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RESEARCH ARTICLE

SAMPLING MAPPING TECHNIQUES FOR SOCIAL RESEARCHERS

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Abstract

The Process of Mapping displays a geographic relationship between objects is done through mapping. A map is a representation of features of a region on the ground that typically reveals their relative shapes, sizes, and locations under some representational rule or convention. A sample is used to illustrate the type, amount, or quality of the entire. This refers to the method of selecting a subset of the population for testing, analysis, classification, etc. known as sampling. The determination of population parameters and associated sample errors are made possible using appropriate sampling strategies. It may be best to measure or see certain necessary inventory data directly from maps. Area is the most typical measurement of data. Planimeters, dot grids, and other similar tools can be used to determine the area of an inventory item. For extending and reporting the findings of any sampling activities, area information is crucial. This paper has highlighted the process of four types of sampling on the population of the district of West Bengal and has represented it on the map. Mapping is significant for better understanding and a good way to demonstrate the processes for researchers and others as well.

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Introduction:-

Mapping is often a two-dimensional surface. Maps serve as geographic scales. Even though they portray elements in perspective of their attributes, maps primarily serve to represent entities in terms of functional location (Lund, 1982).

A sample is a subset of the population, which is the group of people about whom information is sought. Our attitudes and behaviors are frequently based on samples in everyday life including in scientific investigation or any form of inquiry into a group. The majority of population estimations use census data (Weber et al., 2018). For instance, estimates are frequently made using a carefully chosen sample when data on the percentage of high-quality items in a batch of manufactured goods, the total number of graduates in a region, the total consumption expenditure in a city, the turnover ratios of revenues of a product, the total surface area underneath a crop, or the total number of fish in a lake are needed.

It is considered also that the population is clearly defined and is made up of the units U_1, U_2, \dots, U_n , which collectively make up the population's finite member N (often fairly big). The description of a population could be straightforward, as in the case of factory-made electric bulbs, but not in the situation of structures or fields in rural areas, where a precise

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definition is required to handle ambiguous or borderline circumstances. Additionally, the units that make up the population must be appropriately described according to the kind of information being sought. For instance, in the instance of a majority of individuals, the unit could be a single person, a family, a collection of families living in the same area, etc. A-frame, also known as a sample frame, is a comprehensive inventory of the population's units.

The method of representing the selected samples from the population (Universe) through the sampling process on a map with colour or convenient signs and symbols is called Sampling mapping.

Objectives of the study:-

1. To collect the desired information about the population or universe and sample.
2. To identify different districts of West Bengal by Simple Random Sampling, Systematic Sampling and Stratified Sampling method.
3. To prepare a Sampling map with the help of different sampling method.

Methodology:-

Suppose we have to be selected 9 districts out of the total 23 districts of West Bengal through the sampling method. Now we will use the Simple Random Sampling method to select these 9 districts. After selecting these nine districts, we will represent those selected districts on the map with color or convenient signs and symbols.

A. Simple Random Sampling

The simple random sampling process is the most basic form of probability sampling, where the probabilities connected to various potential samples are all identical. This method draws the sample one unit at a time, with an equal chance of selection for each unit in each draw. Simple random sampling is frequently mentioned, but few population-based surveys employ this technique. The most basic and straight forward sampling method is simple random sampling. Rapid surveys are not an exception because they also utilize a more intricate sampling plan. A sample is picked using the simple random sampling (SRS) method, which involves selecting n sampling units at random from a population of N with each sampling unit having an equal probability of being selected. There are two ways to pick the sampling units: either without replacement, in which case the units that are chosen are not reinserted into the population or with replacement, in which case the sampled units are reinserted into the population.

To determine Random Sampling methods, there have mainly two important processes: a) the Lottery method and (b) A Random Number Table.

In this research, it has been drawn a random sample of at least 40% of the districts of West Bengal by (a) the Lottery method of selection (b) Using a random number table and representing it on the map of West Bengal.

Here, the population size, $N = 23$ (there are 23 districts in West Bengal).

Samples of at least 40% of the districts = $23 \times 40\% = 9.2 \approx 9$ (approx.)

□ Sample Size (n) = 9

(i) For Lottery Method:

Here population size (n) is identified by serial numbers 01 to 23. These numbers can be written in 23 pieces of the same size, color and shape. This paper can be folded uniformly and can be put in a jar or a box. After well mixing one by one 9 (Sample size, $n=9$) pieces of paper are drawn from the box or a jar. For example, let us, consider that the piece of paper contains serial numbers 2, 5, 7, 19, 13, 9, 11, 6, and 20. After drawn the serial number from the jar or a box we may draw a sampling mapping by the following procedure. Following are the 23 districts of West Bengal.

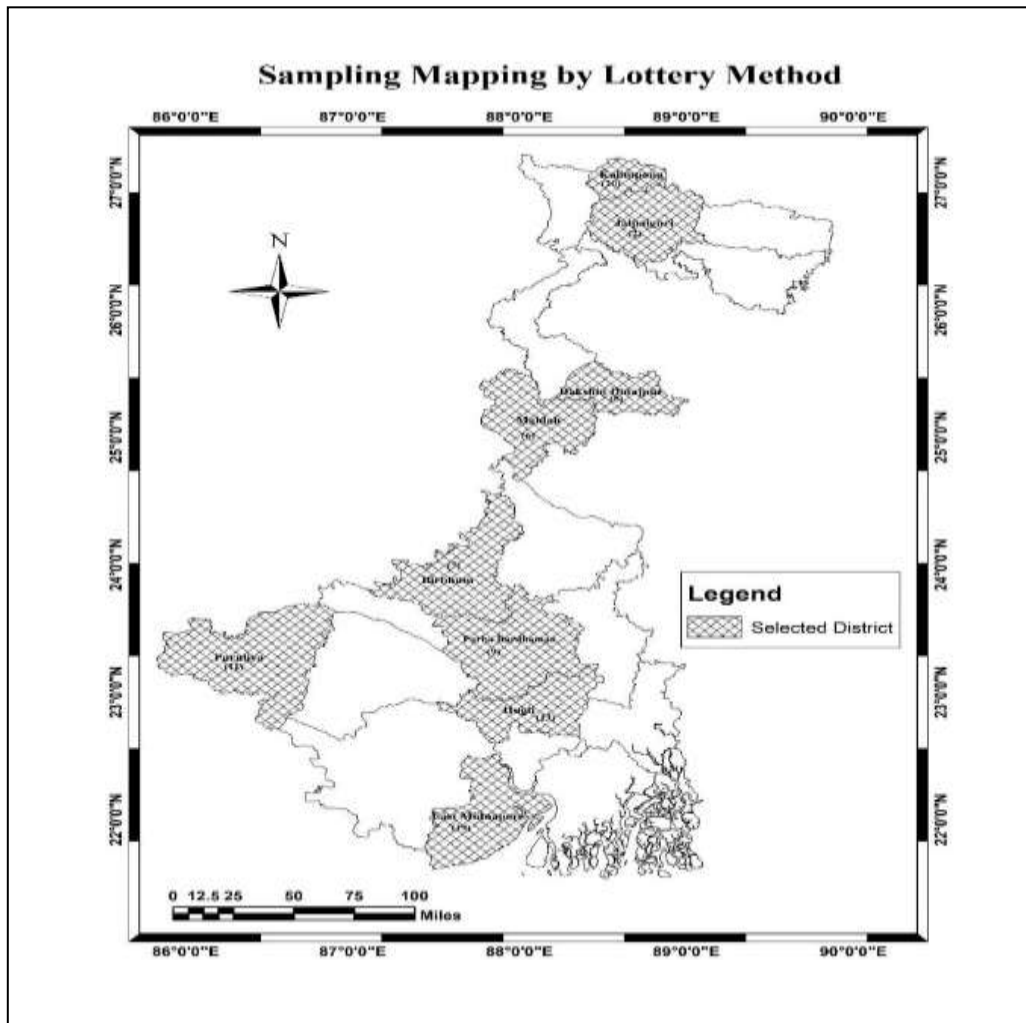
Sl. No.	Name of the District	Sl. No.	Name of the District
1	Darjeeling	13	Hooghly
2	Jalpaiguri	14	North 24 Pargana
3	Coachbihar	15	Paschim Medinipur
4	Uttar Dinajpur	16	Howrah
5	Dakshin Dinajpur	17	Kolkata
6	Malda	18	South 24 Pargana
7	Birbhum	19	Purba Medinipur
8	Murshidabad	20	Kalimpong

9	Purba Bardhaman	21	Alipurduar
10	Nadia	22	Paschim Bardhaman
11	Purulia	23	Jhargram
12	Bankura		

At first select or identify the above serial number (2,5,7,19,13,9,11,6,20) on the map.

Sl. No.	Name of the District
2	Jalpaiguri
5	Dakshin Dinajpur
7	Birbhum
19	Purba Medinipur
13	Hooghly
9	Purba Bardhaman
11	Purulia
6	Malda
20	Kalimpong

After the selection of 9 districts on the map of West Bengal, we have labeled the selected districts by using shade or color.



Source: By authors

(ii) Using random number table:

Here population size, N=23 and sample size, n=9. Now we will select the sample by using a random number table. Here we see that, N =23 is a two-digit number. For that, we will take two-digit numbers from the random number table which are provided below.

We may use the random sampling numbers given below:
 5967, 8941, 7989, 3335, 7577, 9735, 3042, 8401, 7053, 5364, 5872, 1143

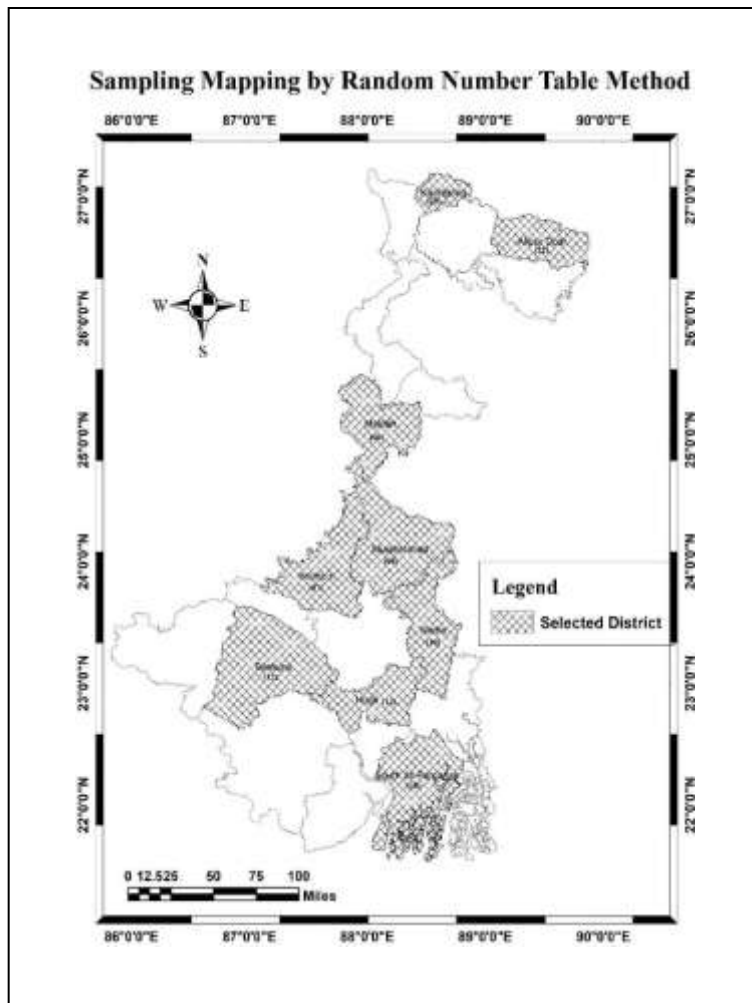
But there are hundred two-digit numbers like 00, 01, 02, 03, 04,99.

If we allot one serial number to each number, many Random numbers will be rejected before we get the required sample. So, we will divide 100 by 23. So, the number is 4 or we will reject the numbers 00, 97, 98, and 99.

Now, we will take the numbers which are between 1 to 23.

Random Number Drawn	59	67	89	41	79	89	33	35	75	77	35	30
Remainder (Div.by23)	13	21	20	18	10	20	10	12	06	08	12	07
Accepted/ Rejected(A/R)	A	A	A	A	A	R	R	A	A	A	R	A
Final Selection	13	21	20	18	10	----	----	12	06	08	----	07

Source: Calculated by authors



Source: By authors

Finally, Sl. No. 13, 21, 20, 18, 10, 12, 6, 8 and 7 are drawn.

B. Systematic Sampling

Systematic sampling is more practical than random sampling alone. At the same time, it guarantees that each component has an equal chance of being included in the sample. Also with the support of random numbers, the very first unit is chosen in this sampling technique, and the other units are chosen automatically following a specified pattern. Systematic sampling is the term for this technique. Assume that the N population units are numbered from 1 to N in some order. Let's further assume that N may be expressed as the combination of two numerals n and k , in which case $N = nk$ (where, N = population size, n = sample size and k = interval).

Drawing a Systematic sample is simpler, and it's frequently simpler to perform it well. Since there may be significant time savings while drawing in fields and work places, this is more advantageous. Also, the choice of units is easy, and the price is reasonable. For surveyors to gather units using systematic sampling, very less preparation is necessary. Moreover, the population is distributed more evenly by the systematic sample. Therefore, no significant portion will be under represented in the sample. The sample has a better cross-section and is distributed uniformly.

In this type of sampling, the value of k ($k = N/n$, where k = interval, N = population and n = sample unit.) has to be found first by dividing the population (N) by the sample unit (n). Then the value of k (suppose, $N = 20$ and $n = 5$, so, $k = 20/5 = 4$) has to be selected through random sampling method. In this case, if the value of k is between 1 and 4, then any random number between 1 and 4 has to be selected. Suppose in this case any random number from 1 to 4 is 3. However, the first sample unit will be 3 and the next sample unit will be $3 + 4 = 7$, $7 + 4 = 11$, $11 + 4 = 15$, $15 + 4 = 19$, $19 + 4 = 23$ etc.

In this research, we have prepared a sample ($n = 7$) from the population size ($N = 23$) applying systematic random sampling technique selecting every third item starting from the first-row wise and representing it on the map of West Bengal.

Here population size (N) = 23

We have to select a sample size (n) = 7. In case of systematic random sampling, $N = n \cdot k$ [where, k is an integer]

Or, $k = N/n = (23/7) = 3.2 = 3$ (approx.) already given.

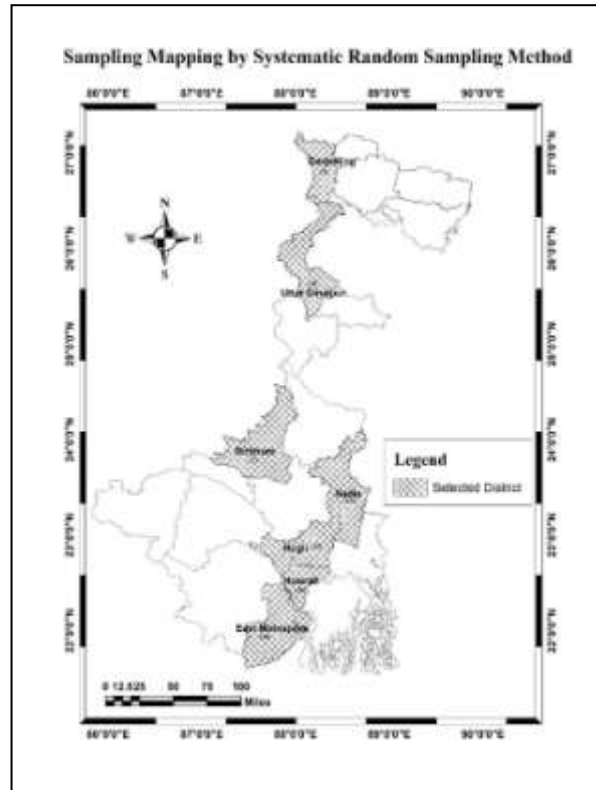
Now, we have to select a random number between 1 to k or 1 to 3. Then we need to select every third item thereafter.

Suppose the random number is 2.

So, we select the following serial number of districts, $2 + 3 = 5$, $5 + 3 = 8$, $8 + 3 = 11$, $11 + 3 = 14$, $14 + 3 = 17$, $17 + 3 = 20$.

OR,

If we take the random number 1, then the serial number of districts will be as follows: 1, 4 (1+3), 7(4+3), 10(7+3), 13(10+3), 16(13+3), 19(16+3).



Source: By authors

(C) Stratified Random Sampling:

A Stratified Random Sample is created by grouping the constituents of the population into mutually exclusive, non-overlapping sets of sample units known as strata and then choosing a simple random sample from inside each stratification (stratum is singular for strata). No entities can be eliminated, and each prospective unit of analysis must always be assigned to just one stratum. Before choosing sample units, stratification includes grouping sampling elements of the population into comparatively homogeneous categories. In sample surveys, stratified sampling is standard practice. By treating them as strata, the approach allows somebody to obtain a sample that contains any desired proportion of the various demographic subgroups. In stratified sampling, the population consisting of N units is first divided into K sub-populations of N_1, N_2, \dots, N_k units respectively. These sub-populations are non-overlapping and together they comprise the whole of the population.

Those groups of people are referred to as strata. To fully benefit from stratification, it is necessary to be aware of N_i 's ideals. Once the stratum has indeed been identified, a sample is taken from each stratum using independent drawings in several layers. Stratified random sampling is the process of taking a basic random sample from each stratum.

In this article, a population is divided into 4 strata. So that, $N_1 = 5, N_2 = 10, N_3 = 6, N_4 = 2$ respectively. From this data we have prepared a sample size (n)=5 using stratified sampling adopting proportional allocation and have represented it on the map of West Bengal.

Here, Population size, $N = 23$. It is divided into 4 strata, [where $N_1 = 5, N_2 = 10, N_3 = 6, N_4 = 2$]

$$\square N = N_1 + N_2 + N_3 + N_4 = 5 + 10 + 6 + 2 = 23$$

For Strata with $N_1 = 5, P_1 = N_1/N = (5/23)$ Hence, $n_1 = n \cdot P_1 = 5 \times 5/23 = 1.08 \approx 1$ (approx.)

Similarly, for strata with $N_2 = 10, P_2 = N_2/N = 10/23$

$$\square n_2 = n \cdot P_2 = 5 \times 10/23 = 2.17 \approx 2 \text{ (Approx.)}$$

$$\square n_3 = n \cdot P_3 = 5 \times 6/23 = 1.30 \approx 1 \text{ (Approx.)}$$

For Strata with $N_4 = 2, P_4 = N_4/N = (2/23)$

$$\square n_4 = n \cdot P_4 = 5 \times 2/23 = 0.43 \approx 1 \text{ (Approx.)}$$

Therefore, number of samples selected from each stratum, $n_1 = 1, n_2 = 2, n_3 = 1, n_4 = 1$

$$\square \text{Total number of sample } (n) = n_1 + n_2 + n_3 + n_4 = 1 + 2 + 1 + 1 = 5$$

So, we have to select $n_1 = 1$ district from N_1 strata, $n_2 = 2$ district from N_2 strata, $n_3 = 1$ district from N_3 strata and $n_4 = 1$ district from N_4 strata.

Now these districts are to be selected from regions by simple random sampling using Random numbers table method. you may use the random sampling numbers given below.

1940, 2697, 5245, 4665, 3829, 0322, 5409, 6972,
2624, 0533, 0663, 3989, 2856, 3555, 9467, 3029

For Strata with $N_1 = 5$ (Population size), No. of sample drawn, $n = 1$ (In case of Northern Region)

Random Number (RN)	Accepted/Rejected (A/R)	Final Selection	Name of District
1	A	1 (Sl. No. 1 is selected)	Darjeeling
9	R	----	----
4	R	----	----

Source: Calculated by author

Here, the population size $N_1 = 5$

Which is a one-digit number so mark each of the items by 1 to 5.

Again, for Strata with $N_2 = 10$ (Population size), No. of sample drawn, $n = 2$ (In case of Plain Region)

Random Number (RN)	Accepted/Rejected (A/R)	Final Selection	Name of District
2	A	2	Uttar Dinajpur
6	A	6	Purba Bardhaman

Source: Calculated by authors

Here, 2 districts ($n = 2$) are selected from N_2 strata or Plain Region and their serial numbers are 2 and 6.

For Strata with $N_3 = 6$ (Population size), No. of sample drawn, n (Sample size $= 1$) $= 1$ (In case of Western Region)

Random Number (RN)	Accepted/Rejected (A/R)	Final Selection	Name of the District
5	A	5	Bankura
2	----	----	----
4	----	----	----

Source: Calculated by authors.

Here, 1 district is selected from N_3 strata or Western Region and the serial number is 1. So, the selected district is Bankura.

For Strata with $N_4 = 2$ (Population size), No. of sample drawn, n (Sample size $= 1$) $= 1$

Random Number (RN)	Accepted/Rejected (A/R)	Final Selection	Name of the District
3	R	----	----
8	R	----	----
2	A	2	South 24 Parganas

Source: Calculated by author

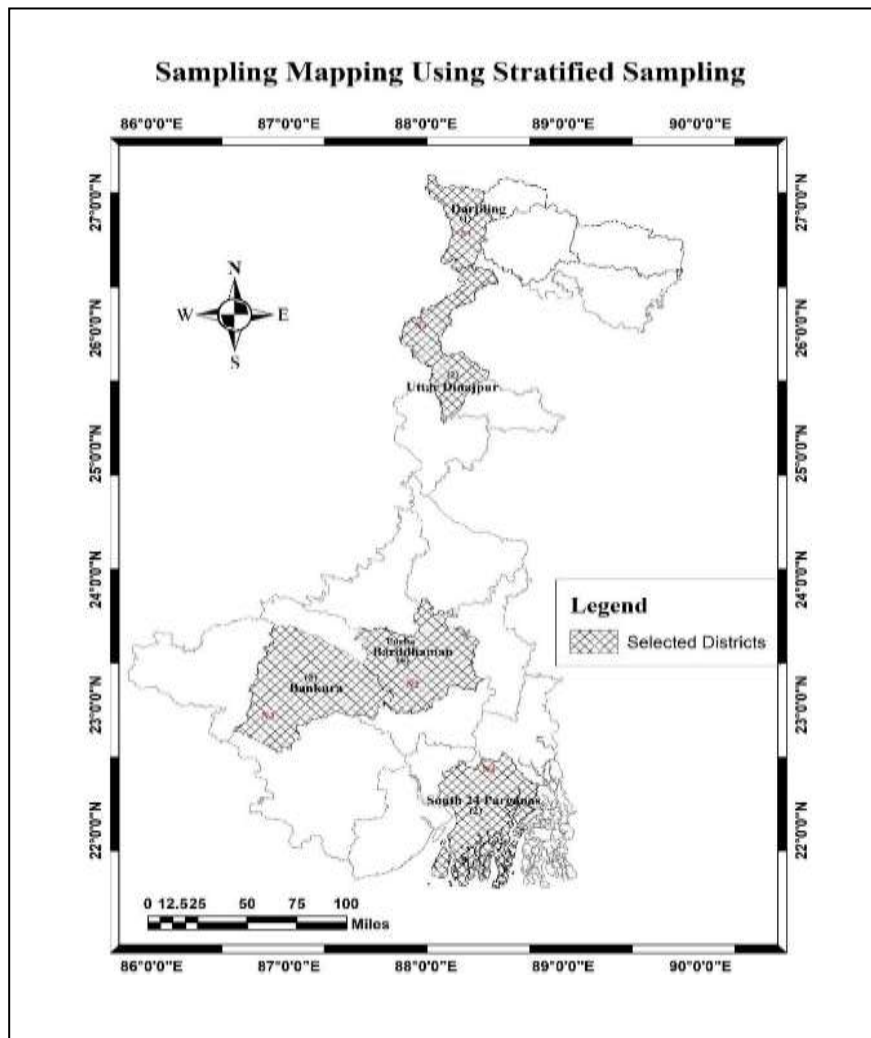
Here, 1 district is selected from N_4 strata, or Coastal Region and the serial number is 2. So, the selected district is S-24 Parganas.

Strata/ Region	Sl. No.	Name of the District	Selected Sl. No. of the District and its name
N1 / Northern Region	1	Darjeeling	Sl. No. 1 is selected and the name of district is Darjeeling.
	2	Jalpaiguri	

	3	Kalimpong	
	4	Cochbihar	
	5	Alipurduar	
N2 / PlainRegion	1	Dakshin Dinajpur	SI No. 2 and 6 are selected and the name of districts are Uttar Dinajpur and Purba Bardhaman.
	2	UttarDinajpur	
	3	Malda	
	4	Nadia	
	5	Murshidabad	
	6	Purba Bardhaman	
	7	Hugli	
	8	North24Parganas	
	9	Howrah	
	10	Kolkata	
N3 / Western Region	1	Birbhum	SI No. 5 is selected, and the name of the district is Bankura.
	2	Paschim Medinipur	
	3	Paschim Bardhaman	
	4	Purulia	
	5	Bankura	
	6	Jhargram	
N4/ Coastal Region	1	Purba Medinipur	SI No.2 is selected, and the name of the District is South24-Parganas.
	2	South 24-Parganas	

Source: Calculated by author.

Finally, Darjeeling, Uttar Dinajpur, Purba Bardhaman, Bankura and South24Parganas districts are selected by stratified random sampling adopting proportional allocation.



Source: By authors.

Conclusion:-

We have been able to create the concept about the population and sample through this paper with the help of different sampling method. How to select a sample from the population through various sampling method is clearly identified in this regard. Above all, out of 23 districts of West Bengal, some districts have been selected as sample and marked on the map which is very useful for the social researchers.

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