

**Working Paper Series**

**Composite Sustainability Index: A Practical Application in Sustainability  
Assessment of West Bengal**

**SUMMARY REPORT**

**Joyashree Roy<sup>1</sup>  
Rupsa Bhowmick<sup>2</sup>  
Manisha Dolui<sup>3</sup>**

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<sup>1</sup> ICSSR National Fellow, Professor of Economics, Jadavpur University,

<sup>2</sup> Project Assistant, Global Change Programme, Jadavpur University

<sup>3</sup> Project Assistant, Global Change Programme, Currently with Tennessee State University, USA

## ***Introduction:***

The term ‘Sustainable Development’ which was defined by the World Commission on Environment and Development (the Bruntland Commission, 1987) as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” has evolved over the years. Rio+20 recognizes to operationalise the concept there is need for setting focus areas and targets that cover three basic pillars and interdependence of environmental, social and economic systems. For developing countries it is important that the policy makers need to revisit priorities of environmental issues along with social and economic issues.

A lot of successful efforts have been made in the past two decades to identify the indicators of sustainable development. An indicator helps to understand direction and enables to know the distance from the target. The indicator may point to an issue or condition. Faced with problems an indicator helps to determine what direction to take to address the issue. Indicators of a sustainable society point to areas where links between economy, environment and society are weak. Indicators act as signals on development pathway to decision- makers so that the paths of unsustainable development can be avoided.

In an effort to identify the indicators of sustainable development, the Commission of Sustainable Development (CSD, 1992) initiated a programme on sustainable development indicators in 1995. The programme resulted in a working list of one hundred and thirty four indicators (134) indicators. In order to assess the validity of these, twenty two (22) countries from all over the world volunteered to test these indicators in an initiative that began in 1996. These countries subsequently met in 1999 to discuss experience and best practices. In March 2000, under the direction of the Division of Sustainable Development and Department of Economic and Social Affairs (DSD/ DESA), a small group of experts met to draft the final CSD framework. As a result of the meeting, a draft list of 58 indicators was selected and distributed to all testing countries for approval. Rio+20 Summit in 2012 United Nations member states began the ambitious process of defining the priorities for humanity over the next fifteen years. Open Working Group on Sustainable Development Goals (SDGs) came up with a draft document with 17 focus areas and 148 targets to address before 2030. The focus areas span from ending poverty everywhere to advancing rule of law across the world to working to combat climate change.

We could update our data base for West Bengal and using the methodology that we develop (Roy et al. 2006; 2007; 2009) constructed a single index of sustainability. Without a single index, it becomes difficult to compare the relative performances on the sustainable development pathway. If the respective performances are compared on the basis of different individual indicators of sustainability, then we will get different sets of ranking which will not really help in identifying which states are in greater need of which policy prescriptions.

## Objective and Data Sources:

In this study we have applied our ‘Composite Sustainability Index’ (CSI). Using the CSI, we have examined the sustainability status of the districts of West Bengal, ranked them on the sustainable development pathway and also identified the different issues of concern which should be addressed by policy makers while formulating developmental policies to make developmental policies to make development more sustainable.

A similar report on India had been carried out previously. (Roy, Bhowmick, & Dolui, 2014) However this research goes to more depth and analyses in greater details the situation in West Bengal and its districts. We have collected statistical data from various secondary sources (Bureau of Applied Economics & Statistics, Government of West Bengal, Health on the March, [www.indiastat.com](http://www.indiastat.com), [www.westbengalstat.com](http://www.westbengalstat.com), [www.westbengalforest.gov.in](http://www.westbengalforest.gov.in), Economic Review etc). Subject to data availability, we have selected a list of indicators, as shown in table, for our study. Some of the indicators are positive while others are negative with respect to contribution to achieving sustainability. That indicator, an increase in whose the value helps the districts to move towards the goal of achieving sustainability is given a positive sign. Whereas that indicator, an increase in whose value causes the districts to move away from the goal of achieving sustainability, is known as a negative sign. The table 1 shows the relevant classification of the sustainability indicators.

**Map 1: Location Map**



**Table 1 Indicators and Their status in Sustainability Index:**

| Indicator                                     | The more the value Than West Bengal's average, the better (positive) | The less the value Than West Bengal's average, the better (negative) |
|-----------------------------------------------|----------------------------------------------------------------------|----------------------------------------------------------------------|
| <b>Social</b>                                 |                                                                      |                                                                      |
| Population with access to safe drinking water | *                                                                    |                                                                      |
| Up to five mortality rate                     |                                                                      | *                                                                    |
| Life expectancy                               | *                                                                    |                                                                      |

|                                                     |   |   |
|-----------------------------------------------------|---|---|
| Medical Facility                                    | * |   |
| Contraceptive User                                  | * |   |
| Sex ratio                                           | * |   |
| Crude Birth Rate                                    |   | * |
| Grade V Education                                   | * |   |
| Secondary Education                                 | * |   |
| Higher education                                    | * |   |
| Adult literacy rate                                 | * |   |
| Below Poverty Line                                  |   | * |
| Crimes against Women                                |   | * |
| Crimes against Child                                |   | * |
| <b>Environmental</b>                                |   |   |
| Food grains production                              | * |   |
| Gross irrigated area                                | * |   |
| Chemical fertilizer Consumption                     |   | * |
| Forest cover                                        | * |   |
| Protected Area                                      | * |   |
| Land Use                                            | * |   |
| Reported cases of Acute Respiratory Infection (ARI) |   | * |
| Reported cases of Malaria                           |   | * |
| Reported cases of Diarrhea                          |   | * |
| <b>Economic</b>                                     |   |   |
| NDDP                                                | * |   |
| Invested capital                                    | * |   |
| Road lengths                                        | * |   |

### ***Methodology:***

In this paper we use the Composite Sustainability Methodology (Roy, Bhowmick, & Dolui, 2014) (Roy, Chatterjee, & Basak, 2006) (Roy, Chatterjee, & Nandy, 2007) (Roy, Nandy, & Chatterjee, 2009) to construct a 'single index of sustainability' for the State of West Bengal. This method helps us to evaluate:

- The relative performance of the districts of the state of West Bengal in their progress towards sustainability.
- Trace the movement of the districts on the sustainable development pathway.
- Identify policy priorities to put a district on the sustainable development pathway with the goal to obtain sustainable development for West Bengal.

Following the literature while constructing the CSI, first we formulate a ‘benchmark’ or ‘baseline’ to evaluate the relative distance (a primary desideratum of the sustainability indicators) of the districts in West Bengal in terms of the sustainability performances. Our goal is to assign numerical values and assess the relative positions of the districts in West Bengal with respect to benchmark. Conceptually, we have taken ‘all districts’ average performances’ level as the benchmark. The benchmark satisfies some important properties.

- i. It is quantifiable.
- ii. It is unit free, making it comparable across time and space.
- iii. It is dynamic by nature. This means that with changing performance, the benchmark shifts over times. In constructing the benchmark, we have drawn from the literature (Pscharopoulos & Woodhall, 1985) the concept of ‘Representation Index’ (RI).

**Table 2 Relation between RI and sustainability Status Relation between RI and Sustainability Status:**

| Representation Index |  | Sustainability Status |  |
|----------------------|--|-----------------------|--|
|                      |  |                       |  |
| Value > Benchmark    |  | Positive              |  |
| Value < Benchmark    |  | Negative              |  |

There will be RIs for each district and for each component of the social, environment, economic indicators listed in Table 3. There will be  $(26 \times 18) = 468$  RIs for the twenty three indicators and eighteen districts of West Bengal. We consider Midnapore only without dividing it into purba and paschim to enable comparison. RI is a simple number that indicates whether a particular state is pulling up or pushing down the overall level of West Bengal’s performance.

For the entire social, economic and some selected environmental indicators like disease, we use the formula-

$$1) \text{ RI} = (\text{Percentage share of the component indicator of the } i\text{th district}) / (\text{percentage share of population of that district}) * 100.$$

$$(1a) \text{ Benchmark RI} = (\text{percentage share of the component indicator of State}) / (\text{percentage share of total population of State}) * 100.$$

While calculating the representation indices of some of the environmental indicators like gross cropped area, protected area, wetlands and forest area we use the formula-

$$2) \text{ RI} = (\text{percentage share of the component indicator of the } i\text{th district}) / (\text{percentage share of total geographical area of that district}) * 100$$

$$2a) \text{ Benchmark RI} = (\text{percentage share of the component indicator of state}) / (\text{percentage share of total geographical area of state}) * 100$$

Similarly, while calculating the representation indices of the remaining environmental indices of the remaining environmental indicators, like area under food grains, consumption of chemical fertilizers and gross irrigated area, we use –

$$3) \text{ RI} = (\text{percentage share of the component indicator of the } i\text{th district}) / (\text{percentage share of gross cropped area of the district}) * 100$$

$$3a) \text{ Benchmark RI} = (\text{percentage share of the component indicator of state}) / (\text{percentage share of total gross cropped area of state}) * 100$$

There will be 23 benchmarks for each of the component indicators. Using the 23 benchmarks and the  $(23 \times 18) = 414$  RIs we estimate the ‘Relative Representation Index’ (RRI). We calculate the RRI to assign a score to every district for each indicator. The RRI score of any district for a particular indicator gives the deviation of that district from the benchmark RI. If the RRI score is positive, then the district will have a positive sustainability status and vice versa whereas, if the RRI score is zero, then the state will be exactly at par with the benchmark. The formula for calculating RRI is,

4)  $RRI = RI - \text{value of benchmark RI}$ .

For positive indicators like adult literacy rate, we have used Formula 4. For negative indicators like infant mortality rate, we have used the formula,

4a)  $RRI = \text{value of benchmark RI} - \text{value of the RI}$

There will be  $(23 \times 18) = 414$  RRI scores which can be either positive, zero or negative. The RRI scores are used to construct Semi-Composite Indices (SCI), namely the ‘Composite Social Index’ (CSI) using the social sustainability indicators, the ‘Composite Social Index’ (CSCI) using the environmental sustainability indicators and the ‘Composite Economic Index’ (CECI) using the economic sustainability indicators. By simple summation of the 11 social, 9 environmental and 3 economic RRI scores we get the SCIs. The relevant formulas are:

5)  $CSCI = \sum_{j=1}^{11} RRI_j$ ; RRI<sub>j</sub> being the RRI of the jth social indicator.

6)  $CENI = \sum_{j=1}^3 RRI_j$ ; RRI<sub>j</sub> being the RRI of the jth economic indicator.

7)  $CECI = \sum_{j=1}^3 RRI_j$ ; RRI<sub>j</sub> being the RRI of the jth economic indicator.

These three semi-composite indices can now be used to estimate the ranks of the districts. Each district gets three sets of ranks which gives us a good idea about the positions of the districts on the social, environmental and economic sustainable development pathways respectively. We will get three SCIs for each district and thus  $(3 \times 18) = 54$  SCIs for all the districts.

8)  $CSI = CSCI + CENI + CECI$ ; RRI<sub>j</sub>; j=1(1) 23; RRI<sub>j</sub> being the RRI of the jth indicator.

Proceeding from equation (1) through (8) we have defined a methodology to arrive at one single index, Composite sustainability Index ‘CSI’ for each district. So there will be 18 CSI values which are pure numbers and comparable over time and space. The value of the CSI for the different districts can be either positive or negative. This is because computationally the values of the individual RRI scores can be either positive or negative or even zero. Conceptually, for those districts for which the CSI value is positive, can be said to be on the path to achieving sustainability. Whereas the districts, for which the CSI value is negative, can be considered as deviating from the sustainable development pathway and is, therefore, in need of policy interventions. There can be a possibility of the deviation from the sustainable development pathway. This may happen due to several reasons. We assume zero CSI to be the switch point of a district on its pathway to sustainability. The objective of every district should be, to constantly make efforts to attain positive values. The step in the derivation of the 18 CSIs are shown in the table below.

**Table 3 Indices used in the study:**

| Indices | Numbers |
|---------|---------|
|---------|---------|

|                                  |                        |
|----------------------------------|------------------------|
| Representation Indices           | $(26 \times 18) = 468$ |
| Relative Representation Indices  | $(26 \times 18) = 468$ |
| Semi-Composite Indices           | $(3 \times 18) = 54$   |
| Composite sustainability Indices | $(1 \times 18) = 18$   |

Thus, this three pillar approach study will help us to assess the sustainability status of the state of West Bengal in order to take up policies for priority areas.

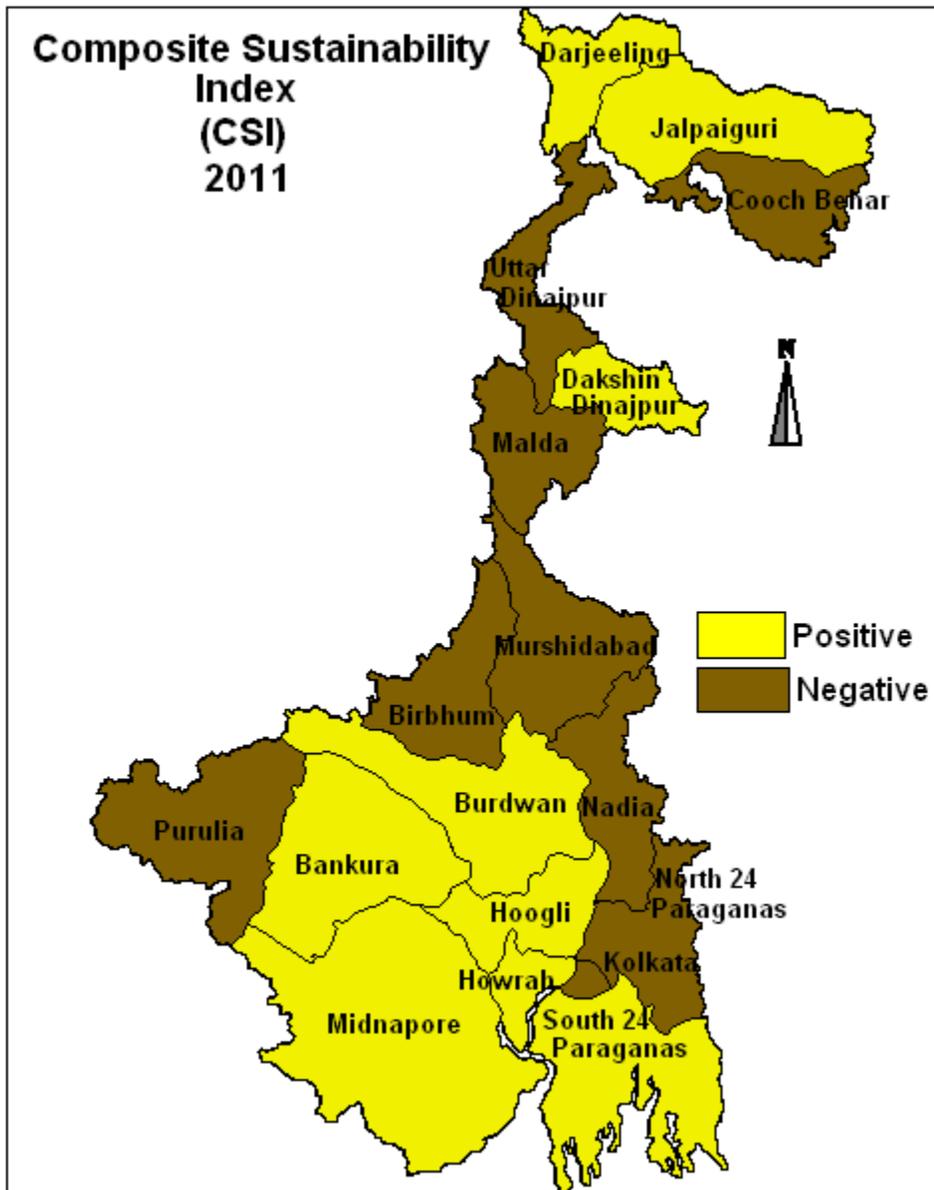
### ***Results of Empirical Investigation:***

In this section we present the ranks of the states districts based on the CSI (see Table 4) and the maps showing their sustainability status based on the CSI, the CEI, the CECI, the CSCI, the CENI and the individual indicators. The districts can have positive, negative or exact sustainability status. Positive sustainability status for a district implies that it is performing well and moving along the right track towards achieving sustainability whereas negative sustainability status implies that it is performing poorly and deviating away from the sustainable development pathway. Exact sustainability status, on the other hand, implies that the performance of the district is at par with the all- West Bengal average.

### Map and Ranks based on Composite Sustainability Index (CSI):

Map 1 shows the overall sustainability status of West Bengal reflected in the performance level of the districts. 9 out of 18 (50%) districts have positive sustainability status whereas 9 out of 18 (50%) districts have negative sustainability status. The three worst performers for 2011 have been Kolkata, Birbhum and Murshidabad while the best ones have been Midnapore, Darjeeling and burdwan.

**Map 2: Composite Sustainability Index (CSI) 2011**



**Table 4 Ranks for 2011 based on CSI:**

| Districts        | Rank | CSI Values |
|------------------|------|------------|
| Midnapore        | 1    | 704        |
| Darjeeling       | 2    | 560        |
| Burdwan          | 3    | 454        |
| Bankura          | 4    | 431        |
| 24 Parganas (S)  | 5    | 276        |
| Howrah           | 6    | 261        |
| Hoogly           | 7    | 229        |
| Dakshin Dinajpur | 8    | 19         |
| Jalpaiguri       | 9    | 2          |
| Nadia            | 10   | -76        |
| 24 Parganas (N)  | 11   | -140       |
| Kooch Behar      | 12   | -158       |
| Uttar Dinajpur   | 13   | -314       |
| Purulia          | 14   | -482       |
| Malda            | 15   | -531       |
| Murshidabad      | 16   | -670       |
| Birbhum          | 17   | -732       |
| Kolkata          | 18   | -1942      |

Note: Lower the magnitude of the rank; better is the performance of the districts

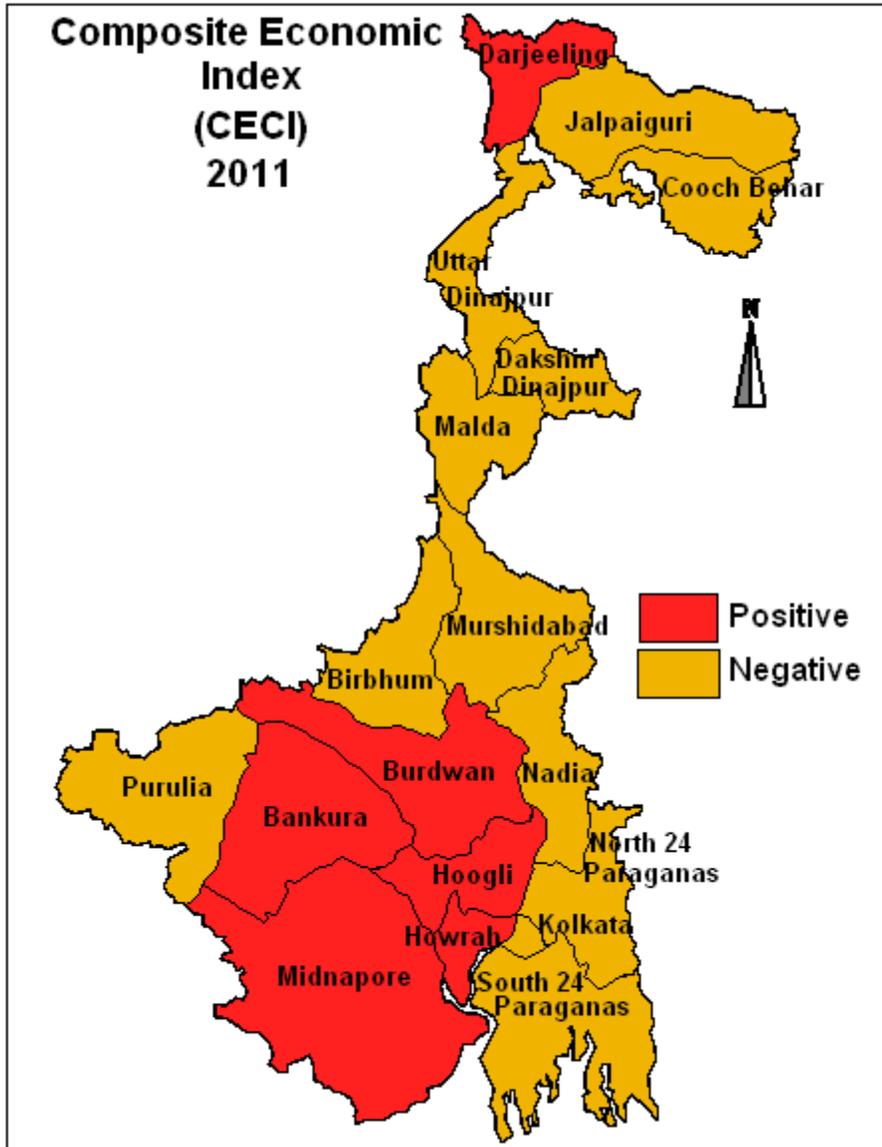
Let us identify the indicators which have played decisive roles in determining the final CSI values of each district. **Midnapore** has been the best performer for the year 2011. In 2011; **Burdwan** has performed well with respect to indicators like up to 5 mortality, malaria, gross irrigated area and invested capital which helped it to get positive score. **Birbhum** second last in 2011 because of a large negative value. Though it has done good performances in crime against women, road length and some environmental indicators like food grain production, malaria, diarrhoea, ARI and gross irrigated area but it has done poorly with respect to access to safe drinking water, up to 5 mortality, medical facility, forest cover, protected area and invested capital. **Bankura** also has done well with respect to indicators like up to 5 mortality, CC user, crime against women, malaria, protected area and invested capital for 2011. In the year 2011, **24 Paraganas (S)** has done very well for the indicators like up to 5 mortality, crime against children, food grain production, fertilizer, gross irrigated area, malaria, diarrhoea and ARI. In 2011, **Hoogli** has done good performance with respect to the indicators like up to 5 mortality, secondary education, crime against women and crime against children, malaria and diarrhoea. The CSI value of **24 Paraganas (N)** is negative in 2011 with poor performances in the indicators like medical facility, crime again child, forest cover, food grain production, protected area, invested capital and road length. **Kolkata** ranked last in 2011 because of a very large negative value. Kolkata has performed well with respect to the indicators like safe access to drinking water, medical facility, higher education and net district domestic product but has performed poorly with respect to the indicators like cc user, crime against women, crime against children, malaria, protected area, invested capital and road length. **Nadia** has a negative CSI value in 2011 due to poor performances with respect to the indicators like higher education, forest cover, protected area, ARI and invested capital. **Murshidabad** has ranked third last for its largely negative CSI value in 2011 due to

its poor performances with respect to the indicators like up to 5 mortality rate, medical facility, forest cover, protected area and invested capital. **Uttar Dinajpur** has a negative value in 2011 due to its poor performances with respect to the indicators like medical facility, crude birth rate, and crime against child, forest cover, protected area and NDDP. **Dakshin Dinajpur** achieved a positive CSI value in 2011 due to its good performance with respect to the indicators like up to 5 mortality, contraceptive (CC) user, crime against child, and food grain production though it has done poor performances in some indicators like forest cover, ARI, protected area and invested capital. **Malda** has a very high negative value in 2011 due to its poor performances with respect to the indicators like forest cover, diarrhoea, protected area and invested capital. **Jalpaiguri** achieved positive CSI value in 2011 due to its good performances with respect to up to 5 mortality, crime against child, forest cover and road length. **Darjeeling** has a large positive CSI value in 2011 because of its good performances with respect to the indicators like up to 5 mortality, medical facility, and crime against child, forest cover and malaria. In spite of doing good performances with respect to some indicators like access to safe drinking water and contraceptive (CC) user **Cooch Behar** get a negative CSI value in 2011 due to poor performances with respect to some indicators like forest cover, diarrhoea, ARI and invested capital.

### Maps based on Semi Composite Indices (SCI):

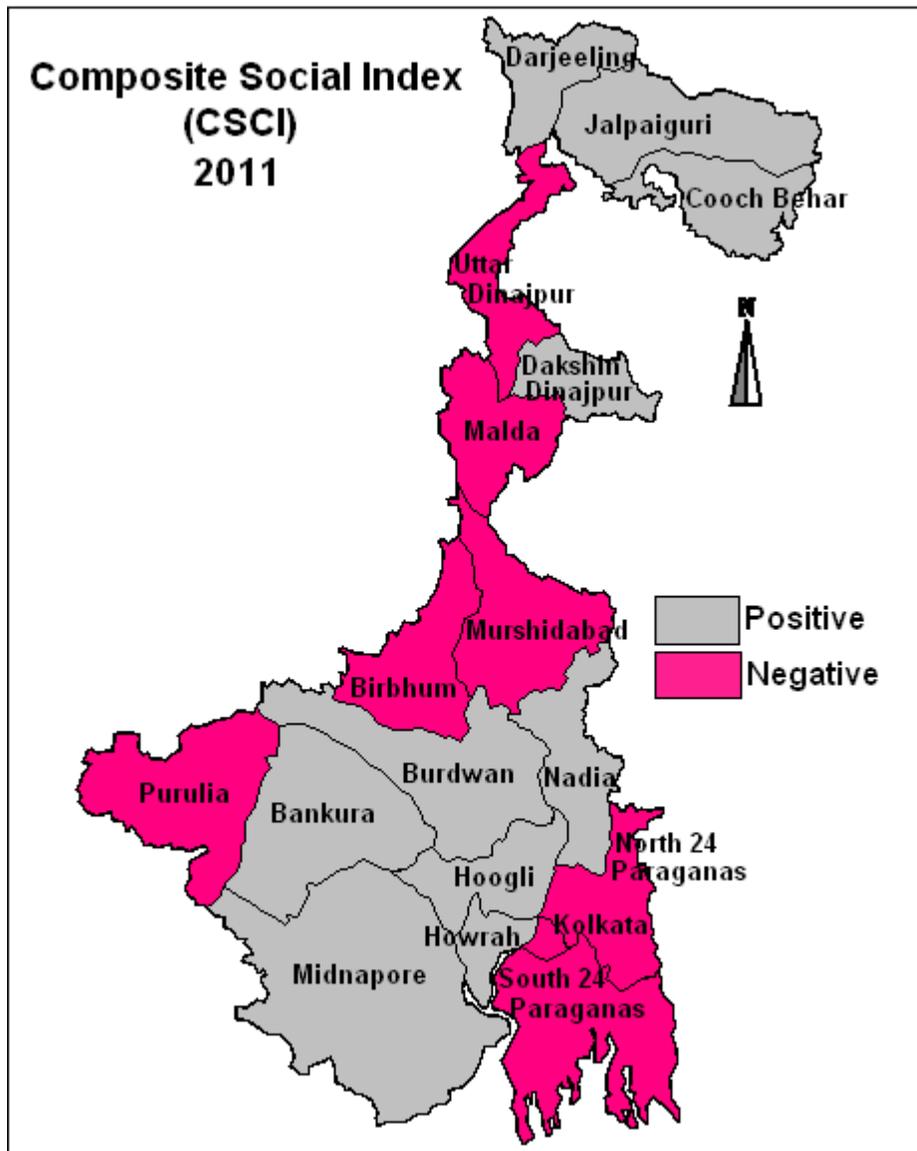
Maps 2 to 4 show the sustainability status of the districts with respect to CECI, CSCI and CENI respectively.

### Map 3: Composite Economic Index (CECI) 2011



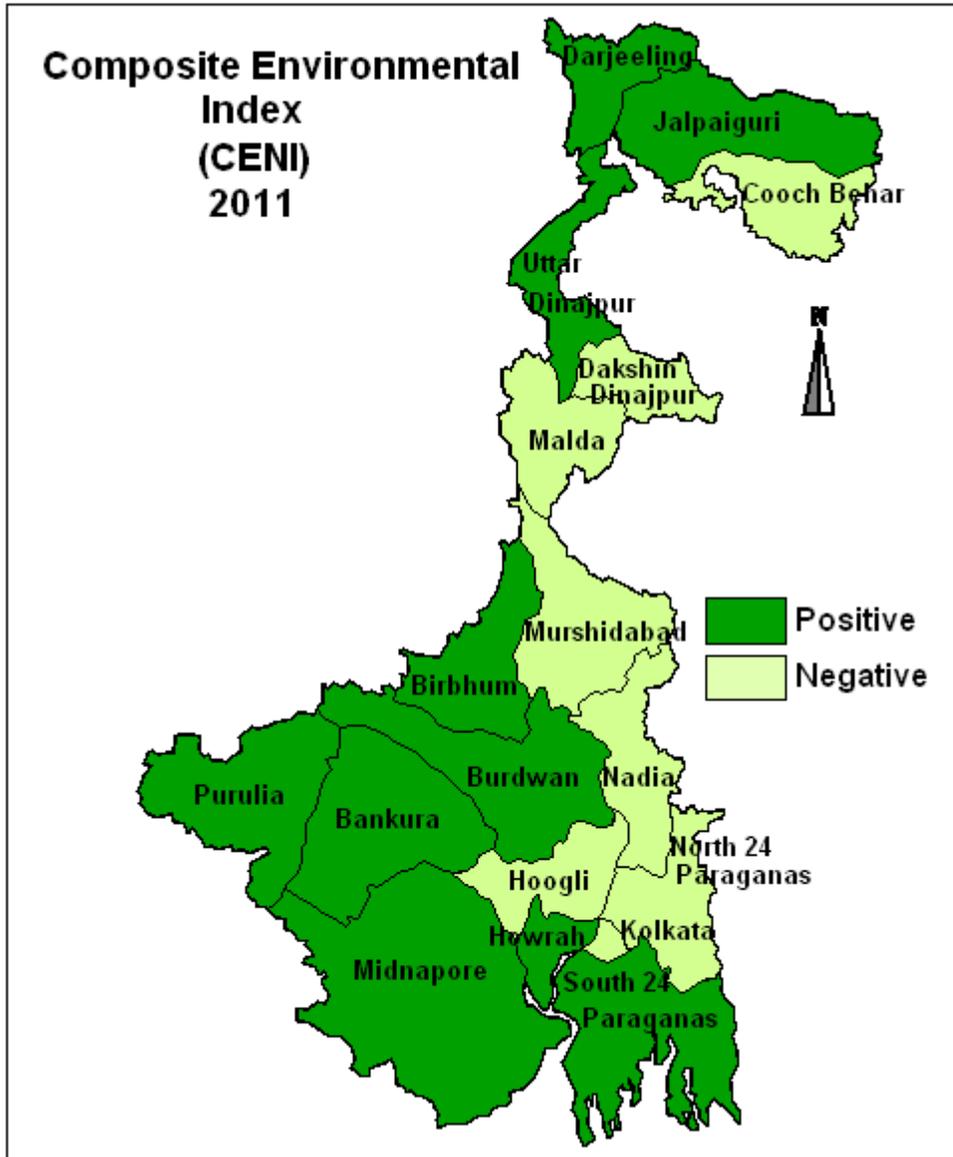
Map 2 shows the sustainability status of the districts by economic criteria. 6 out of 18 (33.33%) districts have positive sustainability status where as 12 out of 18 (66.67%) districts have negative sustainability status. Burdwan, Midnapore and South 24 Paraganas have been the best performers while Uttar Dinajpur, Malda and Cooch Behar have been the worst performers in the economic category for the year 2011.

**Map 4: Composite Social Index (CSCI) 2011**



Map 3 shows the sustainability status of the districts territories by social criteria. 10 out of 18 (55.56%) districts have positive sustainability status while 8 out of 18 (44.45%) districts have negative sustainability status. Darjeeling, Hoogli and Cooch Behar have been the best performers while Birbhum, Kolkata and Purulia have been the worst performers for the year 2011.

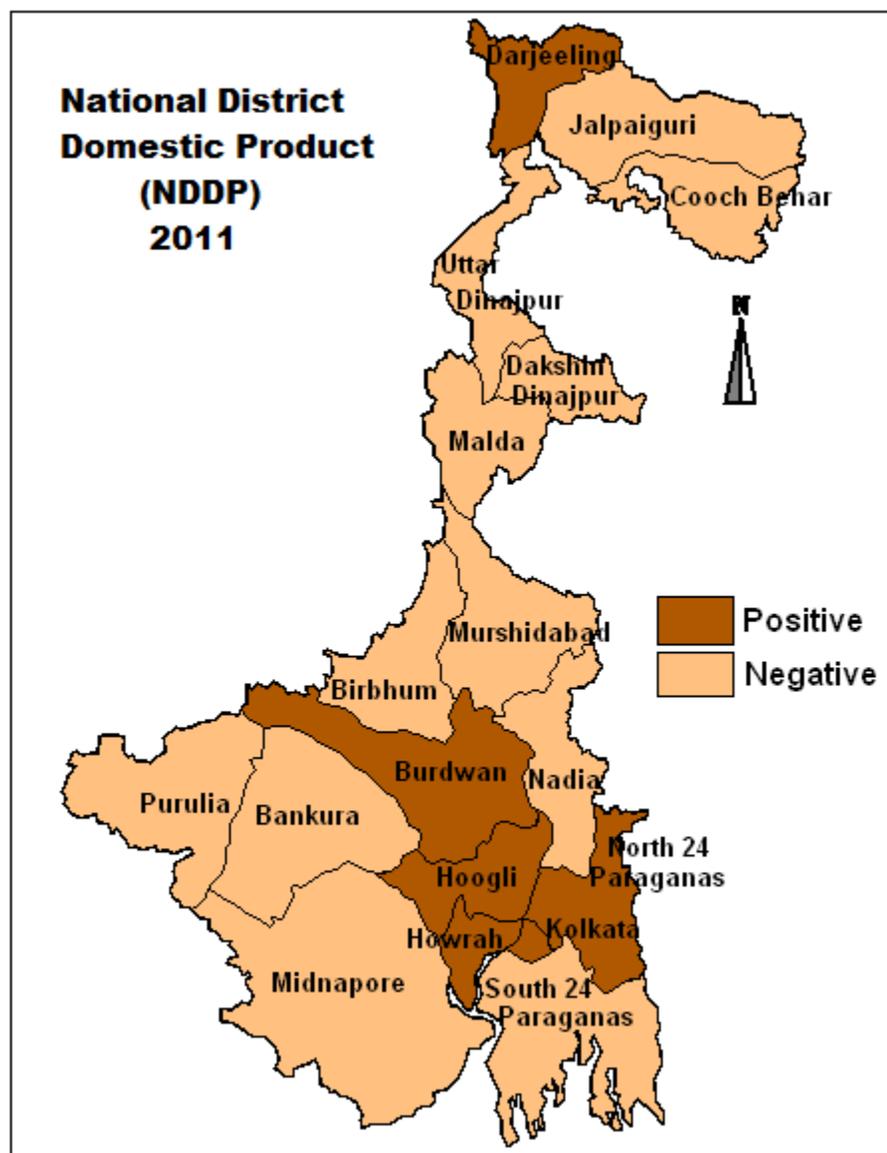
**Map 5: Composite Environmental Index (CENI) 2011**



Map 4 shows the sustainability status of the districts by environmental criteria. 10 out of 18 (55.56%) districts have positive sustainability status while 8 out of 18 (44.45%) districts have negative sustainability status. Bankura, Midnapore and South 24 Paraganas have been the best performers whereas Kolkata, Cooch Behar and Malda have been the worst performers for the year 2011.

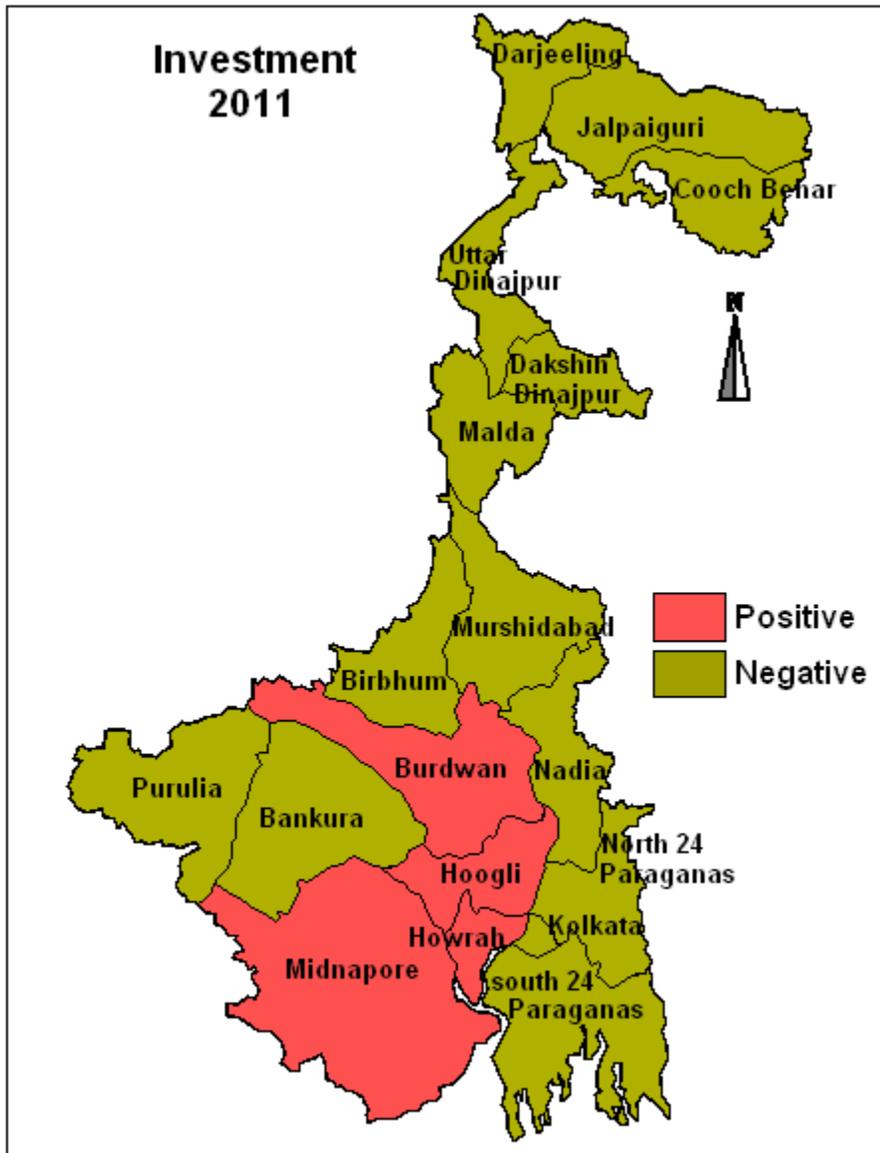
Maps based on Economic Indicators of Sustainable Development:

**Map 6: National District Domestic Product**



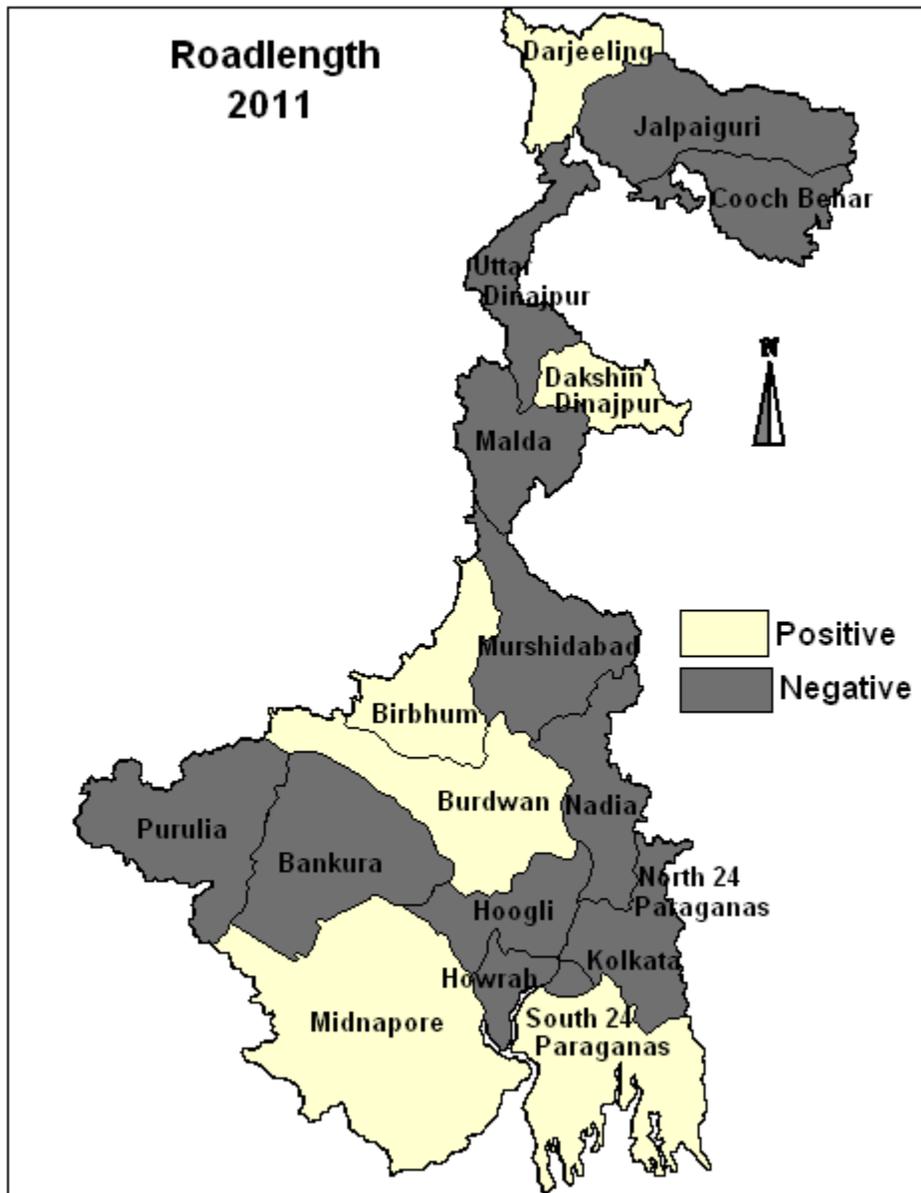
Map above shows the sustainability status of the districts on the basis of national district domestic product (NDDP). 6 out of 18 (33.33%) districts have positive sustainability status while 12 out of 18 (66.67%) districts have negative sustainability status. Kolkata, Darjeeling and Burdwan have been the best performers whereas Uttar Dinajpur, Purulia and Birbhum have been the worst performers for the year 2011.

**Map 7: Investment**



Map above shows the sustainability status of the districts of West Bengal on the basis of investment. 4 out of 18 (22.22%) districts have positive sustainability status while 14 out of 18 (77.78%) districts have negative sustainability status. Midnapore, Burdwan and Howrah have been the best performers while Murshidabad, Uttar Dinajpur and Cooch Behar have been the worst performers for the year 2011.

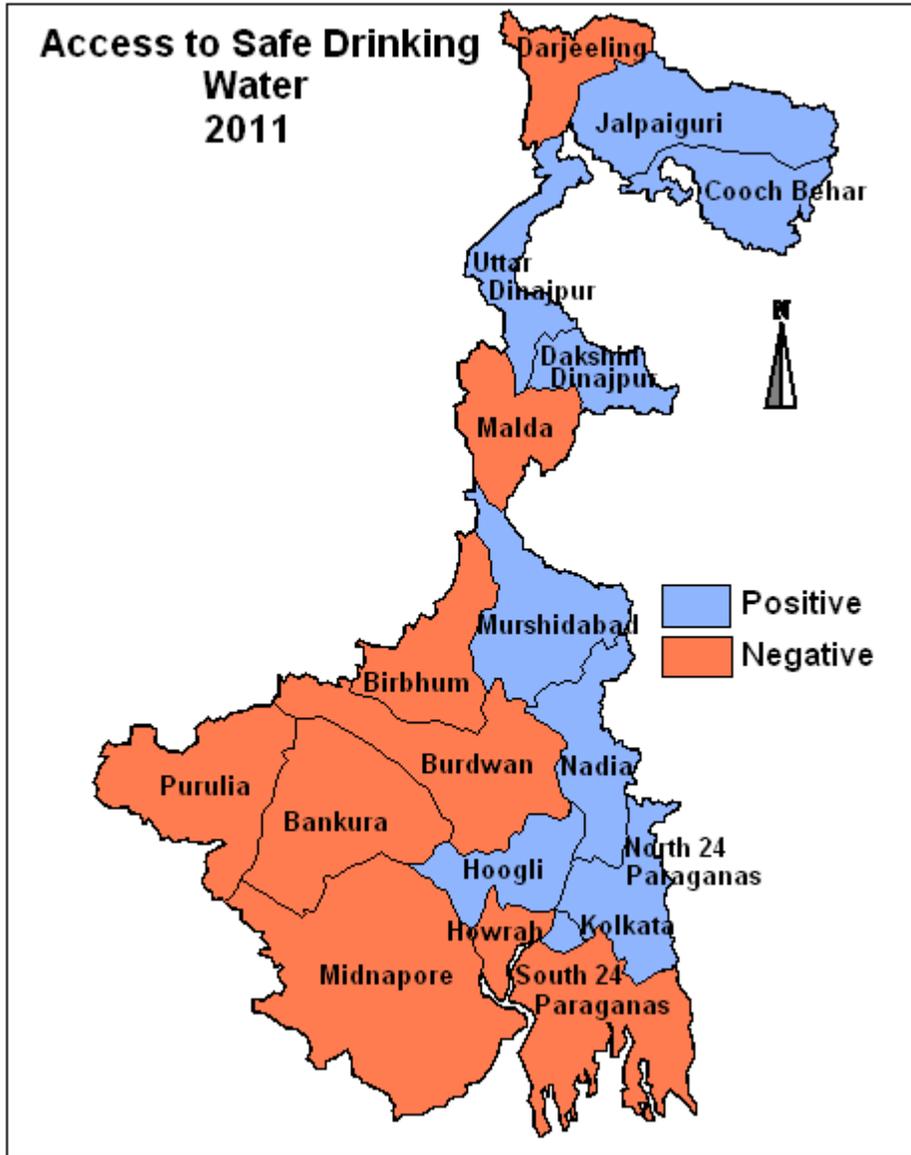
**Map 8: Road Length**



Map above shows the sustainability status of the districts of West Bengal on the basis of road length. 10 out of 18 (55.56%) districts have positive sustainability status while the remaining 8 out of 18 (44.45%) districts have negative sustainability status. Midnapore, Birbhum and South 24 Paraganas have been the best performers while Kolkata, Howrah and Bankura have been the worst performers for the year 2011.

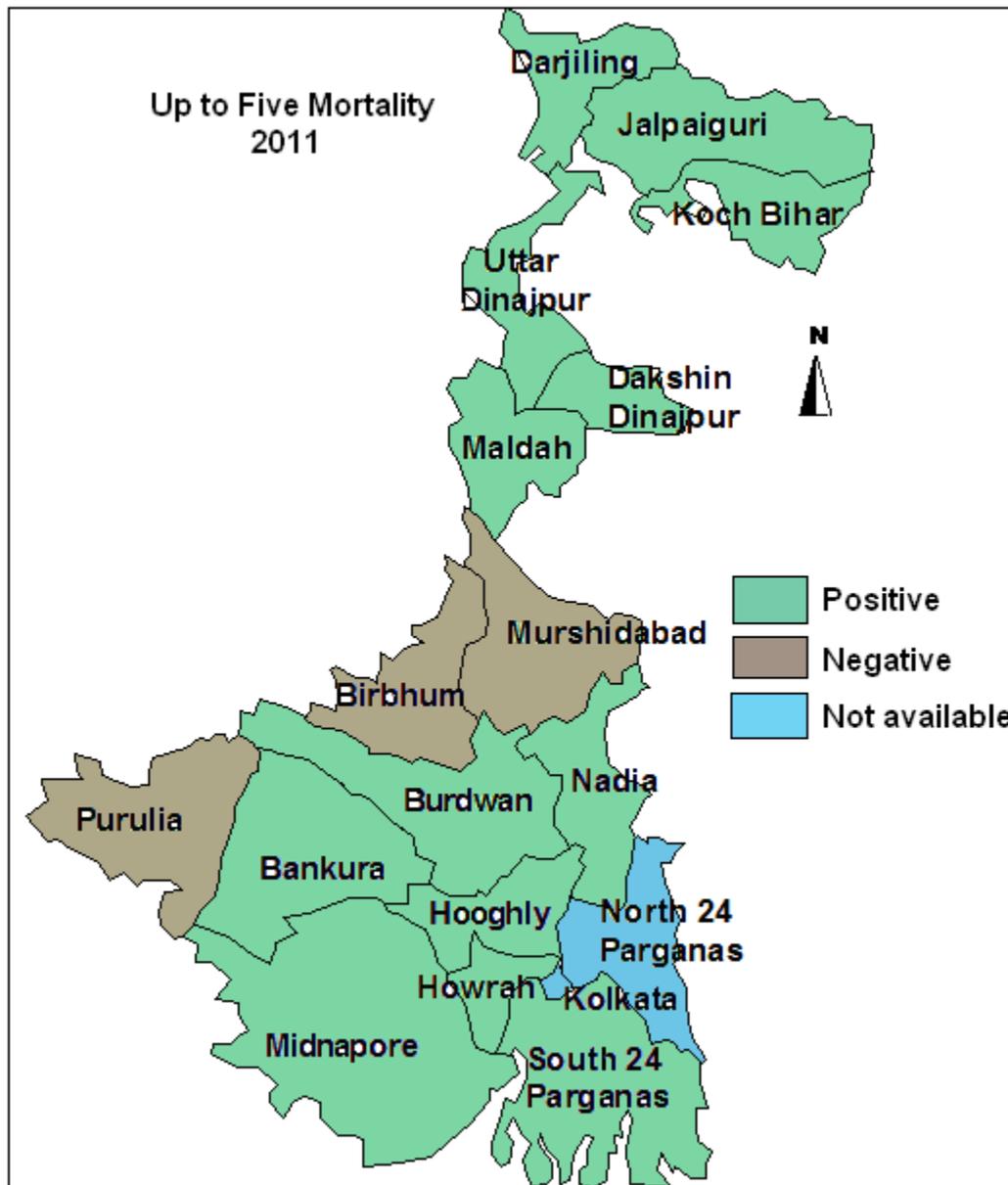
**Map based on Social Indicators of Sustainable Development:**

**Map 9: Access to Safe Drinking Water**



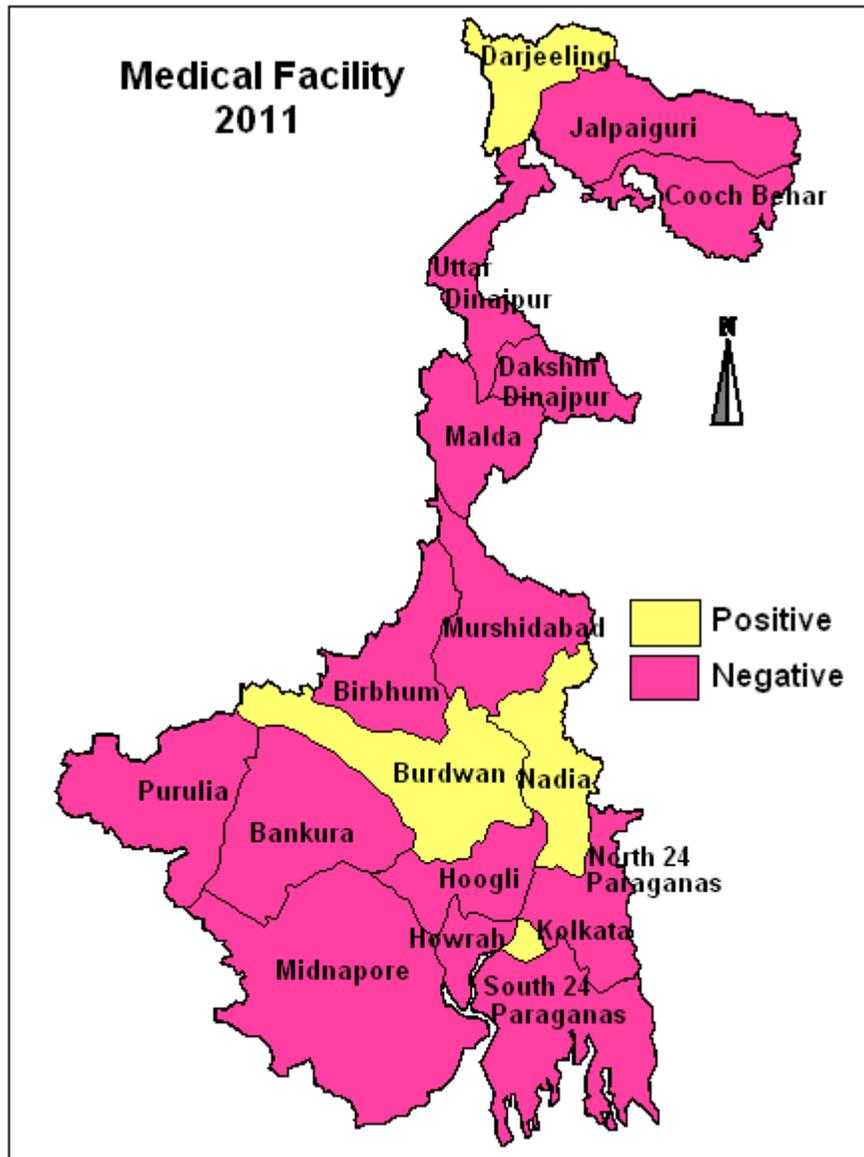
Map above shows the sustainability status of the districts of West Bengal on the basis of access to safe drinking water. 9 out of 18 (50%) districts have positive sustainability status while the remaining 9 out of 18 (50%) districts have negative sustainability status in the year 2011. Cooch Behar, Nadia and Kolkata have been the best performers while Midnapore, South 24 Paragans and Purulia have been the worst performers for the year 2011.

**Map 10: Up to Five Mortality**



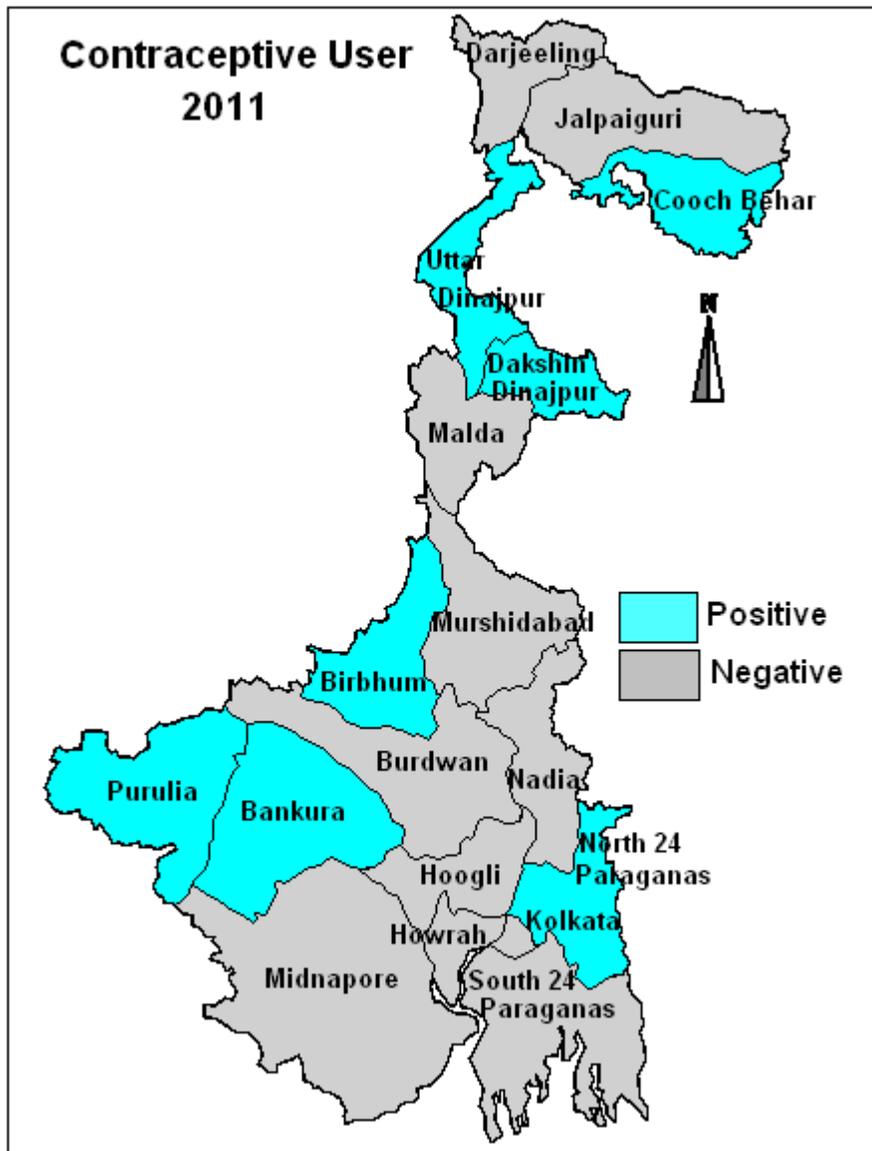
Map above shows the sustainability status of the districts of West Bengal on the basis of up to 5 mortality. We did not have the data for Kolkata and North 24 Paragans. 13 out of 16 (81.26%) districts have positive sustainability status while the remaining 3 out of 16 (18.76%) districts have negative sustainability status. Howrah, south 24 Paragans and Midnapore have been the best performers while Burdwan, Purulia and Murshidabad have been the worst performers for the year 2011.

**Map 11: Medical Facility**



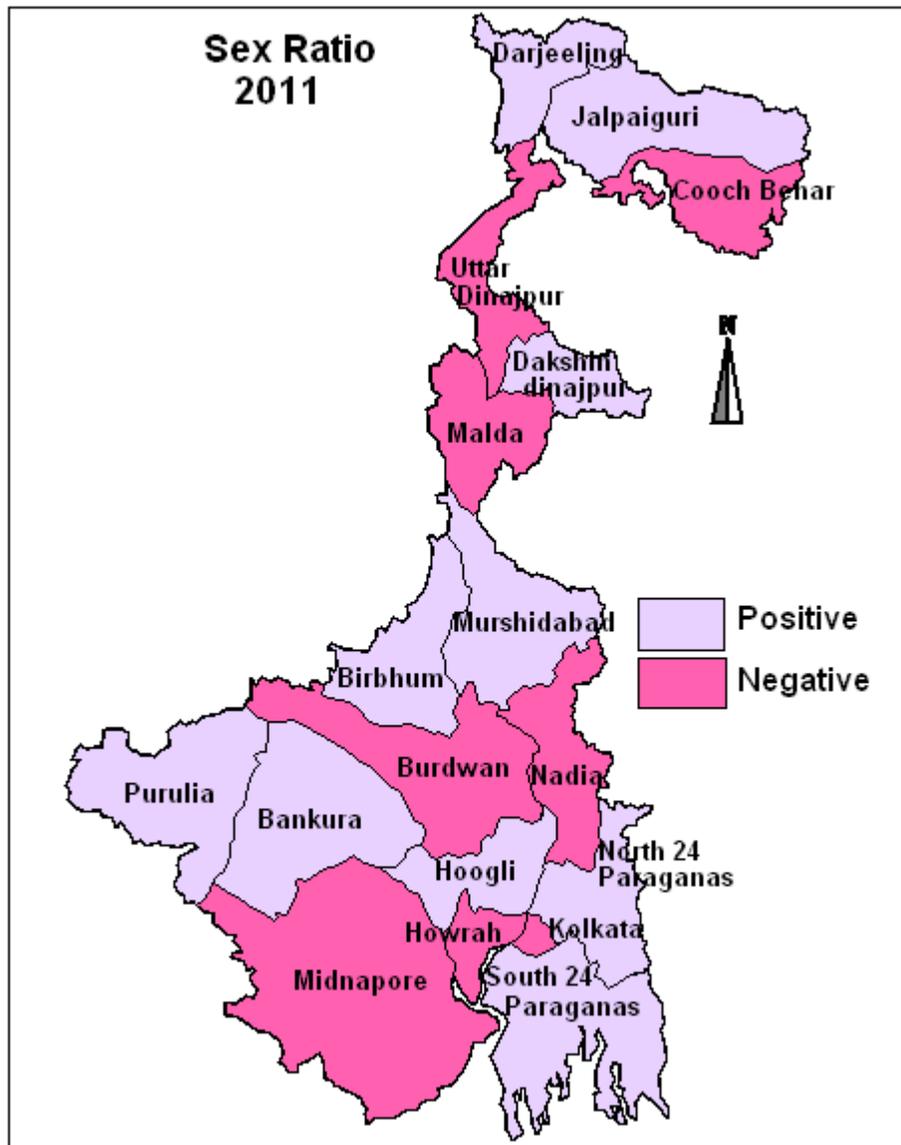
Map above shows the sustainability status of the districts of West Bengal on the basis of medical facility. 4 out of 18 (22.22%) districts have positive sustainability status while the remaining 14 out of 18 (77.78%) districts have negative sustainability status. Kolkata, Darjeeling and Burdwan have been the best performers while Uttar Dinajpur, Malda and Murshidabad have been the worst performers for the year 2011.

**Map 12: Contraceptive User**



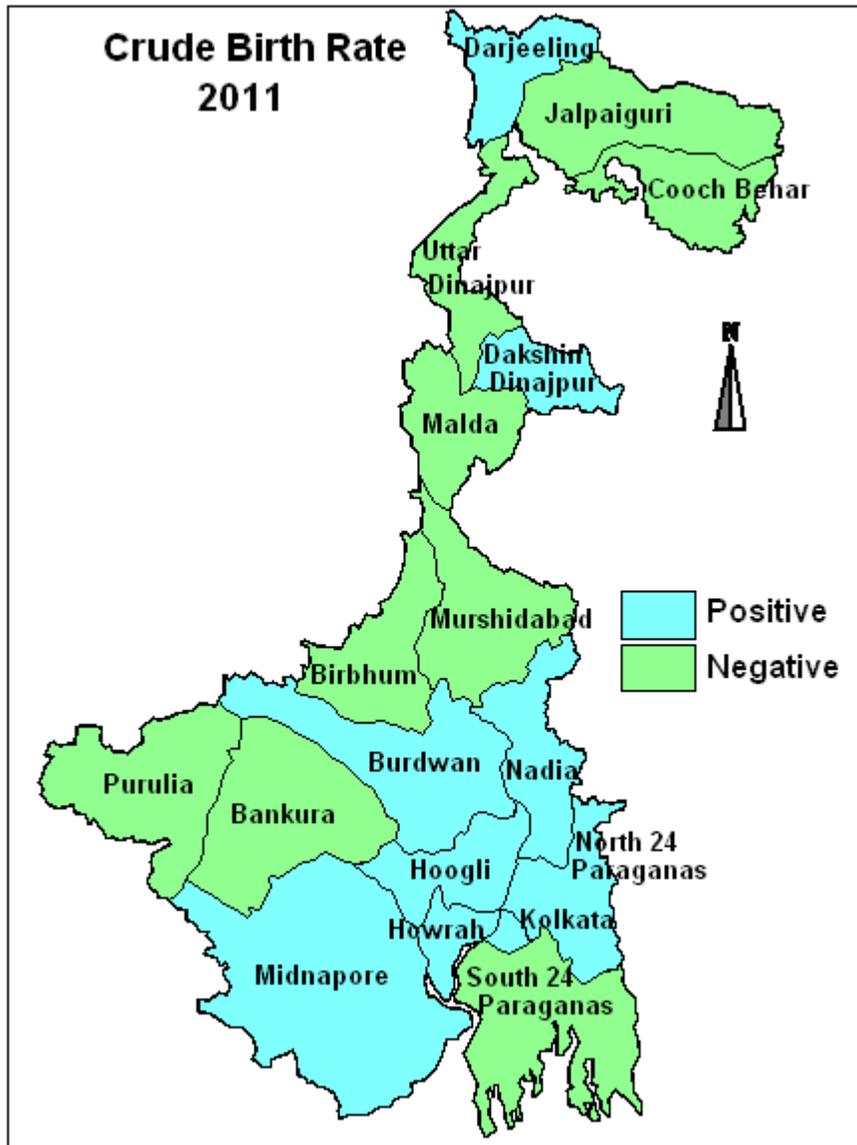
Map above shows the sustainability status of the districts of West Bengal on the basis of the contraceptive user. 7 out of 18 (38.89%) districts have positive sustainability status while the remaining 11 out of 18 (61.11%) districts have negative sustainability status for the year 2011. Cooch Behar, Purulia and Dakshin Dinajpur have been the best performers while Darjeeling, Jalpaiguri and Kolkata have been the worst performers for the year 2011.

**Map 13: Sex Ratio**



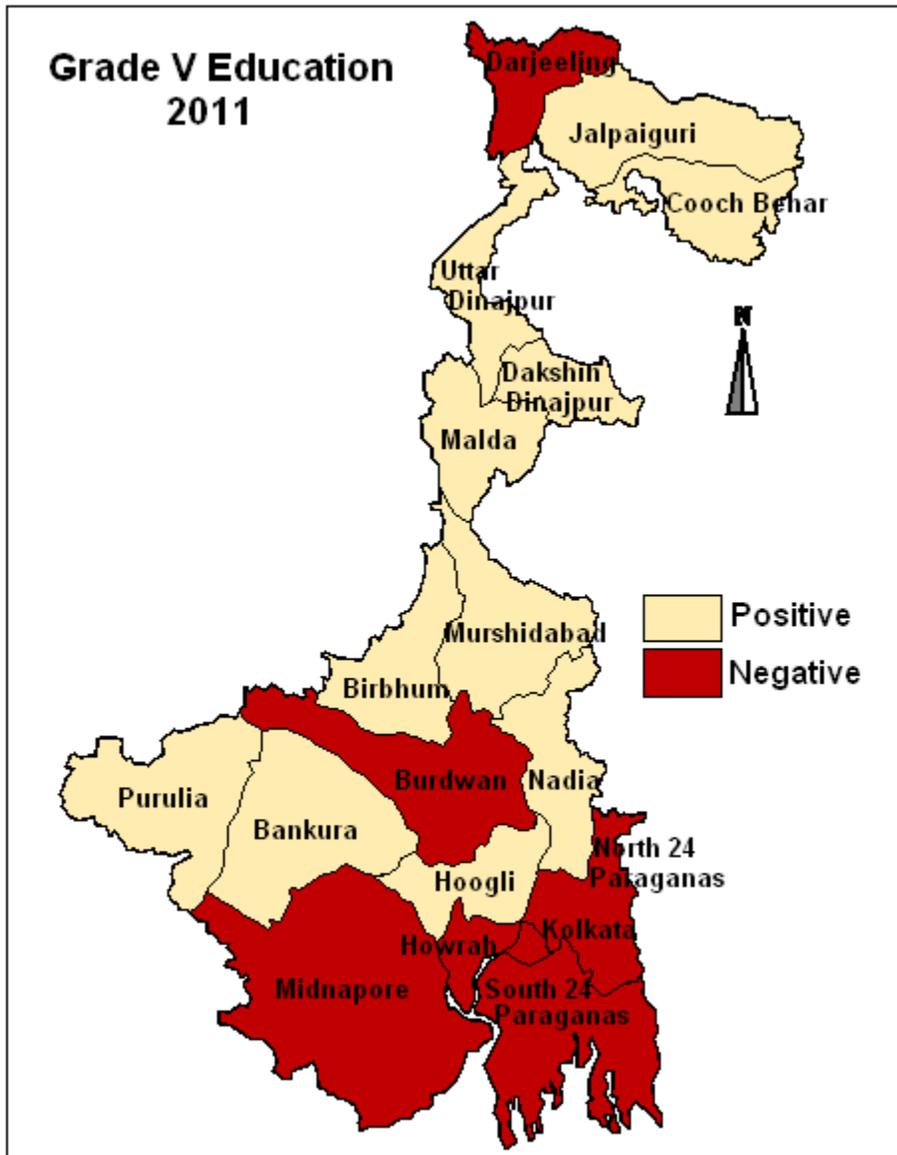
Map above shows the sustainability status of the districts of West Bengal on the basis of sex ratio. 10 out of 18 (55.56%) districts have positive sustainability status while the remaining 8 out of 18 (44.45%) districts have negative sustainability status. Darjeeling, Hoogli and Purulia have been the best performers while Midnapore, Kolkata and Howrah have been the worst performers for the year 2011.

**Map 14: Crude Birth Rate**



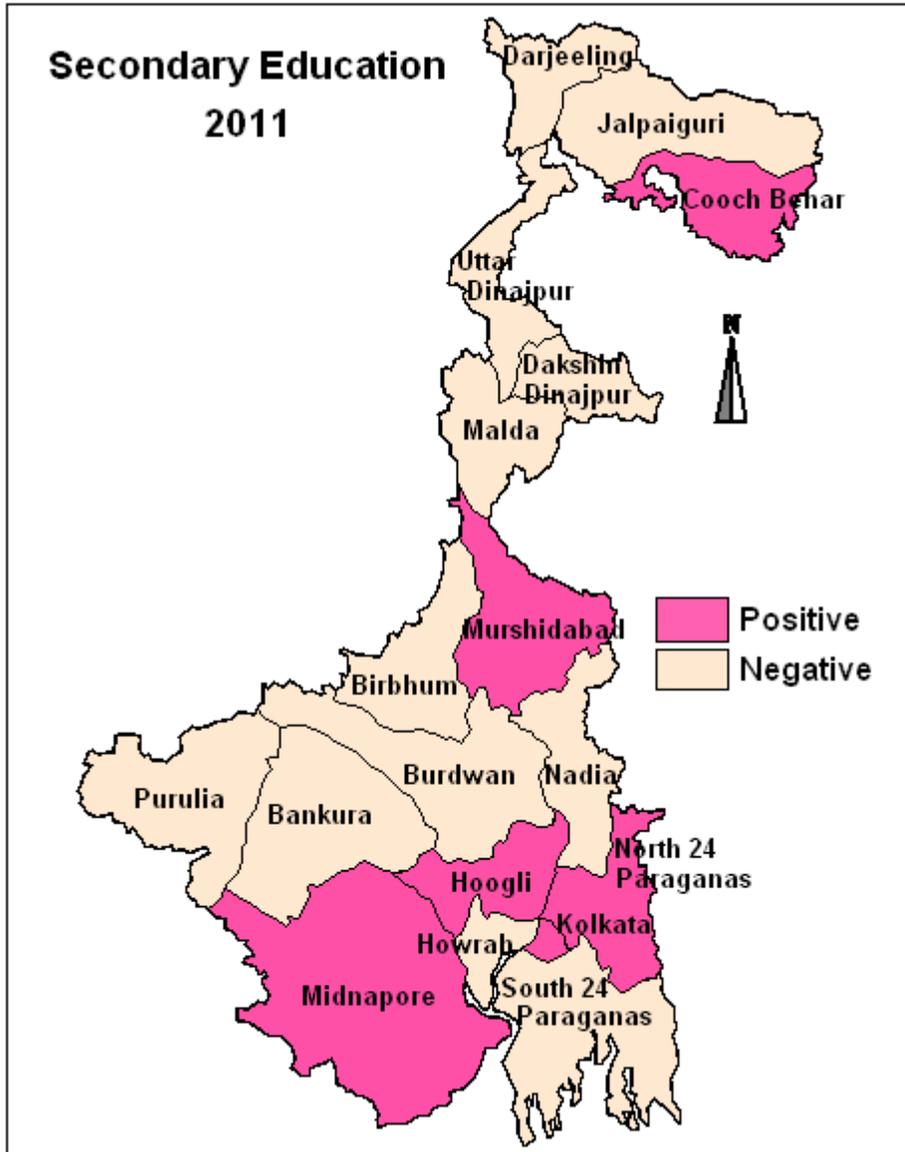
Map above shows the sustainability status of the districts of West Bengal on the basis of crude birth rate. 9 out of 18 (50%) districts have positive sustainability status while the remaining 9 out of 18 (50%) districts have negative sustainability status. Kolkata, Midnapore and North 24 Paraganas have been the best performers while Uttar Dinajpur, Malda and Murshidabad have been the worst performers for the year 2011.

**Map 15: Grade V Education**



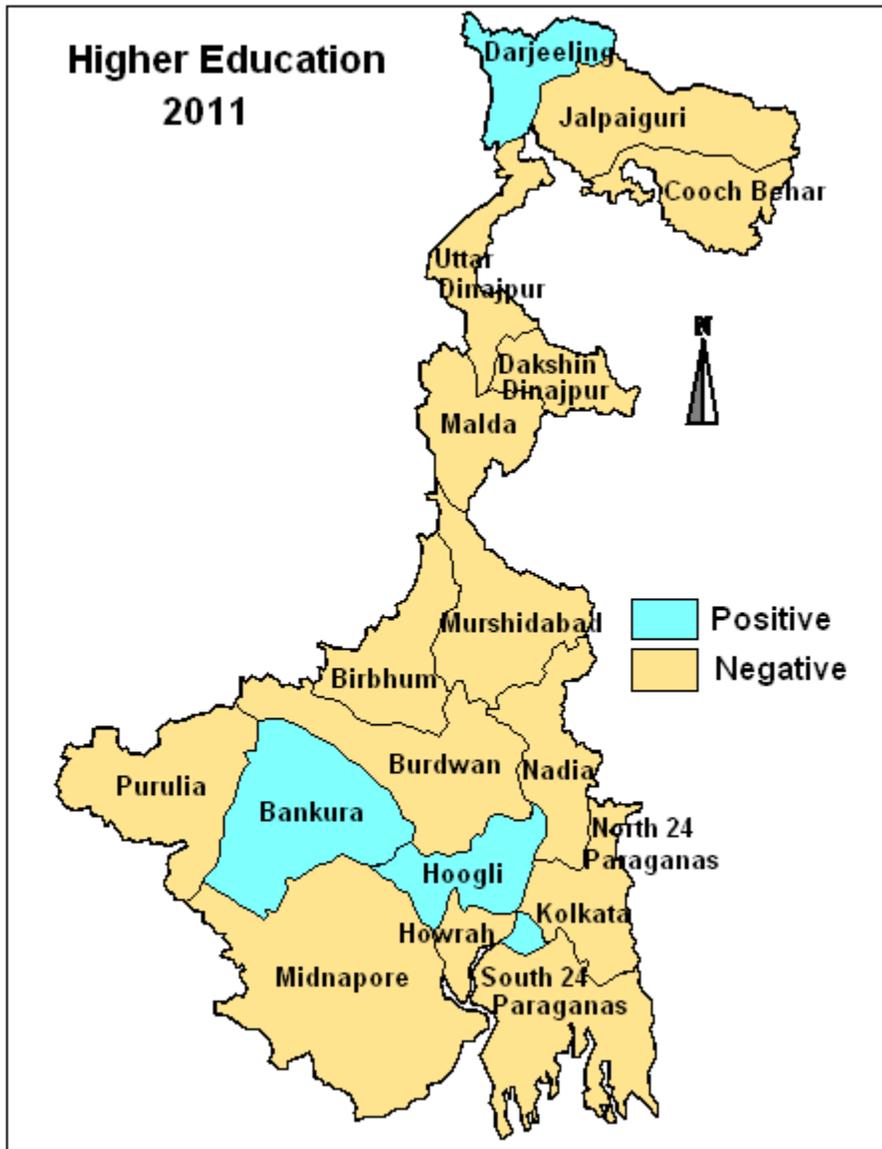
Map above shows the sustainability status of the districts of West Bengal on the basis of grade V education. 11 out of 18 (61.11%) districts have positive sustainability status while the remaining 7 out of 18 (38.89%) districts have negative sustainability status. Purulia, Nadia and Cooch Behar have been the best performers while Kolkata, north 24 Paraganas and Midnapore have been the worst performers for the year 2011.

**Map 16: Secondary Education**



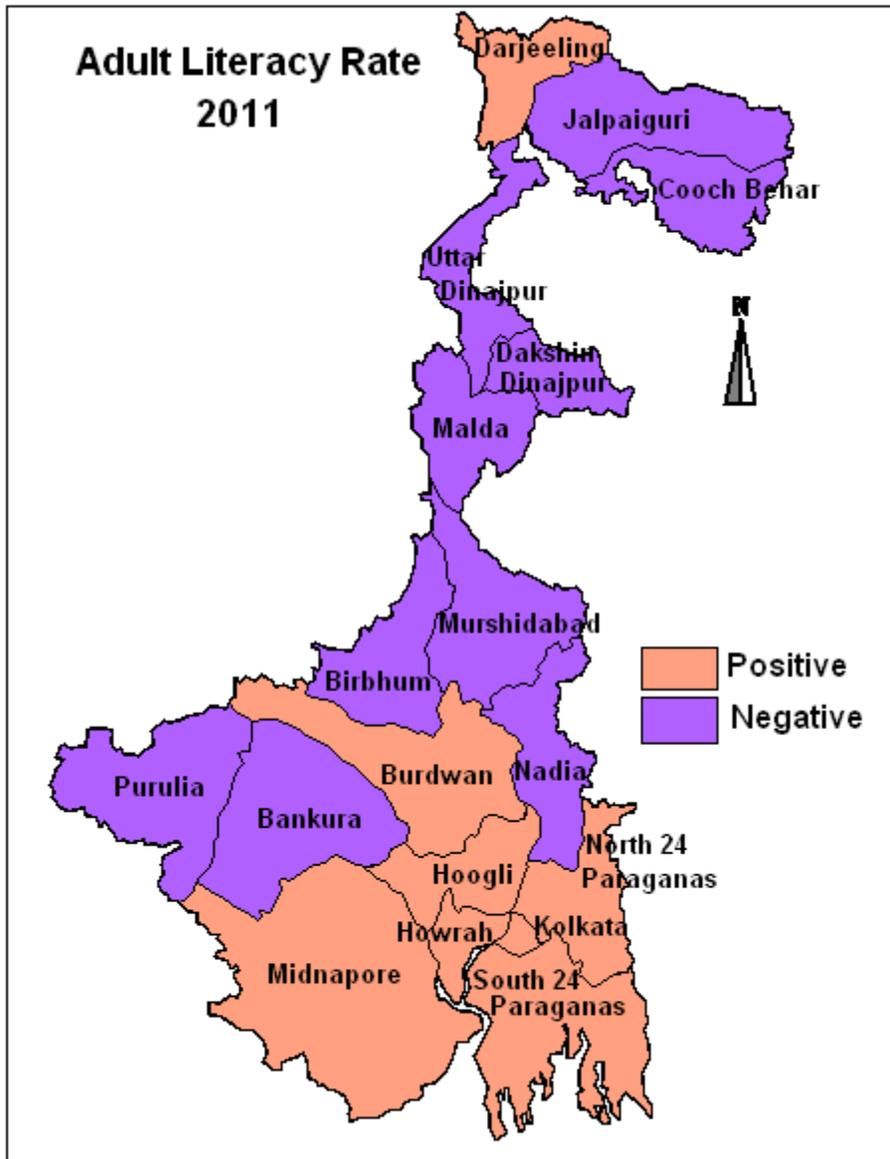
Map above shows the sustainability status of the districts of West Bengal on the basis of secondary education. 6 out of 18 (33.33%) districts have positive sustainability status while 12 out of 18 (66.67%) districts have negative sustainability status. Midnapore, Hoogli and Kolkata have been the best performers while Malda, South 24 Paraganas and Purulia have been the worst performers for the year 2011.

**Map 17: Higher Education**



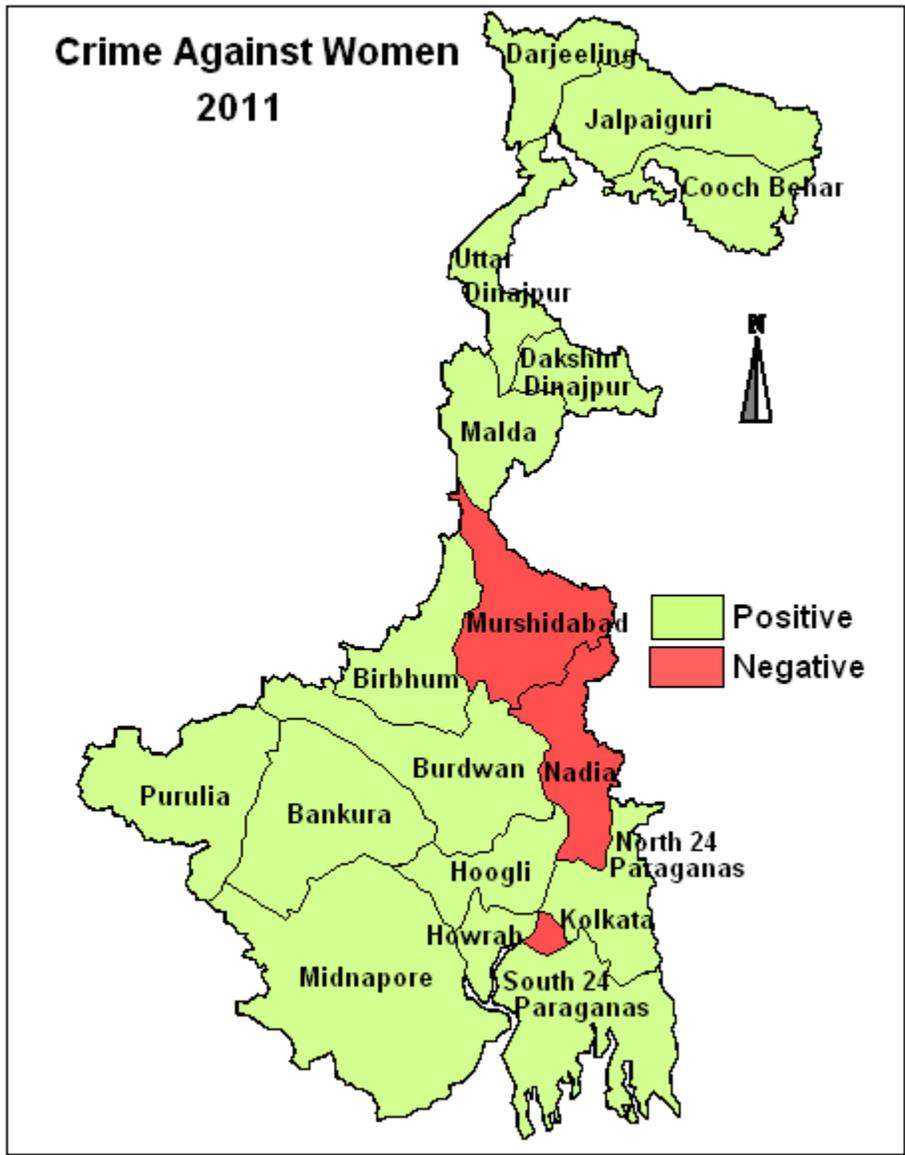
Map above shows the sustainability status of the districts of West Bengal on the basis of higher education. 4 out of 18 (22.22%) districts have positive sustainability status while the remaining 14 out of 18 (77.78%) districts have negative sustainability status. Kolkata, Darjeeling and Hoogli have been the best performers while Uttar Dinajpur, Malda and Nadia have been the worst performers for the year 2011.

**Map 18: Adult Literacy Rate**



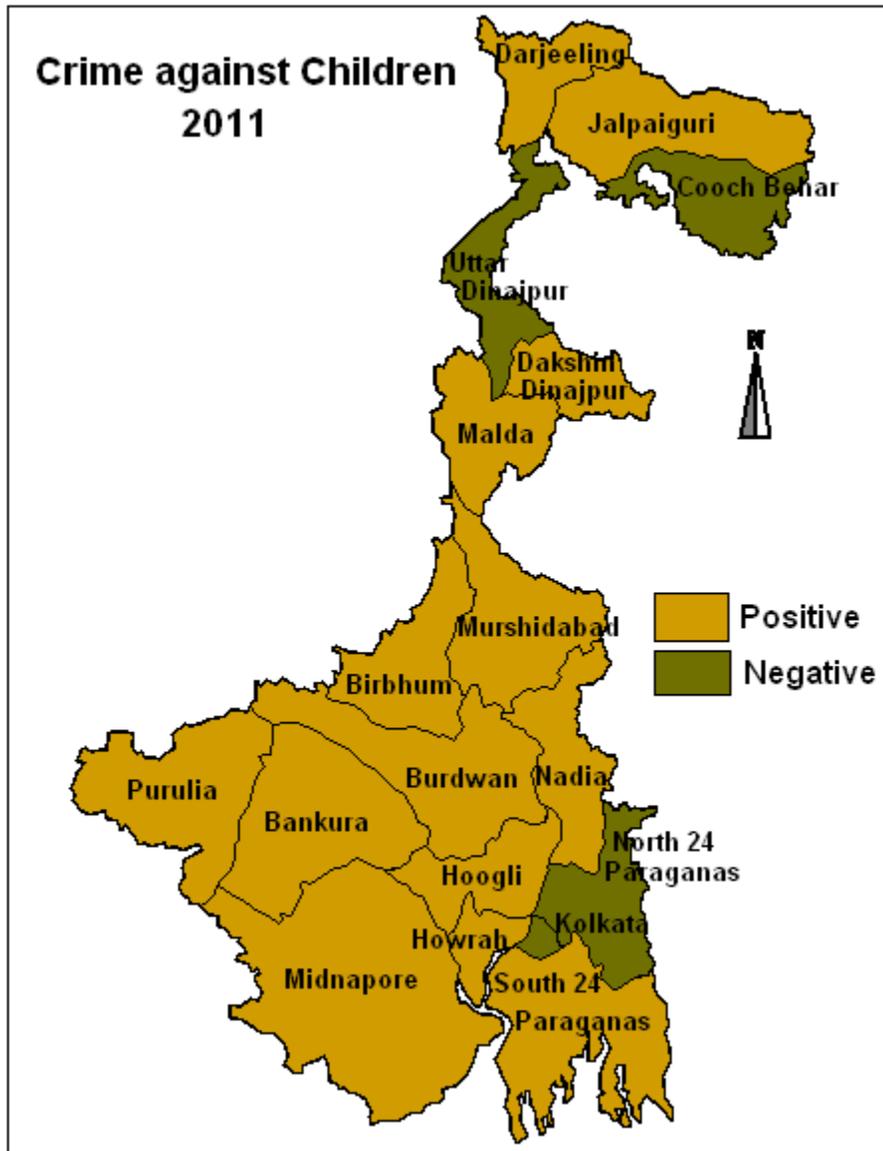
Map above shows the sustainability status of the districts of West Bengal on the basis of adult literacy rate. 8 out of 18 (44.45%) districts have positive sustainability status while 10 out of 18 (55.56%) districts have negative sustainability status. Kolkata, north 24 Paraganas and Howrah have been the best performers while Uttar Dinajpur, Malda and Purulia have been the worst performers for the year 2011.

**Map 19: Crime against Women**



Map above shows the sustainability status of the districts of West Bengal on the basis of crime against women. 15 out of 18 (83.33%) districts have positive sustainability status while the remaining 3 out of 18 (16.67%) districts have negative sustainability status. Purulia, Bankura and Midnapore have been the best performers while Kolkata, Murshidabad and Nadia have been the worst performers for the year 2011.

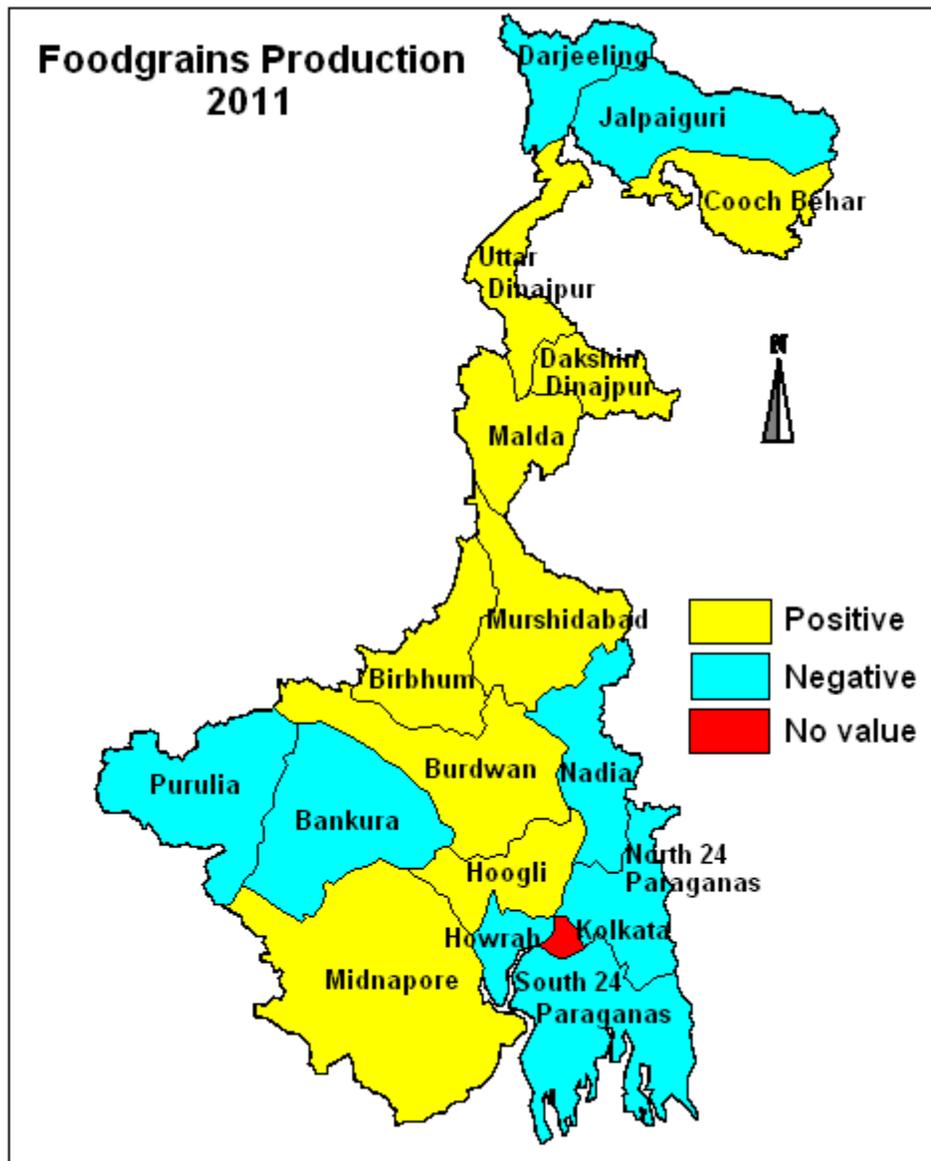
**Map 20: Crime against Children**



Map above shows the sustainability status of the districts of West Bengal on the basis of crime against children. 15 out of 18 (83.33%) districts have positive sustainability status while the remaining 3 out of 18 (16.67%) districts have negative sustainability status. Uttar Dinajpur, North 24 Paraganas and Cooch Behar have been the worst performers for the year 2011.

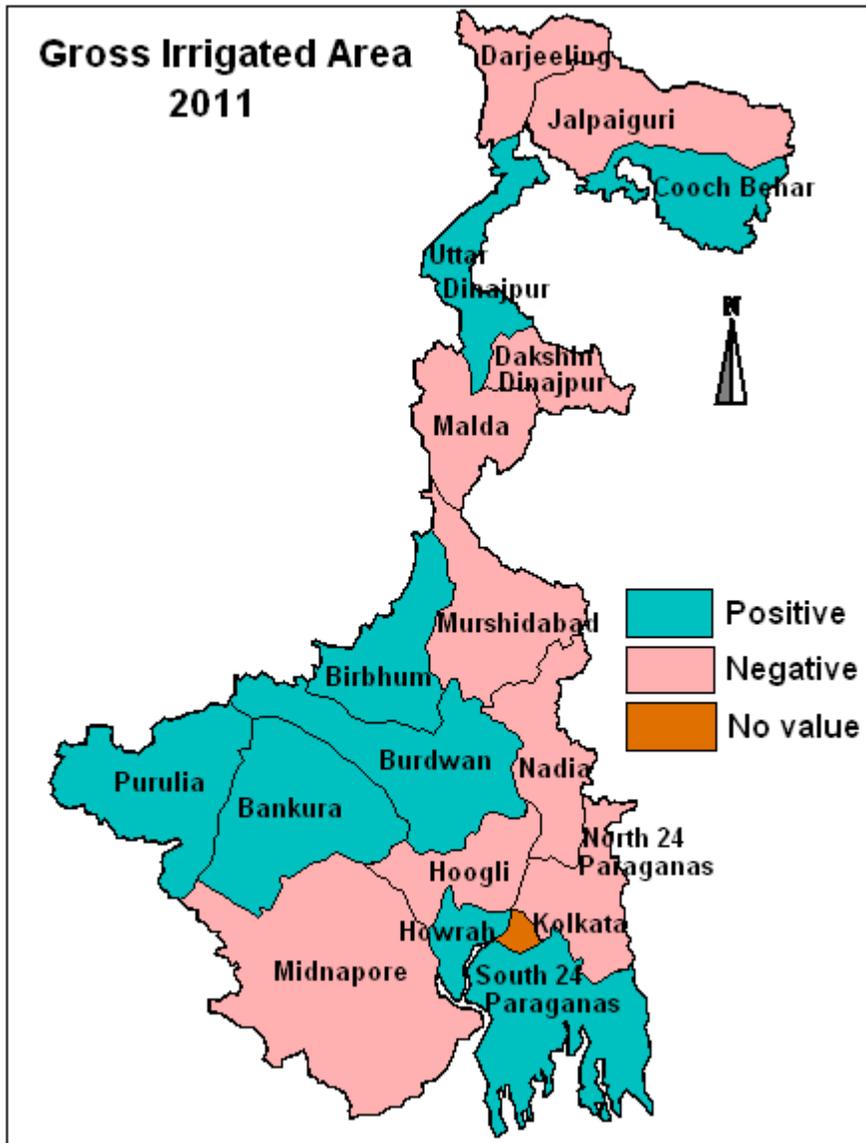
Map based on Environmental Indicators of Sustainable Development:

Map 21: Food grain Production



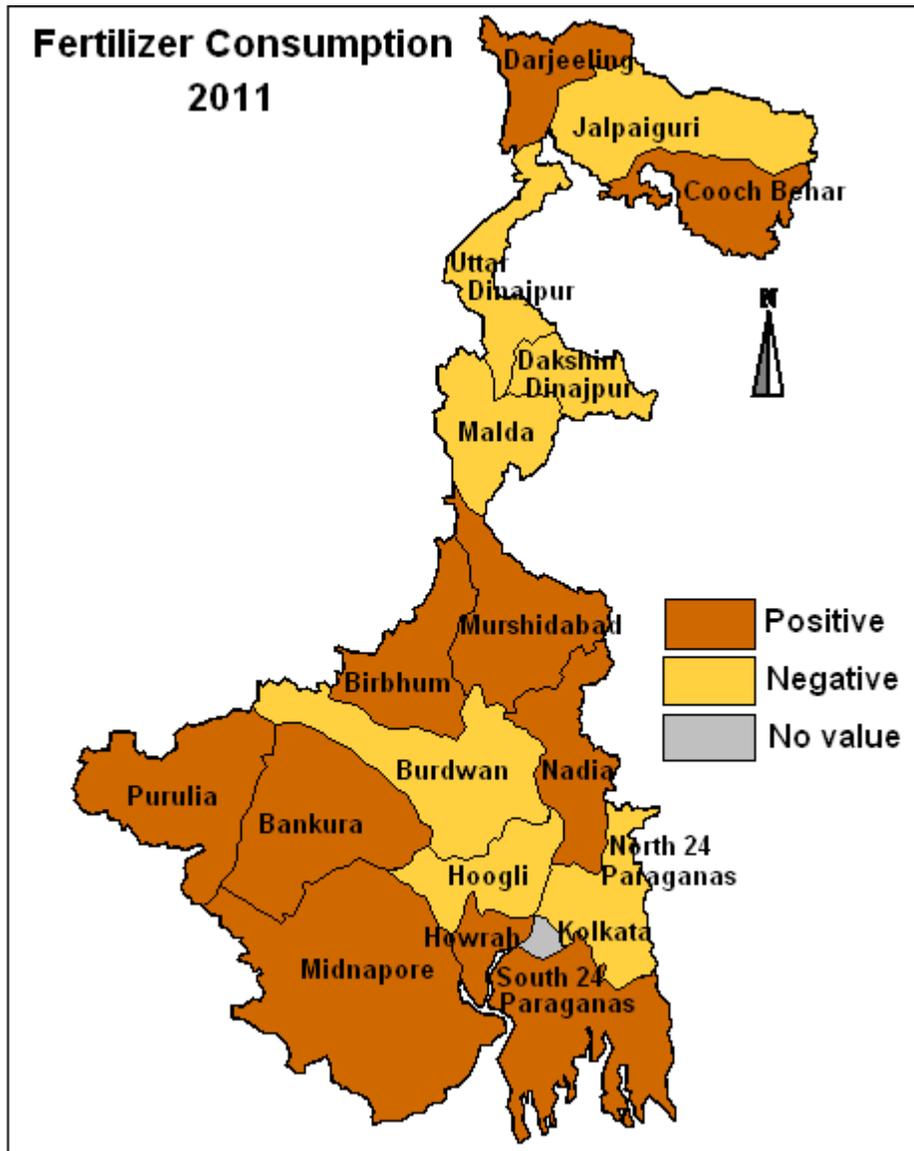
Map above shows the sustainability status of the districts of West Bengal on the basis of food grain production. We did not have the data for Kolkata. 9 out of 17 (52.95%) districts have positive sustainability status while the remaining 8 out of 17 (47.06%) districts have negative sustainability status. Dakshin Dinajpur, Uttar Dinajpur and Midnapore have been the best performers while Howrah, North 24 Paraganas and Darjeeling have been the worst performers for the year 2011.

**Map 22: Gross Irrigated Area**



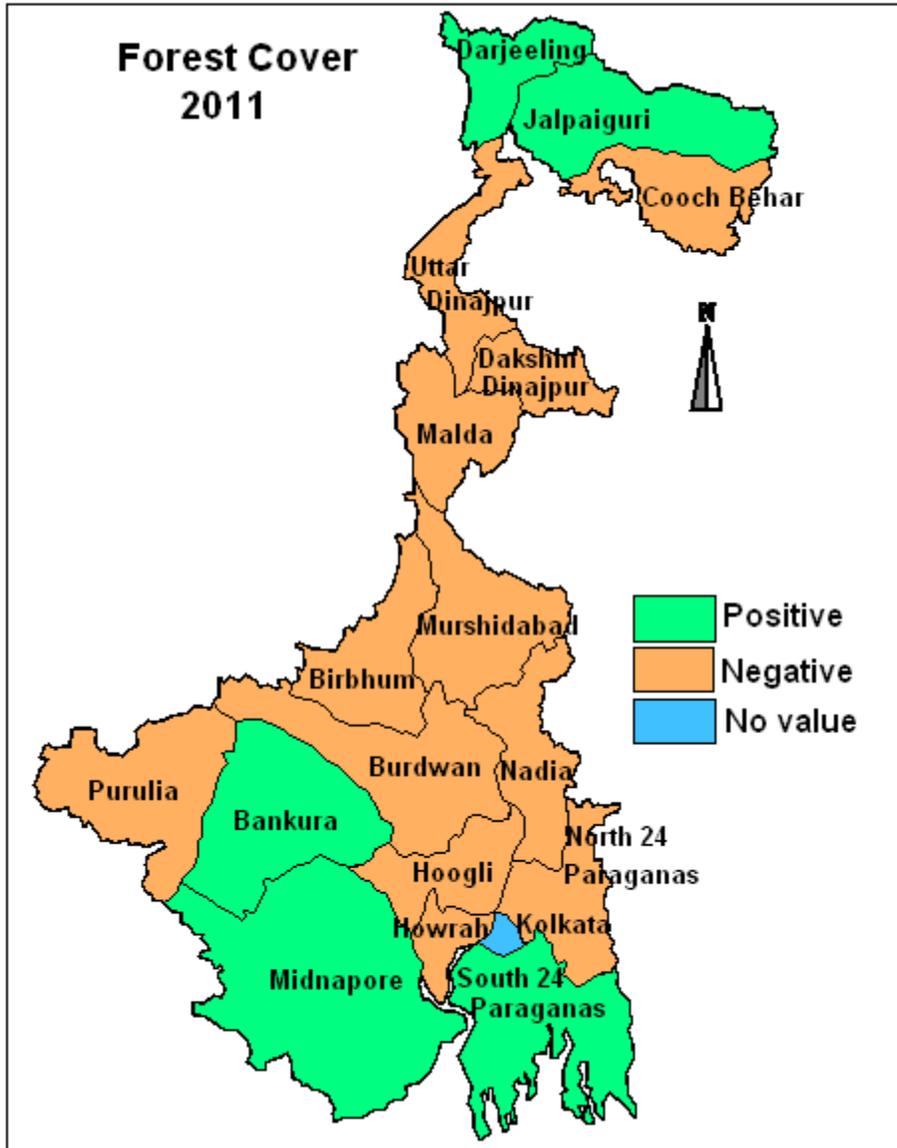
Map above shows the sustainability status of the districts of West Bengal on the basis of gross irrigated area. We did not have the data for Kolkata. 8 out of 17 (47.06%) districts have positive sustainability status while the remaining 9 out of 17 (52.95%) districts have the negative sustainability status. Burdwan, Birbhum and Bankura have been the best performers while Darjeeling, Malda and Nadia have been the worst performers for the year 2011.

**Map 23: Fertilizer Consumption**



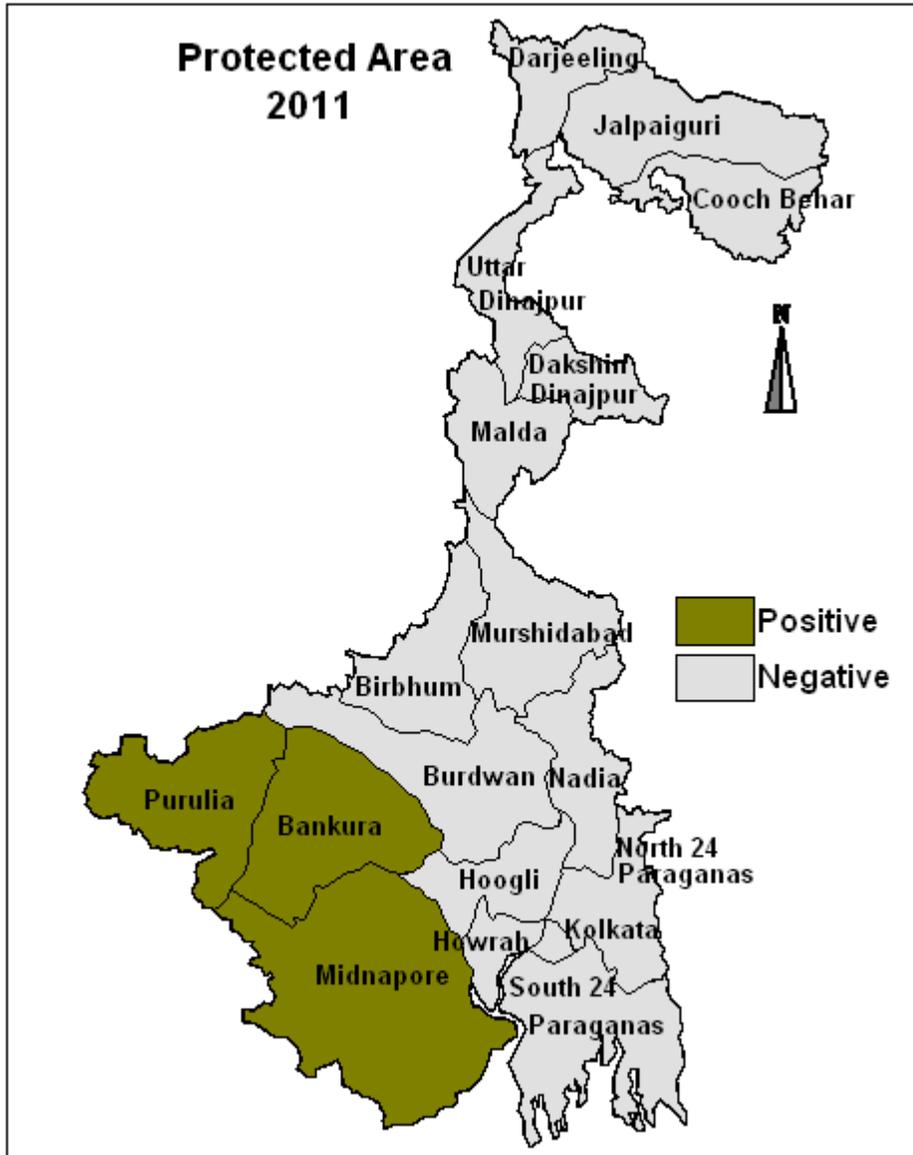
Map above shows the sustainability status of the districts of the West Bengal on the basis of chemical fertilizer consumption. We did not have the data for Kolkata. 10 out of 18 (55.56%) districts have the positive sustainability status while the remaining 8 out of 18 (44.45%) districts have negative sustainability status. Purulia, Cooch Behar and South 24 Paraganas have been the best performers while Hoogli, Jalpaiguri and Malda have been the worst performers for the year 2011.

**Map 24: Forest Cover**



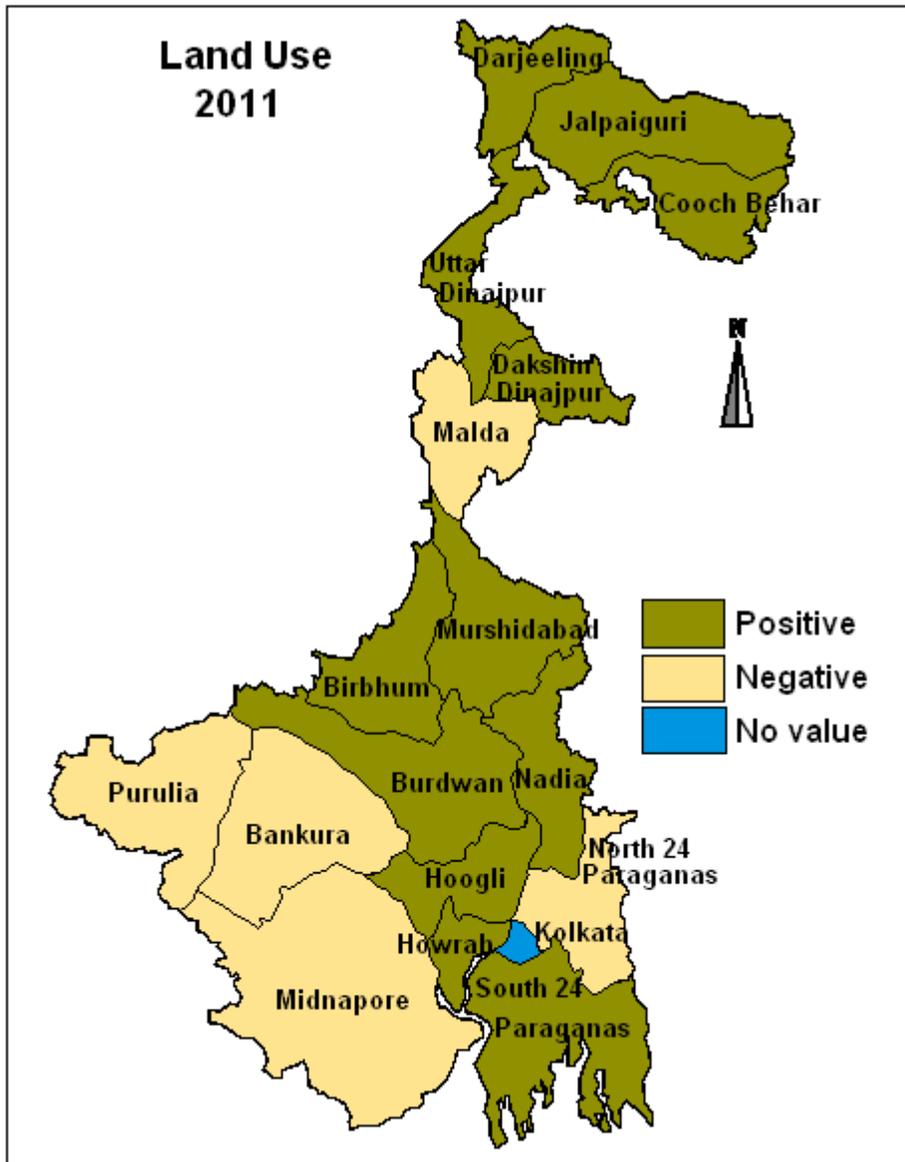
Map above shows the sustainability status of the districts of West Bengal on the basis of forest cover. We did not have the data for Kolkata. 5 out of 17 (29.41%) districts have positive sustainability status while 12 out of 17 (70.59%) districts have negative sustainability status. Darjeeling, Jalpaiguri and South 24 Paraganas have been the best performers while Dakshin Dinajpur, Hoogli and Murshidabad have been the worst performer for the year 2011.

**Map 25: Protected Area**



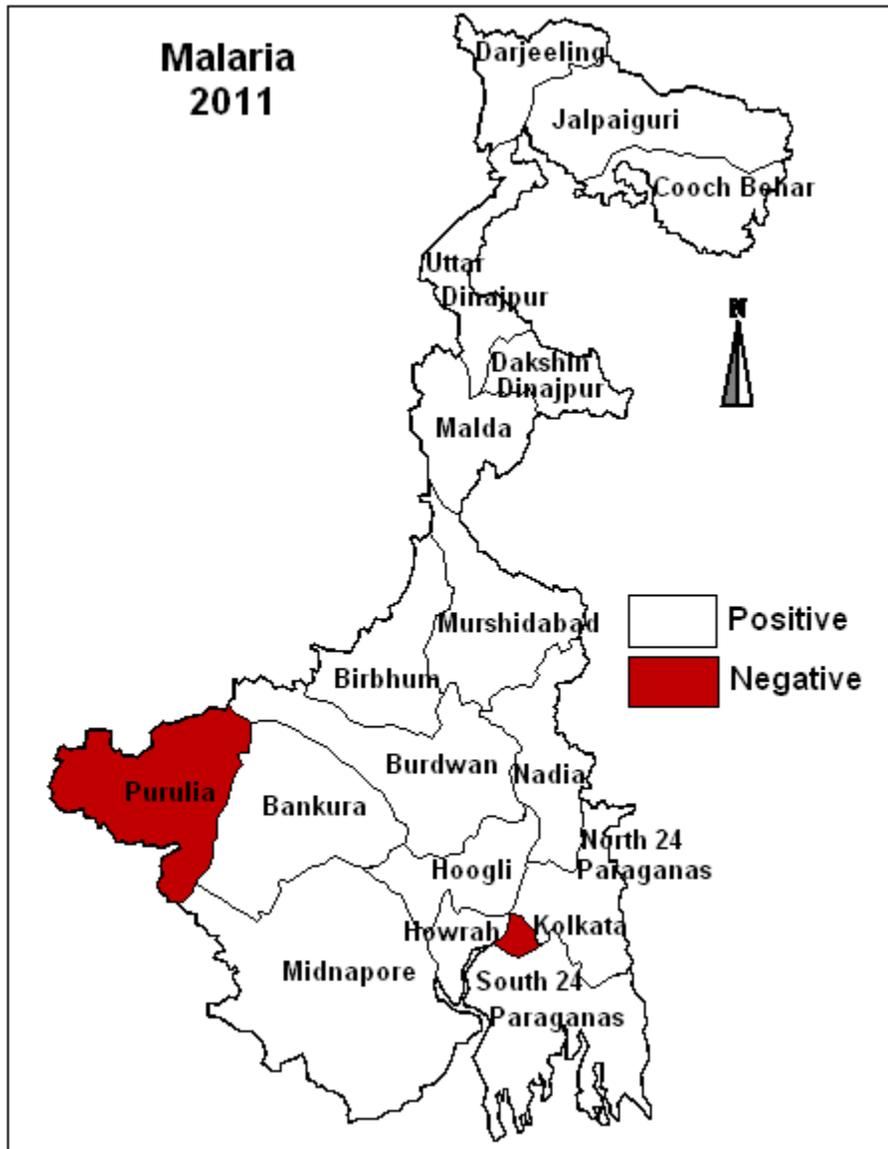
Map above shows the sustainability status of the districts of West Bengal on the basis of protected area. 3 out of 18 (16.67%) districts have positive sustainability status while 15 out of 18 (83.33%) districts have negative sustainability status. Bankura, Midnapore and Purulia have been the best performers while Hoogli, Nadia and Uttar Dinajpur have been the worst performers for the year 2011.

**Map 26: Land Use**



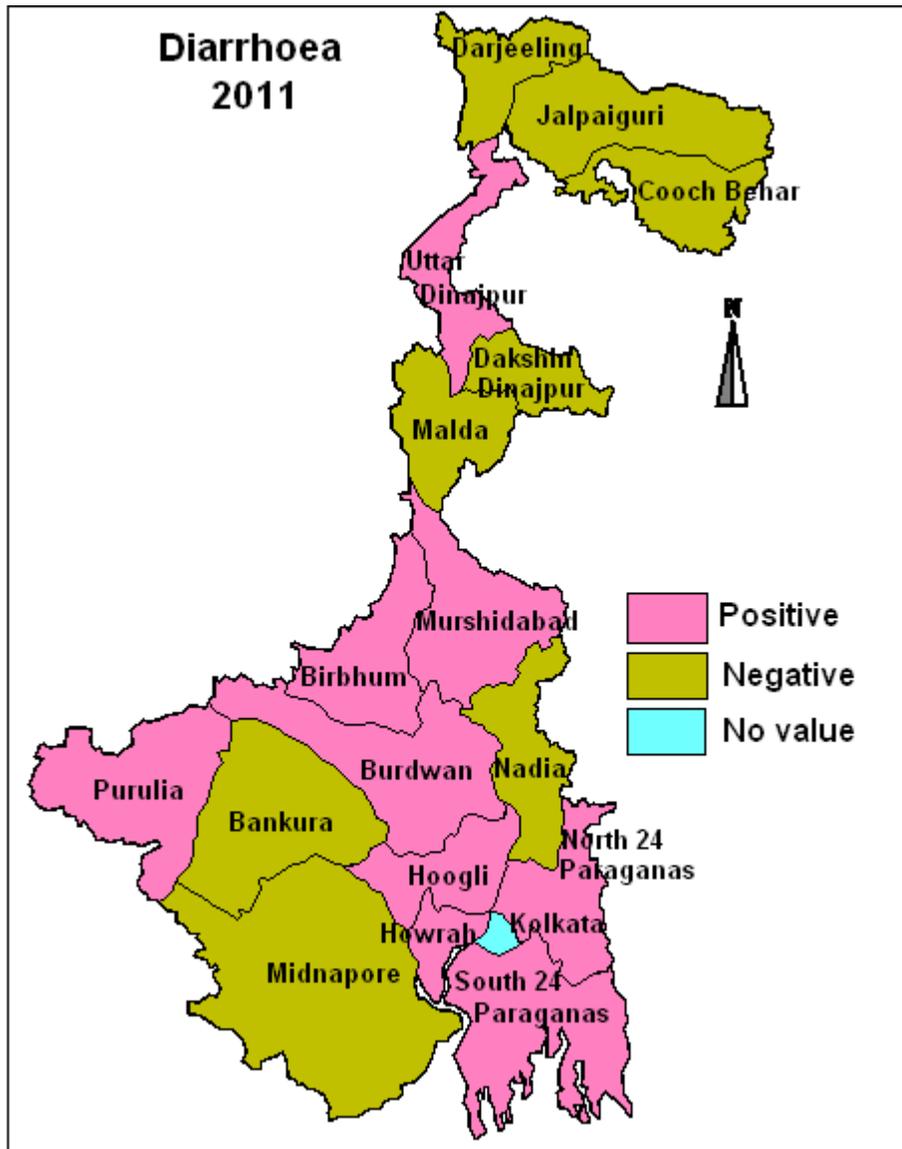
Map above shows the sustainability status of the districts of West Bengal on the basis of land use. We did not have the data for Kolkata. 5 out of 17 (29.41%) districts have positive sustainability status while the remaining 12 out of 17 (70.59%) negative sustainability status for the year 2011. Cooch Behar, Uttar Dinajpur and Murshidabad have been the best performers while Purulia, Bankura and Malda have been the worst performers for the year 2011.

**Map 27: Malaria**



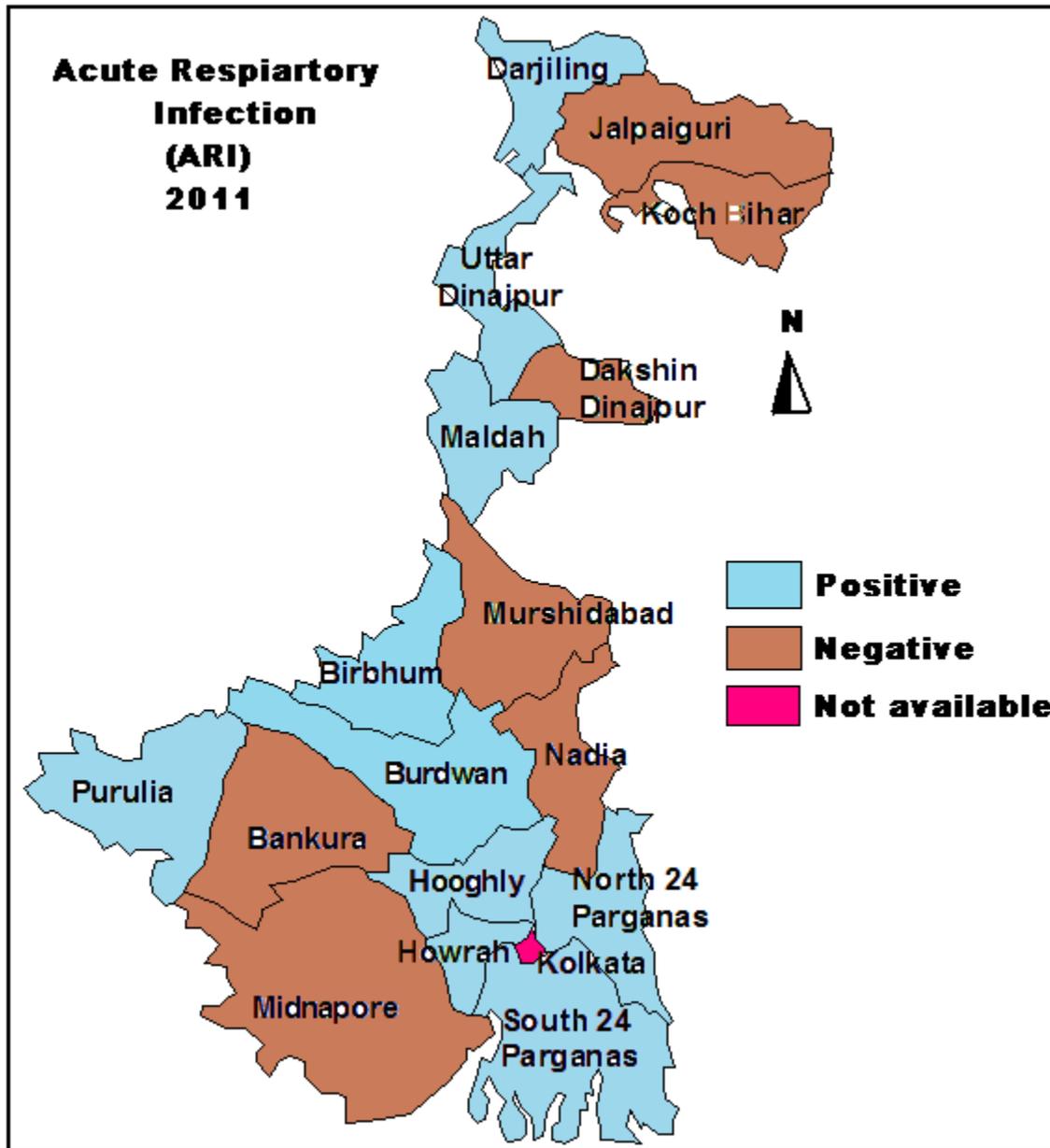
Map above shows the sustainability status of the districts of West Bengal on the basis of reported cases of malaria. 16 out of 18 (88.89%) districts have positive sustainability status while the remaining 2 out of 18 (11.11%) districts have negative sustainability status. Burdwan, Uttar Dinajpur and Hoogli have been the best performers while Kolkata, Purulia and Jalpaiguri have been the worst performers for the year 2011.

**Map 28: Diarrhoea**



Map above shows the sustainability status of the districts of West Bengal on the basis of reported cases of diarrhoea. We did not have the data for Kolkata. 9 out of 17 (52.94%) districts have positive sustainability status while the remaining 8 out of 17 (47.08%) districts have negative sustainability status. South 24 Paraganas, Hoogli and Birbhum have been the best performers while Cooch Behar, Malda and Bankura have been the worst performers for the year 2011.

**Map 29: Acute Respiratory Infection**

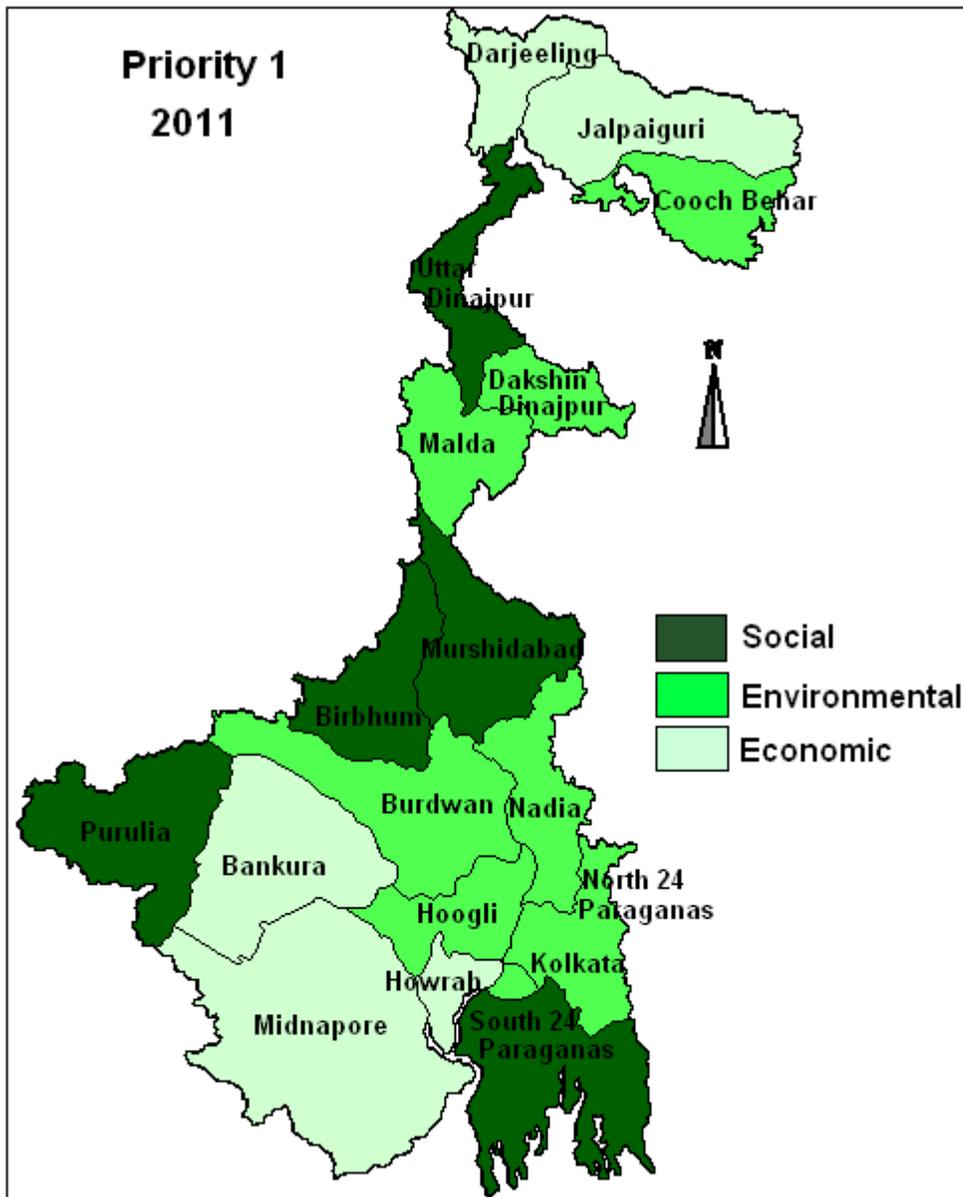


Map above shows the sustainability status of the districts of West Bengal on the basis of acute respiratory infection (ARI). We did not have the data for Kolkata. 10 out of 17 (58.82%) districts have positive sustainability status while the remaining 7 out of 17 (41.77%) districts have negative sustainability status. Birbhum, Uttar Dinajpur and Howrah have been the best performers whereas Cooch Behar, Dkashin Dinajpur and Nadia have been the worst performers for the year 2011.

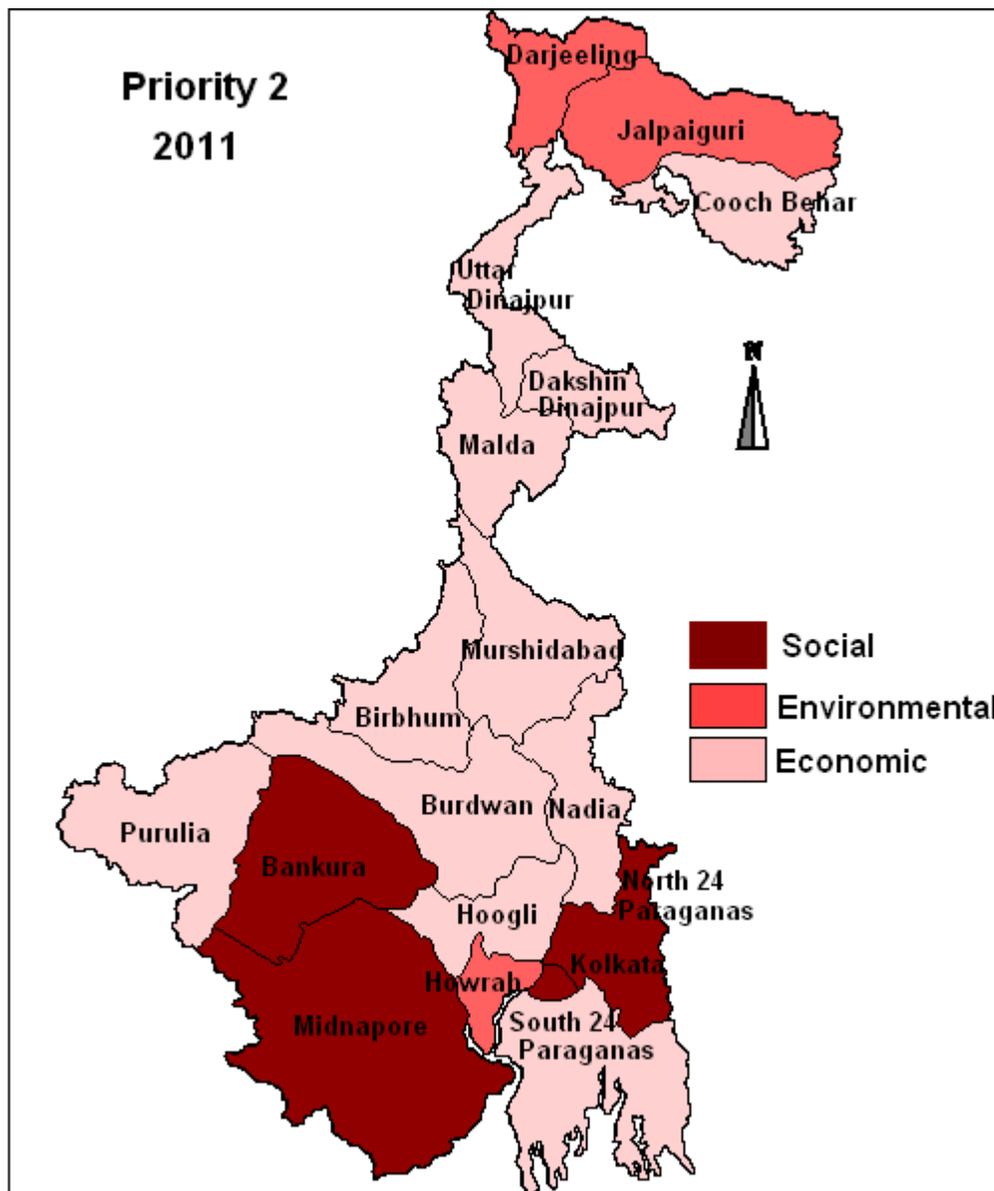
## Priority:

Based on the Relative Representation Index (RRI), we prepared three priority maps. For every district, three sustainability indicators having least Relative Representation (RRI) index (Roy, et al.2006, 2007, 2009) values has been defined as issues of concern, with the indicators having the lowest value been given the highest priority.

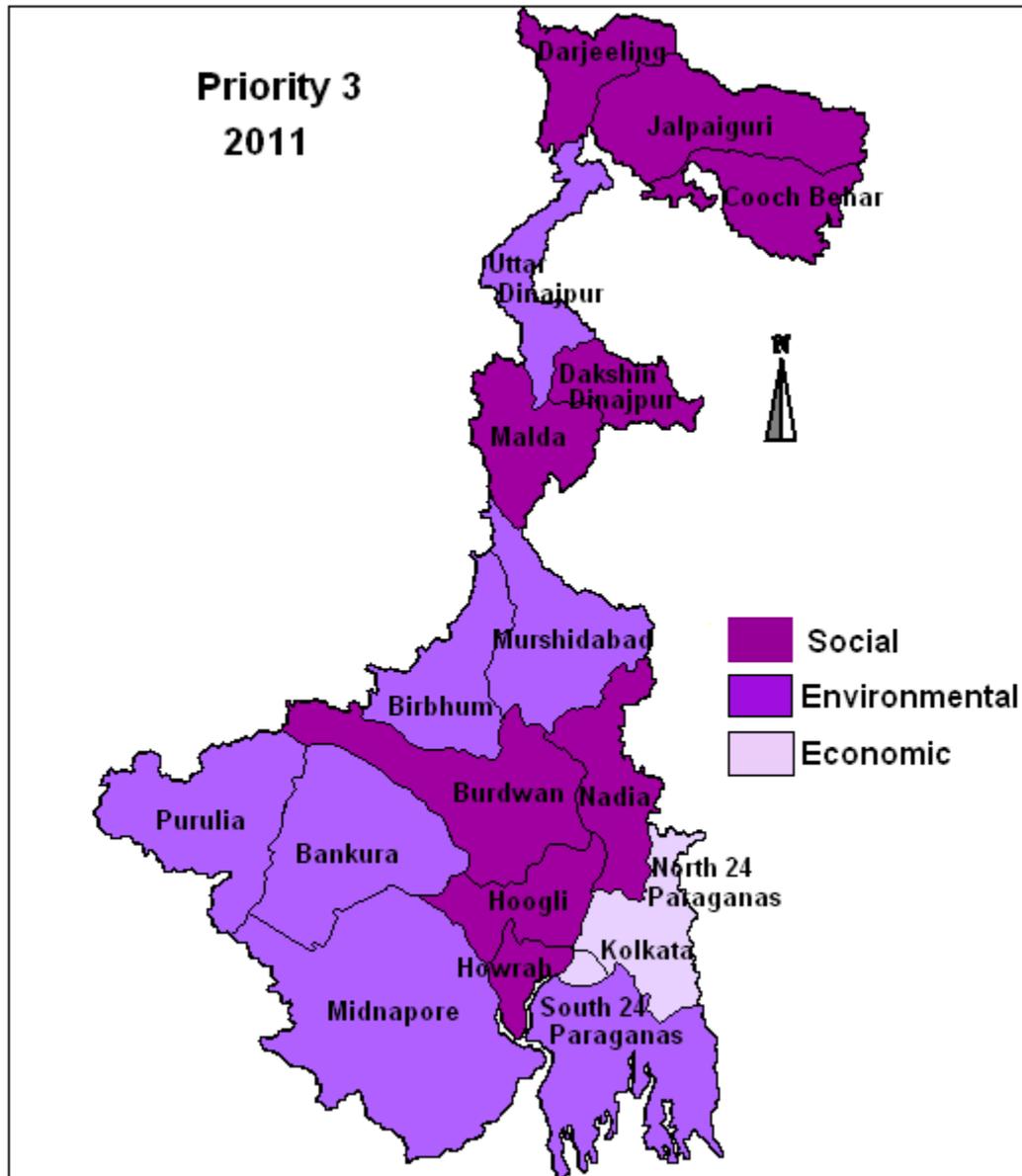
Map 30: Priority 1



**Map 31: Priority 2**



### Map 32: Priority 3



Map 28, 29 and 30 can be of immense help to policy makers when they try to prioritize development action which will help the districts to achieve sustainability.

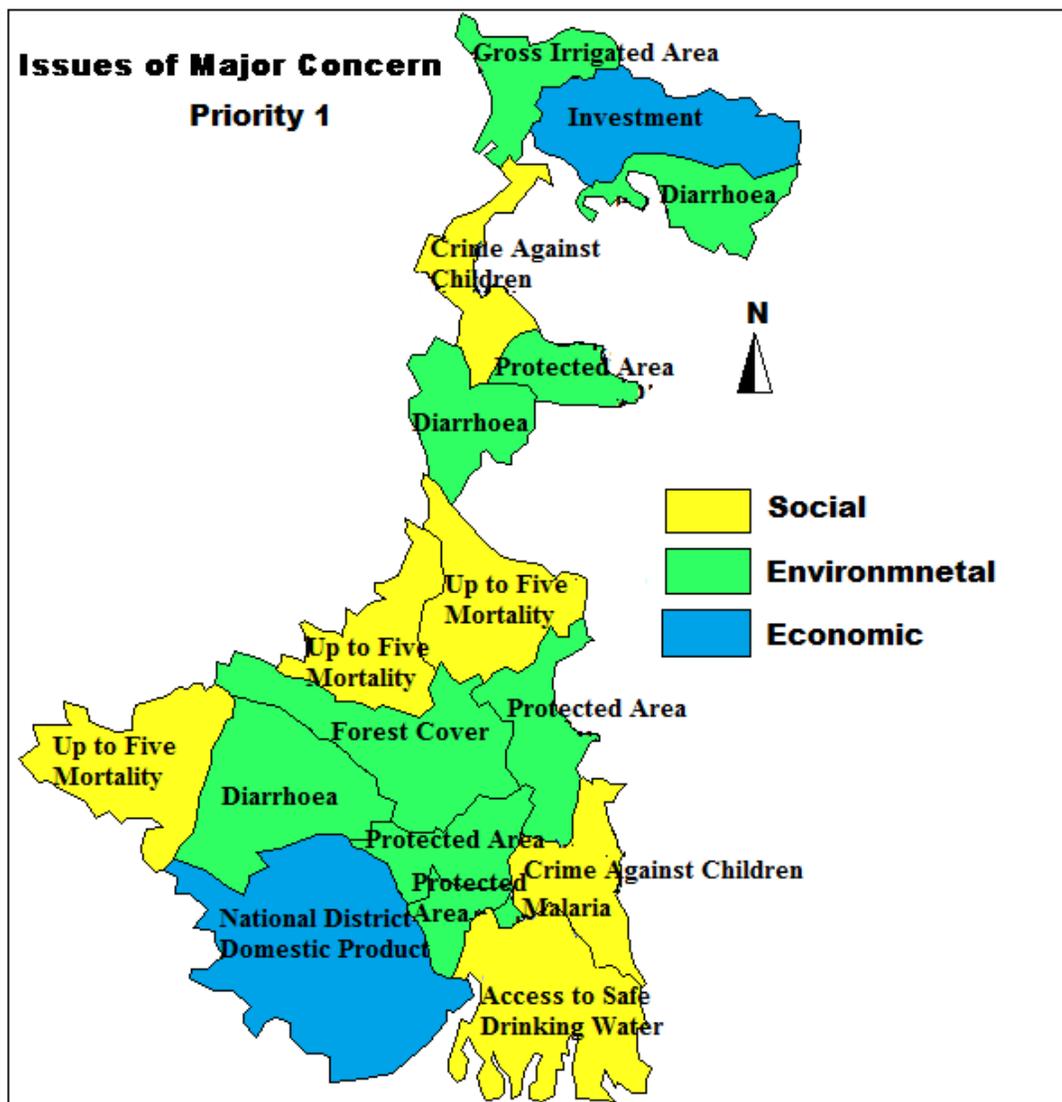
- As many as eight (8) districts have environmental issues as the primary issues of concern. Similarly, five (5) districts have social issues as primary issues of concern and five (5) districts have economic issues as primary issues of concern.
- As many as eleven (11) districts have economic issues as secondary issues of concern. Four (4) districts have social issues as secondary issues of concern and three (3) districts have environmental issues as secondary issues of concern.

- As many as nine (9) districts have social issues as least issues of concern. Seven (7) districts have environmental issues as least issues of concern and two (2) districts have economic issues as least issues of concern.

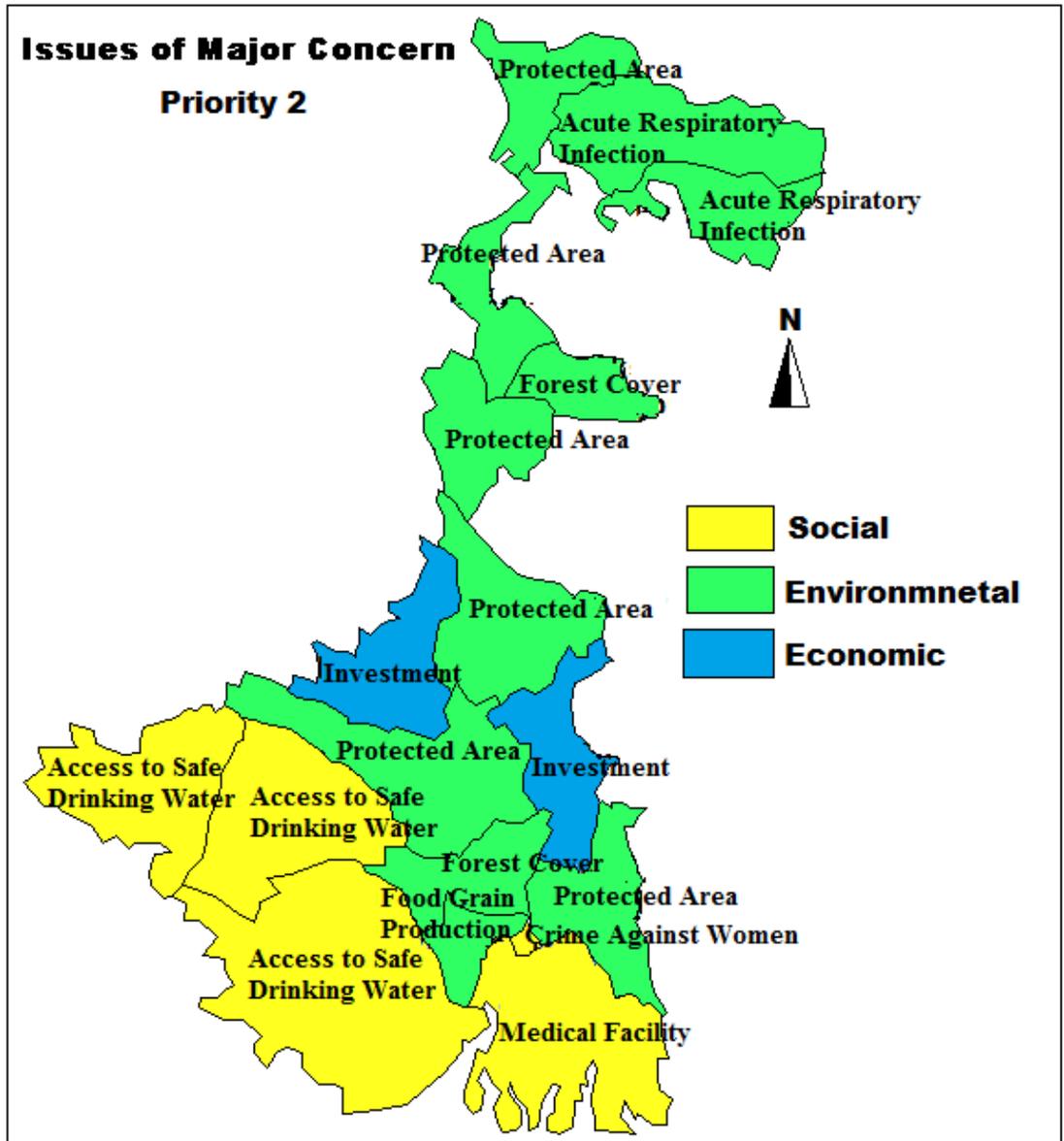
## ***Issues of concern and policy Recommendation:***

We have defined an issue of concern for a district as that for which the value of the Relative Representation Index (RRI) is minimum. Hence that district has performed poorly with respect to that indicator relative to the other indicators and is deviating away from the path of achieving sustainability. So to bring it back on the path of achieving sustainable development, policies have to be designed keeping in mind the issue of concern. The findings presented in this section reveal that different districts have different issues of concern. So there can be no blanket policy recommendation to solve the issues. Rather, a judicious combination of different policies for different districts can help to move along the right path of achieving sustainability. Map show the issues of concern of topmost priority followed by second and third priorities for the districts.

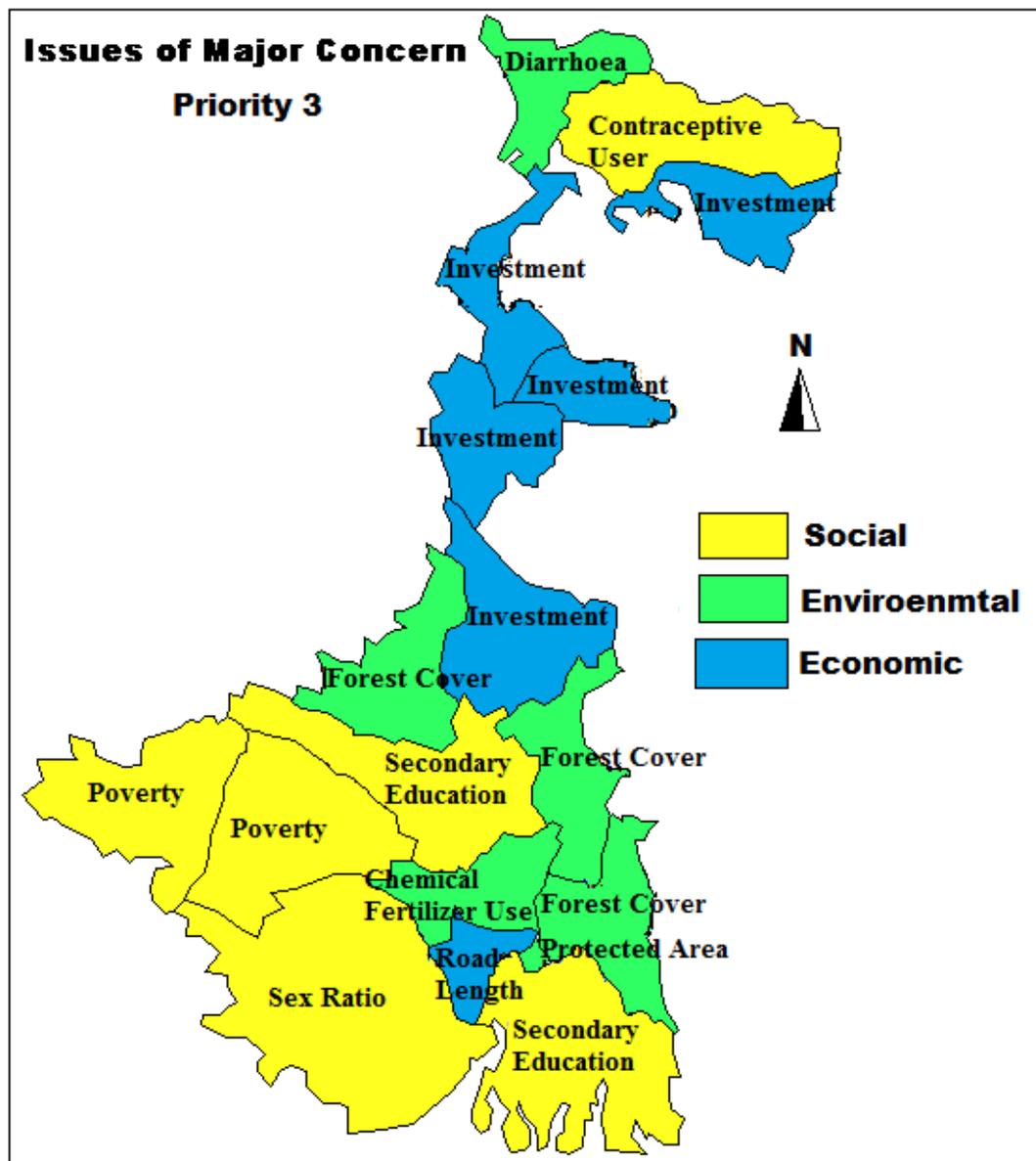
**Map 33: Issues of Major Concern, Priority 1**



**Map 34: Issues of Major Concern, Priority 2**



**Map 35: Issues of Major Concern, Priority 3**



- Among the environmental issues of concern, the ones that figure the maximum number of times are protected area, forest cover and reported cases of diarrhoea.
- Among the social issues of concern, access to safe drinking water and up to five (5) mortality is the most issues of concern.
- Among economic issues of concern, the ones that dominate are investments.

## ***Conclusion:***

This analysis helps us to identify the top three issues of concern for the districts of West Bengal. This becomes important from the context of a policy maker who has at his disposal, a limited amount of fund that he can allocate to address the issues of concern. The top three issues of concern are as follows:

- I. Declining amount of Protected Area.
  - II. Lack of Investment.
  - III. Declining amount of Forest Cover.
- Adequate policy intervention addressing these issues will help the districts to move in the right direction on the sustainable development pathway.
  - This analysis can be used as a tool to mainstream environmental and climate change actions in development agenda.
  - Similar exercise can be conducted for each of the block level or for that matter any administrative level.

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