55.89 | 34.06 |
| Component 4 | 45.63 | 40.38 | Component 11 | 85 | 60 |
| Component 5 | 66.25 | 56.54 | Component 12 | 70 | 54.61 |
| Component 6 | 62.5 | 44.61 | Component 13 | 95 | 79.23 |
| Component 7 | 47.91 | 40 | Component 14 | 96.25 | 90.76 |

From table 4.3 it can be said that girls of Active Delta Area had done very much better performances than boys of Matured Delta area. In all 14 components girls students of Active Delta Area were well advanced than boys students of Matured Delta Area

## 2.1 Grade Wise achievement level in Mathematics of girl students of Active Delta Area and boys students of Matured Delta Area

Table 4.4: Grade Wise achievement level in Mathematics of girl students of Active Delta Area and boy students of Matured Delta Area

| Students / Grade | AA | A+ | A | B+ | B | C | D |
|---|---|---|---|---|---|---|---|
| **Girls of Active Delta Area (%)** | 3.8 | 7.6 | 32.5 | 35 | 18.8 | 2.5 | 0 |
| **Boys of Matured Delta Area (%)** | 0.8 | 0 | 10.8 | 20.8 | 36.9 | 23.1 | 7.7 |

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From table 4.4 it was clear that girl students of Active Delta Area had achieved better grade. 32.5 % girl students had secured 'A' grade and only 10.8 % boy students had achieved that grade. Also it is noticeable that no girl students were in the disqualified level for next class whereas 7.7 % boy students were in that level.

**2.2 Grade wise comparison of the achievements between girls students of active delta area and boys students of matured delta area**

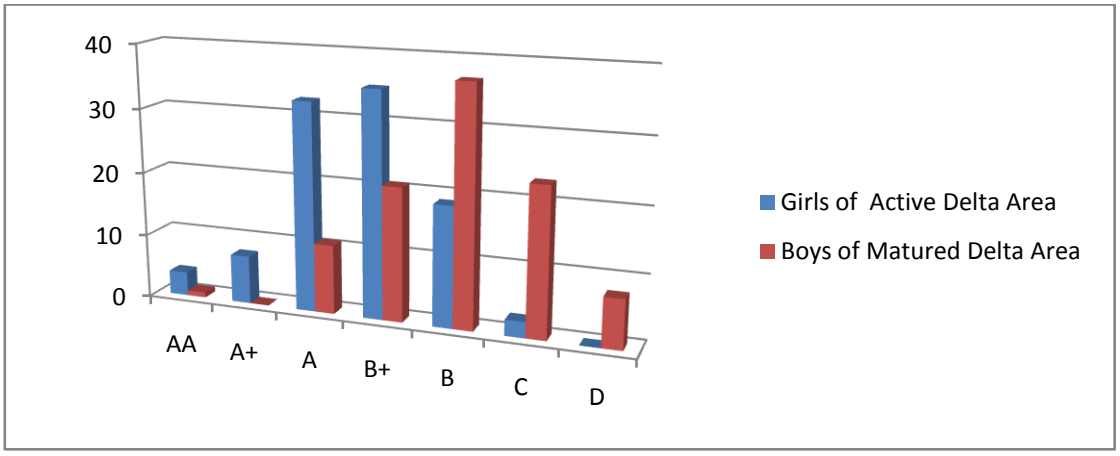


Figure 4.1: A Significant Comparison between Boys and Girls

From figure 4.1 a significant comparison could be drawn between girls' students of Active Delta Area and boys' students of Matured Delta Area. It was clear that girls students of Active Delta Area had obtained the grade AA to grade B, maximum achievement of them were at B + to C level.

Table 4.5: t-test for testing the achievements in Mathematics Gender wise

| Area | N | Mean | Std. Deviation | t-value |
|---|---|---|---|---|
| **Girls of Active Delta Area** | 80 | 28.43 | 7.09 | 7.92 |
| **Boys of Matured Delta Area** | 130 | 20.62 | 6.69 | |

The critical value of t-test at 5% and 1% levels of significance is 1.97 and 2.35 respectively for degree of freedom 208. The computed value of t is 7.92. It is much higher than the critical value of both the 5% and 1% level of significance. It should be taken ass quite significant and consequently the null hypothesis $H_{04}$ stands rejected at both the levels of significance. Therefore it can be said that there stands significant difference between the achievements of girls of Active Delta Area and boys of Matured Delta Area signifying that girls of Active Delta Area have better achievements than boys of Matured Delta Area in mathematics.

**Discussion**

The researcher had administered the achievement test in the schools of rural area of South 24 Parganas in West Bengal. The total area was divided into two parts, one adjacent to the city tagged as matured delta are and another nonstop created area nearby to the ocean and far from the city, labelled as active delta area. The reason behind the

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division into two areas are Matured delta area is the extension of city , satellite city attached to the town , hazards of urbanization such as mobile , internet, cinema, drugs. On the other hand, in active delta area rural status present, surrounded by river, forest, ocean, more virtual distance from city, demographic characteristics is totally different. There are many seasonal hazards like flood, cyclone, soil- erosion, and struggle with forest life. Besides that, occupations of the people of the two areas are totally different. In active delta area all students have to go to the government aided / affiliated school because there exists hardly private school, but in matured delta area students having economically sound background go to private school( CBSE, ICSE , English medium ) and so after social screening economically weak , deprived , de motivated students bound to go the government aided / affiliated / sponsored schools. Also students in matured delta area are dependent on private tutors who are low educated fellow. Actually the researcher talked with few students of matured delta area who have no home guidance, dependent on tuition, tutors had secondary level schooling that are unable to teach the real method, concept, values etc. But, students of active delta area are very much dependent on school teachers who are qualified. From figure 4.7 it is found also that the girls students of active delta area had done better than the boys students of matured delta area.. In geometry, the girl students of active delta area had given response 15% to 20 % better than the boys students of matured delta area in the achievement test in mathematics. The NAS (National Achievement Survey), 2012 by NCERT found trends in Class VIII students which focused that nationally, there was no significant difference between boys and girls achievement levels in mathematics, science and social science. This was also true for most states although in Kerala, girls outperformed boys in all three subjects. Further, Anderson et. al. (2006) reported that relationship between student gender and mathematics achievement was weak and mixed.

In the country outside India some previous studies also support the present study's results as Sinnes (2005), is agree that females in principle will produce exactly the same scientific knowledge as males provided that sufficient rigour is undertaken in scientific inquiry. Also, Abiam and Odok (2006) found no significant relationship between gender and achievement in number and numeration, algebraic and statistics. Fifty years ago, in India too **Kulkarni, Lal and Naidu** in their survey found that girls belonged to Delhi and Mysore get more marks in comparison to boys. Vermeer et al. (2000) as well had further shown that the gender differences in self confidence were more marked for application problems than computation problems, with girls showing significantly lower confidence for application problem. Again in 2000, Boaler showed that the girls' confidence in mathematics improved greatly in classes which actively involved girls in the learning of mathematics. In the recent (2014) findings by NCERT through NAS for class VIII there is no significant difference in the performance of boys and girls as well as students from rural schools than urban schools in general. However, students of General and OBC category outperformed than that of SC category students.
It was seen so far that gender gaps in relation to achievement and attitudes existed in the past and still exist in the present, though girls are in superior position than boys. But why are these gender gaps so prevalent across so many countries? And what causes these recurring patterns of inequality?

Discussion with students, teachers, parents revealed the hidden causes behind success which focused the criteria: geographical location of their area, struggling in daily life, inconvenience in communication, lesser availability of information technology, agricultural dependence, good relationship

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between students and teacher, cooperative attitude of parents towards teachers , nature friendly mind-set, strong bonding of peer feelings, more acquaintances with calculation, more practical knowledge in weight, unit, volume, area involving parental occupation namely fishermen etc. The students of active delta area learn informally many mathematical fundamentals like area, perimeter, concept of unit, weight through their daily life activities.

While collecting data the investigator informally discuss with some students about their daily life. The researcher talked with Asha (student completing of class VIII) helps her mother in agricultural work as needed from time to time. She is 14 years old. At the time of ploughing she has to measure the area for dividing the whole area into different parts for growing different types of crops. Then he assists in watering the field. After growing is completed, she helps in weighing the crops to store it in jute bag. Then at the time of selling she has to estimate the price and reckoning the approximate result of the total value of the crops. Another student named Halima goes with his farther for fishing in the sea. She helps to keep the direction and speed of the boat. At the age of 14 she get hold of risky practice of crossing the sea. After catching fish he gives a hand to assess and balance in weighing for selling. In this way, like Asha and Halima many students of that area are bountiful to great effort to their families. As a result they become skilled in calculation, computation, weighing, measuring the land, maintaining speed and direction. These activities facilitate to breed their cognitive domain as well as affective and psychomotor domain also. This work value allows them to work on their own and make decision, also to service to others and work with co- workers in a friendly non- competitive environment.

Again the researcher observed that they have to come school by walking or cycling. These help them to keep an eye on the distance, time and speed also. In this manner they perceive the functional ideas of mathematical principles and formulae which guide the way to go ahead in mathematics learning and achievement. Skuy et al., (1996) who expressed the belief that the extent to which students take responsibility for their own learning is a good predictor of academic success. The present study has drawn attention to the reality that academic achievement in mathematics is influenced by the physical and educational environment of the home. That result was carried by the findings of the study in India and outside India in addition in twenty years back and in recent studies also. As for example, it can be said that in India **Rajput (1984), Singh (1986), Deshmukh (1988), Prabha Rashmi (1992), Setia (1992), Mustafa (2009), Nuri & Hulya (2010)** have focused the positive contribution of the home environment to the Achievement in Mathematics and outside India **Pruett (1997), Jacobbi (1997) and Chen (2001)** found that the Achievement in Mathematics is significantly influenced by Home physical and educational Environment. In this context recommendation on Proposed New Education Policy 2016 by **National Commission for Protection of Child Rights (NCPCR)** can be included here: “Children, especially in rural areas, demonstrate great learning skills through their curiosity, exploration, experiments, and innovations with locally available material. However, their activity based learning is severely challenged in the classrooms which centred on textbooks, information and examinations. The worst sufferer in this situation is science, the subject of explorations, discoveries and innovations.”

Females and males have different experiences in school, and this is one possible explanation for the gender gap in mathematics. Walls (2010) says, “A significant number of children experience discomfort, alienation, and disengagement from mathematics from very early in their

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schooling," and "Girls are more likely to be produced as disaffected and marginalized learners in this process," losing interest, confidence, and achieving less in mathematics (p. 88). Girls may be more likely to experience alienation in relation to mathematics because of personal characteristics and beliefs such as viewing math as a male-dominated subject, being less competitive, and/or being more sensitive (pp. 35, 51, 264).

Some attitudes hinder mathematical success for females, while others facilitate success. An eight-year longitudinal study by Lambertus, Bracken, and Berenson (2010) showed that girls who were successful in math tended to share the following: strong academic support from their families, the desire to understand math concepts at more than a superficial level, assertiveness, and a belief in hard work (p. 343). Another study found the additional common characteristics of stubbornness, determination, organization, and an aptitude and love for mathematics (Forgasz, Becker, Lee, & Steinthorsdottir, 2010 p. 375). Students who liked mathematics were also successful in math and found it fun, challenging, and interesting (p. 349). These students viewed math as a tool for problem solving, thinking about and connecting to real-world contexts, building confidence, and pursuing careers in math and science (p. 349). Successful females often desire to discuss their future career options and other dreams (p. 308). All of these personal characteristics are common among girls who are successful in mathematics.

**Conclusion**

In the present study the overall mean achieved by boys students was 20.62and that of girls students was found 28.43. That is, girls had done better than boys students. It can be said that that in geometry, mensuration and statistical representation groups, girls students secured the position higher in correct response, but as in previous case arithmetic and algebra groups, they had achieved the lower percentage in correct response. That little difference was found because of the fact that girls students are neglected in homes as well as in schools for encouraging of doing mathematics.

It can be assembled the fundamental understanding of these issues around the following four problems which all the educators including the researcher believe to be the core areas of concern (source NCERT):

1. A sense of fear and failure regarding mathematics among a majority of children,
2. A curriculum that disappoints both a talented minority as well as the non-participating majority at the same time,
3. Crude methods of assessment that encourage perception of mathematics as mechanical computation, and
4. Lack of teacher preparation and support in the teaching of mathematics. Previous learning experience: Previous poor performances in mathematics result in anxiety (Ho et al., 2000).

Three examples illustrate the point this gender gap in the achievement of mathematics is completely socially constructed. First, girls students of active delta area had secured better performance in mathematics than boys students of matured delta area. Second, females grow up getting less support and encouragement in mathematics from parents and teachers, yet they don't seem to notice this lack of attention. Third, women choose careers in mathematics-related fields in lower proportions than do males, even if they are equally qualified. The main idea that appears is that while girls tend to score lower in mathematics than boys, the gap is not due to biological differences but to socially constructed factors such as gender roles. These gender roles are perpetuated through social interaction, and every person plays a part in constructing them. Both positive and negative gender stereotypes can affect people's beliefs, values, and attitudes, which in turn can positively or negatively affect achievement. As students, parents, teachers, administrators, or policy makers, "We must recognize and shed fixed mindsets about their

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and our mathematics abilities based on gender, and replace them with our beliefs in the continuing growth and development of the mathematics ability of all" (Forgasz, Becker, Lee, & Steinthorsdottir, 2010).

The main challenge is to find and educate sufficient teachers in the process, as well as the content, of mathematics, its curricular approach and appropriate didactics and teaching approaches. This challenge may seem too demanding for the realities of our countries. The final challenge is to educate stakeholders, beyond members of scientific communities and researchers in mathematics education, to include representatives of business and commercial groups, politicians, parents and local and national authorities. This involvement is essential for the support of teachers and students and for a renewal of the curriculum, both national and international. Six key factors come to the fore. The first is a curriculum based on mathematics process rather than a product, with the focus on deeper learning. The second factor is adequate and appropriate teacher education, as basic education crucially depends on the person who brings about the curriculum, whether present in the classroom or a remote or virtual teacher. Thirdly, to choose strategies those support such a vision of mathematics education. Fourthly, need to add complementary strategies and actions that improve equality of access for groups such as girls, the poor and minority ethnic groups. Fifthly, need to be aware of the factors that help increase the numbers of students who wish to follow careers in mathematics. The sixth and final factor is the need to involve educators from outside the school system. Then, many women like Maryam Mirzakhani (who became both the first woman and the first Iranian honored with the Fields Medal, On 13 August 2014 the most prestigious award in mathematics) would come in our society to enlighten and promote inspire to be in love with mathematics.

Therefore, boys or girls superiority depends totally upon students attitudes, beliefs, teachers, parents' culture and environment of his or her school , home , society , not on biological gender. The problem is to create opportunities of joyful learning for all irrespective of gender, caste, religion, region, language, and class. Let us develop our future generation as a good world citizen.

In sum, additional collaborative efforts – institutional, financial and analytical – are needed in order to supplement the lessons learned from this study and add a new dynamic to on-going national efforts to improve the quality of education and to diminish gender gap for all school-age children in mathematics.

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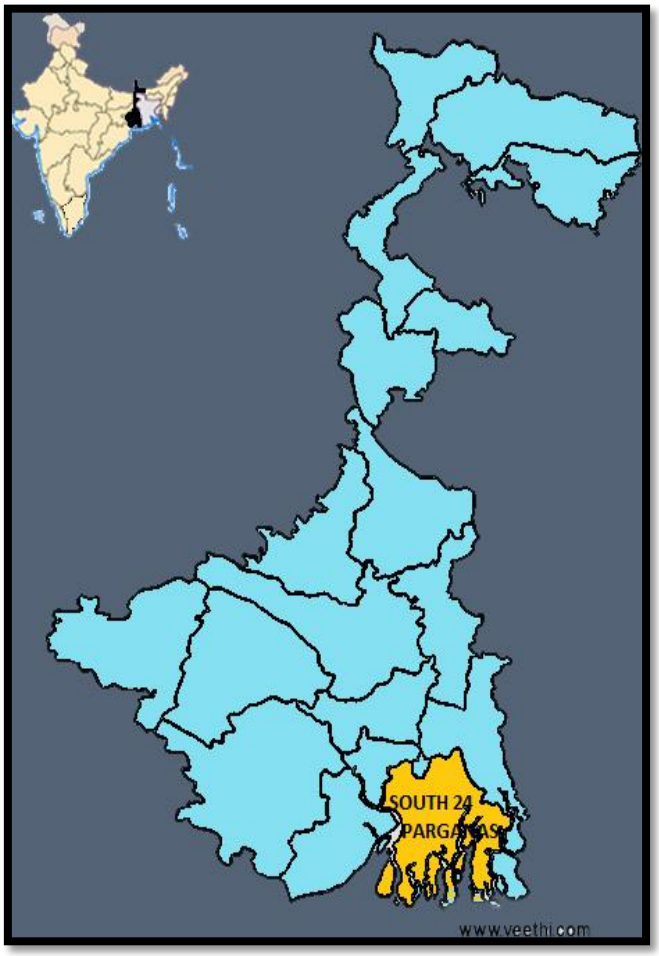
**Appendix -I**



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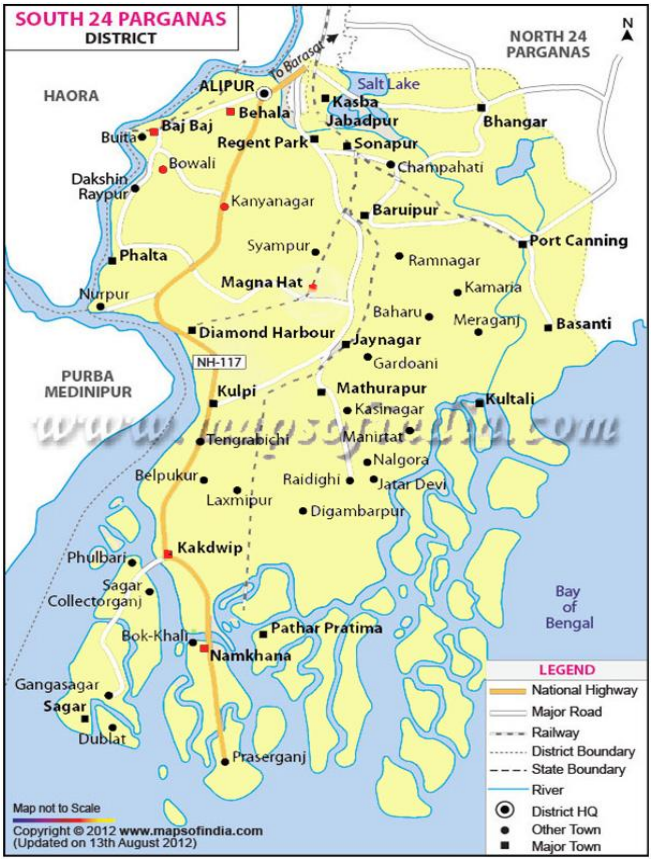
**Appendix- II**

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