

# Assessment of Domestic Pollution Load from Urban Agglomeration in Ganga Basin: Gandak and Kosi Sub-Basin

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**GRBMP: Ganga River Basin Management Plan**  
*by*

**Indian Institutes of Technology**



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Bombay**



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## Preface

In exercise of the powers conferred by sub-sections (1) and (3) of Section 3 of the Environment (Protection) Act, 1986 (29 of 1986), the Central Government has constituted National Ganga River Basin Authority (NGRBA) as a planning, financing, monitoring and coordinating authority for strengthening the collective efforts of the Central and State Government for effective abatement of pollution and conservation of the river Ganga. One of the important functions of the NGRBA is to prepare and implement a Ganga River Basin Management Plan (GRBMP).

A Consortium of 7 Indian Institute of Technology (IIT) has been given the responsibility of preparing Ganga River Basin Environment Management Plan (GRBMP) by the Ministry of Environment and Forests (MoEF), GOI, New Delhi. Memorandum of Agreement (MoA) has been signed between 7 IITs (Bombay, Delhi, Guwahati, Kanpur, Kharagpur, Madras and Roorkee) and MoEF for this purpose on July 6, 2010.

This report is one of the many reports prepared by IITs to describe the strategy, information, methodology, analysis and suggestions and recommendations in developing Ganga River Basin Management Plan (GRB EMP). The overall Frame Work for documentation of GRBMP and Indexing of Reports is presented on the inside cover page.

There are two aspects to the development of GRB EMP. Dedicated people spent hours discussing concerns, issues and potential solutions to problems. This dedication leads to the preparation of reports that hope to articulate the outcome of the dialog in a way that is useful. Many people contributed to the preparation of this report directly or indirectly. This report is therefore truly a collective effort that reflects the cooperation of many, particularly those who are members of the IIT Team. Lists of persons who have contributed directly and those who have taken lead in preparing this report is given on the reverse side.

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## Lead Persons

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2. Purnendu Bose, IIT Kanpur
3. Shashikant Patel, IIT Kanpur

The Kosi basin is bounded on the north by the Himalayas, on the east by Mahananda basin, on the west by the Burhi Gandak basin and on the south by the river Ganga. The basin extends over areas of districts Saharsa, Purnea, Khagaria, Madhubani, Sitamarhi, Muzaffarpur and Darbhanga in Bihar state. Kosi (main stem), Kamla Balan Adhwara, Group of riversan Bagmati are the most important rivers in this basin

| Class of Town | Name                  | Total Area (sq. km) | Population (as in 2011) |
|---------------|-----------------------|---------------------|-------------------------|
| Class I       | Muzzafarpur           | 26.43               | 330560                  |
| Class I       | Dharbhanga            | 19.18               | 318144                  |
| Class I       | Chhapra               | 16.96               | 201597                  |
| Class I       | Siwan                 | 15.68               | 134221                  |
| Class I       | Bettiah               | 11.55               | 132928                  |
| Class II      | Dumra                 | 6                   | 55215                   |
| Class II      | Sitamarhi town        | 8                   | 87279                   |
| Class II      | Gopalganj             | 11.11               | 66624                   |
| Class III     | Motipur               | 12.77               | 26852                   |
| Class III     | kanti                 | 6.6                 | 25542                   |
| Class III     | Birganja              | 5.5                 | 42500                   |
| Class III     | Belsand               | 4                   | 20000                   |
| Class III     | Jonakpur road (Purpi) | 5                   | 18000                   |

Table1: Demographic details of Major urban centres in Gandak – Kosi sub basin

#### Pollution Load from the major urban centers

The details of the ground/surface water utilization were obtained from the various government bodies. The total domestic sewage is calculated on the basis of the field survey and actual flow measurements in all the major drains (as measured on the day of visit). The parameters BOD, COD and TKN are estimated based on per capita contribution.

As per the data available from Jal Nigam/Nagar Nigam none of the other major urban cities have an installed STP. All the sewage carried by the domestic drains are discharged into the river without any treatment.

The pollution load on the river in terms of BOD<sub>5</sub>, COD and TKN is estimated based on the per capita contribution for all the major cities. *Figure 1a & 1b* shows the pollution load from major urban centers in Gandak – Kosi sub basin. *Table 2* gives the details of the pollution load from the major urban centers in Gandak – Kosi sub basin.

| Class        | BOD (kg/day)   | COD (kg/day)   | TKN (kg/day)   |
|--------------|----------------|----------------|----------------|
| I            | 2418.4         | 2902.0         | 9599.9         |
| II           | 14687.4        | 17624.8        | 1882.1         |
| III          | 33223.5        | 39868.2        | 1196.0         |
| <b>Total</b> | <b>50329.2</b> | <b>60395.1</b> | <b>12678.0</b> |

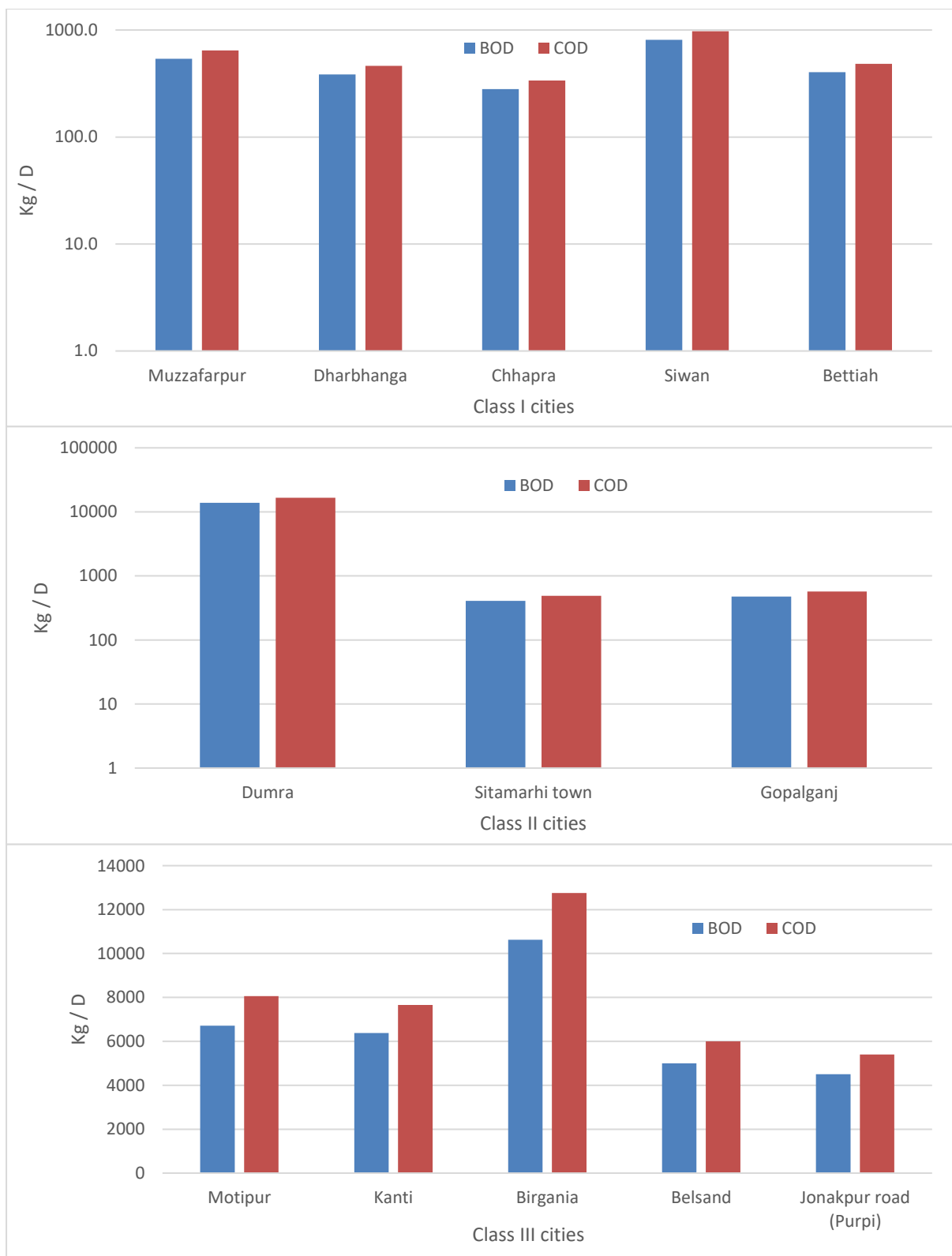


Fig 1a: Contribution of Pollution Load (BOD, COD from Class I, II, III Cities)

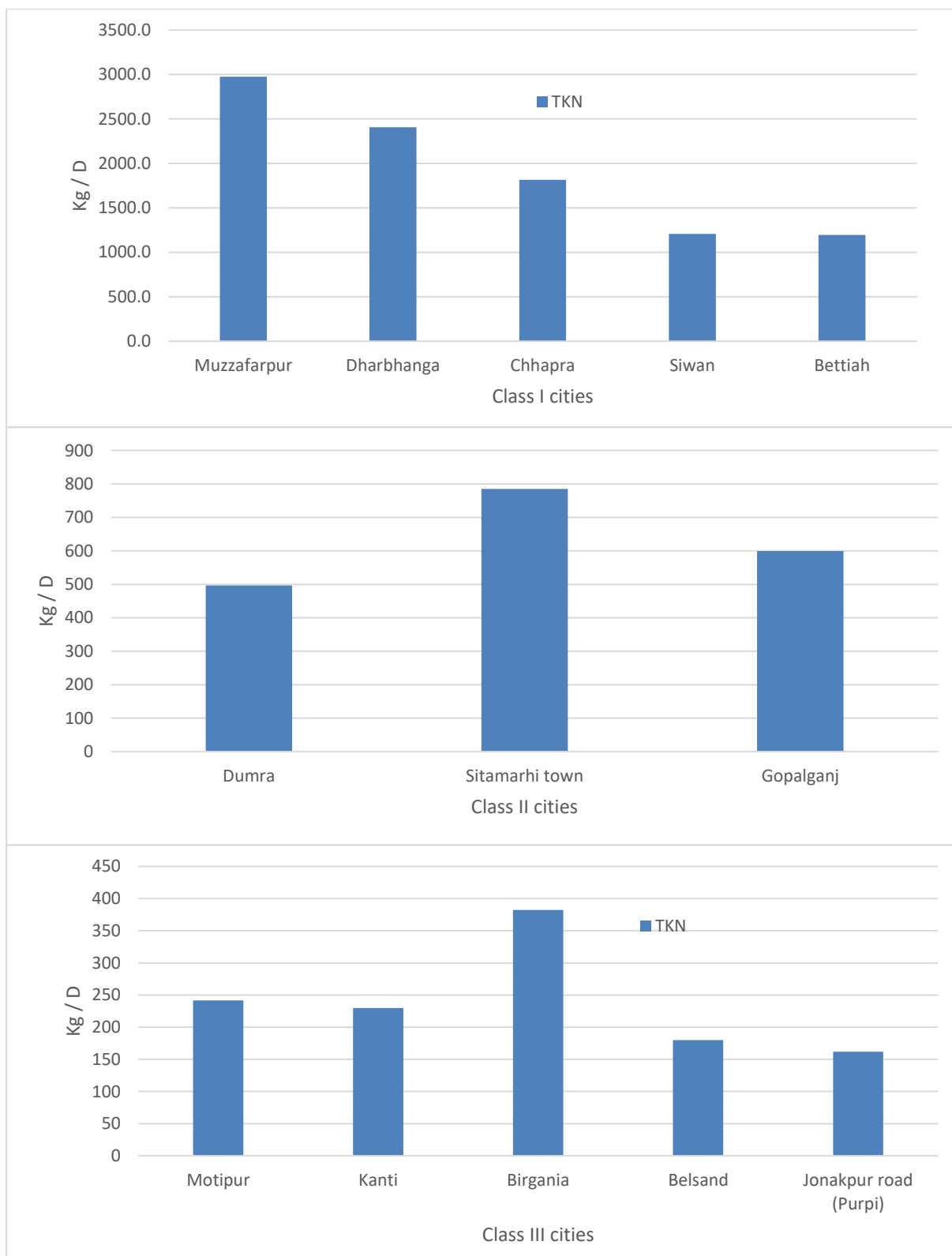


Fig 1b: Contribution of Pollution Load (TKN from Class I, II, III Cities)





## **Water Balance & Pollution Load (Domestic) Fact Sheet**

**City: Muzaffarpur Town**

**State: Bihar**

| S.<br>No. | Items                                                                | Value                   |
|-----------|----------------------------------------------------------------------|-------------------------|
| 1         | Total Area (sq km)                                                   | : 26.43                 |
| 2         | Population as in 2011                                                | : 330560                |
| 3         | Population Growth Rate as in 2011 (%)                                | : ..                    |
| 4         | Total Number of Wards                                                | : 49                    |
| 5         | Population per Ward (Thousands)                                      | : 6,746                 |
| 6         | Total Number of Household as in 2011                                 | : 49922                 |
| 7         | Number of Household per Ward                                         | : 1019                  |
| 8         | Surface Water Supply (MLD)                                           | : NIL                   |
| 9         | Ground Water (GW) Supply (MLD)                                       | : 29.5                  |
| 10        | Number of Bore Wells                                                 | : 25                    |
| 11        | Ground Water Extraction per Bore Well (MLD)                          | : 5                     |
| 12        | Number of Hand Pumps                                                 | : 10000                 |
| 13        | Ground Water Extraction per Hand Pump (lpd)                          | : 500                   |
| 14        | Number of Pumping Stations for Water Supply                          | : 4                     |
| 15        | Total Pumping Capacity (MLD)                                         | : NIL                   |
| 16        | Average Water Supply Rate from ULB Sources (lpcd)                    | : 80.20256877           |
| 17        | Total Water Supply from ULB and Non-ULB Sources (MLD)                | : 34.5                  |
| 18        | Average Water Supply Rate from ULB & Non-ULB Sources (lpcd)          | : 104.4                 |
| 19        | Total Sewage Generation (MLD)                                        | : 27.6                  |
| 20        | Per Capita Sewage Generation (lpcd)                                  | : 83.5                  |
| 21        | Sewage Collection (MLD)                                              | : NA                    |
| 22        | Percentage of Sewage Collection (%)                                  | : NA                    |
| 23        | Number of STPs                                                       | : NA                    |
| 24        | Total Installed Capacity of STPs under GAP I & II (MLD)              | : NA                    |
| 25        | Current Utilized Capacity of STPs (MLD)                              | : NA                    |
| 26        | Percentage Utilization of Installed Capacity (%)                     | : NA                    |
| 27        | Capacity of STPs Sanctioned under JNNURM & Others (MLD)              | : NA                    |
| 28        | Pollution Load (Domestic) (Method 1: Actual Flow) (kg/d)             | BOD <sub>5</sub> : NA   |
|           |                                                                      | COD : NA                |
|           |                                                                      | TKN : NA                |
| 29        | Pollution Load (Domestic) (Method 2: Per Capita Contribution) (kg/d) | BOD <sub>5</sub> : NA   |
|           |                                                                      | COD : NA                |
|           |                                                                      | TKN : NA                |
| 30        | Wastewater Disposal Means                                            | : River & Land Disposal |
| 31        | Name of River/Streams for Wastewater Disposal                        | : Gandak River          |
| 32        | Number of Drains/Nallah for Wastewater Disposal                      | : 20                    |
| 33        | Number of Water Bodies                                               | : 14                    |
| 34        | Gross Area of Water Bodies (sq km)                                   | : 3.01635               |
| 35        | Area of Water Bodies as % of Total Area                              | : <<1.0                 |

## **Water Balance & Pollution Load (Domestic) Fact Sheet**

**City: Darbanga**

**State: Bihar**

| <b>S. No.</b> | <b>Items</b>                                                         | <b>Value</b>             |
|---------------|----------------------------------------------------------------------|--------------------------|
| 1             | Total Area (sq km)                                                   | : <b>19.18</b>           |
| 2             | Population as in 2001                                                | : 2,67,348               |
| 3             | Population Growth Rate as in 2011 (%)                                | : 19.00                  |
| 4             | Total Number of Wards                                                | : 48                     |
| 5             | Population per Ward (Thousands)                                      | : 5,570                  |
| 6             | Total Number of Household as in 2001                                 | : 41,578                 |
| 7             | Number of Household per Ward                                         | : 866                    |
| 8             | Surface Water Supply (MLD)                                           | : 0                      |
| 9             | Ground Water (GW) Supply (MLD)                                       | : 13.37                  |
| 10            | Number of Tube Wells                                                 | : 8                      |
| 11            | Ground Water Extraction per Tube Well (MLD)                          | : 4.5                    |
| 12            | Number of Hand Pumps                                                 | : 3000                   |
| 13            | Ground Water Extraction per Hand Pump (lpd)                          | : 10000                  |
| 14            | Number of Pumping Stations for Water Supply                          | : 4                      |
| 15            | Total Pumping Capacity (MLD)                                         | : 1.7                    |
| 16            | Average Water Supply Rate from ULB Sources (lpcd)                    | : 50                     |
| 17            | Total Water Supply from ULB and Non-ULB Sources (MLD)                | : 43.4                   |
| 18            | Average Water Supply Rate from ULB & Non-ULB Sources (lpcd)          | : 162.2                  |
| 19            | Total Sewage Generation (MLD)                                        | : 34.7                   |
| 20            | Per Capita Sewage Generation (lpcd)                                  | : 129.8                  |
| 21            | Sewage Collection (MLD)                                              | : NA                     |
| 22            | Percentage of Sewage Collection (%)                                  | : NA                     |
| 23            | Number of STPs                                                       | : NA                     |
| 24            | Total Installed Capacity of STPs under GAP I & II (MLD)              | : NA                     |
| 25            | Current Utilized Capacity of STPs (MLD)                              | : NA                     |
| 26            | Percentage Utilization of Installed Capacity (%)                     | : NA                     |
| 27            | Capacity of STPs Sanctioned under JNNURM & Others (MLD)              | : NA                     |
| 28            | Pollution Load (Domestic) (Method 1: Actual Flow) (kg/d)             | BOD <sub>5</sub> : NA    |
|               |                                                                      | COD: NA                  |
|               |                                                                      | TKN: NA                  |
| 29            | Pollution Load (Domestic) (Method 2: Per Capita Contribution) (kg/d) | BOD <sub>5</sub> : 385.0 |
|               |                                                                      | COD: 462.0               |
|               |                                                                      | TKN: 2406.1              |
| 30            | Wastewater Disposal Means                                            | : River & Land Disposal  |
| 31            | Name of River/Streams for Wastewater Disposal                        | : -                      |
| 32            | Number of Drains/Nallah for Wastewater Disposal                      | : 19                     |
| 33            | Number of Water Bodies                                               | : 206                    |
| 34            | Gross Area of Water Bodies (sq km)                                   | : 4.16                   |
| 35            | Area of Water Bodies as % of Total Area                              | : 21.69                  |

**Water Balance & Pollution Load (Domestic) Fact Sheet**  
**City: Chhapra** **State: Bihar**

| S. | Items                                                                | Value                              |
|----|----------------------------------------------------------------------|------------------------------------|
| 1  | Total Area (sq km)                                                   | : 16.96                            |
| 2  | Population as in 2011/2001                                           | : 201597/                          |
| 3  | Population Growth Rate as in 2011 (%)                                | : 12.73                            |
| 4  | Total Number of Wards                                                | : 44                               |
| 5  | Population per Ward (Thousands)                                      | : 4,582                            |
| 6  | Total Number of Household as in 2011                                 | : 35000                            |
| 7  | Number of Household per Ward                                         | : 795                              |
| 8  | Surface Water Supply (MLD)                                           | : 0                                |
| 9  | Ground Water (GW) Supply (MLD)                                       | : 4.35                             |
| 10 | Number of Bore Wells                                                 | : 13                               |
| 11 | Ground Water Extraction per Bore Well (MLD)                          | : 0.33                             |
| 12 | Number of Hand Pumps/ Tubewells                                      | : 515                              |
| 13 | Ground Water Extraction per Hand Pump (lpcd)                         | : 500                              |
| 14 | Number of Pumping Stations for Water Supply                          | : NIL                              |
| 15 | Total Pumping Capacity (MLD)                                         | : NIL                              |
| 16 | Average Water Supply Rate from ULB Sources (lpcd)                    | : *                                |
| 17 | Total Water Supply from ULB and Non-ULB Sources (MLD)                | : 4.6                              |
| 18 | Average Water Supply Rate from ULB & Non-ULB Sources                 | : *                                |
| 19 | Total Sewage Generation (MLD)**                                      | : 1.1                              |
| 20 | Per Capita Sewage Generation (lpcd)                                  | : *                                |
| 21 | Sewage Collection (MLD)                                              | : NIL                              |
| 22 | Percentage of Sewage Collection (%)                                  | : NIL                              |
| 23 | Number of STPs                                                       | : NIL                              |
| 24 | Total Installed Capacity of STPs under GAP I & II (MLD)              | : NIL                              |
| 25 | Current Utilized Capacity of STPs (MLD)                              | : NIL                              |
| 26 | Percentage Utilization of Installed Capacity (%)                     | : NIL                              |
| 27 | Capacity of STPs Sanctioned under JNNURM & Others (MLD)              | : NIL                              |
| 28 | Pollution Load (Domestic) (Method 1: Actual Flow)<br>(kg/d)          | BOD <sub>5</sub> :                 |
|    |                                                                      | COD :                              |
|    |                                                                      | TKN :                              |
| 29 | Pollution Load (Domestic) (Method 2: Per Capita Contribution) (kg/d) | BOD <sub>5</sub> : 280.8           |
|    |                                                                      | COD : 337.0                        |
|    |                                                                      | TKN : 1814.4                       |
| 30 | Wastewater Disposal Means                                            | : River Disposal                   |
| 31 | Name of River/Streams for Wastewater Disposal                        | : Ghagra                           |
| 32 | Number of Drains/Nallah for Wastewater Disposal                      | : <a href="#">1 (major drain)*</a> |
| 33 | Number of Water Bodies                                               | : 7                                |
| 34 | Gross Area of Water Bodies (Hectare)                                 | : NA                               |
| 35 | Area of Water Bodies as % of Total Area                              | : NA                               |

*\*Estimation based on one time survey by IT,BHU team on 17 Feb, 2012 from 2:00 - 5:00 PM.*

## **Water Balance & Pollution Load (Domestic) Fact Sheet**

**City: Siwan**

**State: Bihar**

| S.<br>No. | Items                                                                | Value                                                   |
|-----------|----------------------------------------------------------------------|---------------------------------------------------------|
| 1         | Total Area (sq km)                                                   | : 15.68                                                 |
| 2         | Population as in 2011/2001                                           | : 134221/ 109919                                        |
| 3         | Population Growth Rate as in 2011 (%)                                | : 22.11                                                 |
| 4         | Total Number of Wards                                                | : 38                                                    |
| 5         | Population per Ward (Thousands)                                      | : 3,532                                                 |
| 6         | Total Number of Household as in 2011                                 | : 19062                                                 |
| 7         | Number of Household per Ward                                         | : 502                                                   |
| 8         | Surface Water Supply (MLD)                                           | : 0                                                     |
| 9         | Ground Water (GW) Supply (MLD)                                       | : 2.84                                                  |
| 10        | Number of Bore Wells                                                 | : 8                                                     |
| 11        | Ground Water Extraction per Bore Well (MLD)                          | : 0.38                                                  |
| 12        | Number of Hand Pumps/ Tubewells                                      | : 550                                                   |
| 13        | Ground Water Extraction per Hand Pump (lpd)                          | : 500                                                   |
| 14        | Number of Pumping Stations for Water Supply                          | : NIL                                                   |
| 15        | Total Pumping Capacity (MLD)                                         | : NIL                                                   |
| 16        | Average Water Supply Rate from ULB Sources (lpcd)                    | : *                                                     |
| 17        | Total Water Supply from ULB and Non-ULB Sources (MLD)                | : 3.1                                                   |
| 18        | Average Water Supply Rate from ULB & Non-ULB Sources (lpcd)          | : *                                                     |
| 19        | Total Sewage Generation (MLD)                                        | : 3.2                                                   |
| 20        | Per Capita Sewage Generation (lpcd)                                  | : *                                                     |
| 21        | Sewage Collection (MLD)                                              | : 3.2                                                   |
| 22        | Percentage of Sewage Collection (%)                                  | : 100                                                   |
| 23        | Number of STPs                                                       | : NIL                                                   |
| 24        | Total Installed Capacity of STPs under GAP I & II (MLD)              | : NIL                                                   |
| 25        | Current Utilized Capacity of STPs (MLD)                              | : NIL                                                   |
| 26        | Percentage Utilization of Installed Capacity (%)                     | : NIL                                                   |
| 27        | Capacity of STPs Sanctioned under JNNURM & Others (MLD)              | : NIL                                                   |
| 28        | Pollution Load (Domestic) (Method 1: Actual Flow) (kg/d)             | BOD <sub>5</sub> :<br>COD :<br>TKN :                    |
| 29        | Pollution Load (Domestic) (Method 2: Per Capita Contribution) (kg/d) | BOD <sub>5</sub> : 811.9<br>COD : 974.2<br>TKN : 1208.0 |
| 30        | Wastewater Disposal Means                                            | : River Disposal                                        |
| 31        | Name of River/Streams for Wastewater Disposal                        | : River Daha                                            |
| 32        | Number of Drains/Nallah for Wastewater Disposal                      | : <a href="#">2**</a>                                   |
| 33        | Number of Water Bodies                                               | : 2                                                     |
| 34        | Gross Area of Water Bodies (Hectare)                                 | : NA                                                    |
| 35        | Area of Water Bodies as % of Total Area                              | : NA                                                    |

*\*Estimation based on one time survey by IT,BHU team on 27 Feb, 2012 at 2:00 PM.*

## **Water Balance & Pollution Load (Domestic) Fact Sheet**

**City: Betia**

**State: Bihar**

| S. No. | Items                                                                | Value                                                   |
|--------|----------------------------------------------------------------------|---------------------------------------------------------|
| 1      | Total Area (sq km)                                                   | : 11.55                                                 |
| 2      | Population as in 2011/2001                                           | : 132928/<br>116692                                     |
| 3      | Population Growth Rate as in 2011 (%)                                | : 13.91                                                 |
| 4      | Total Number of Wards                                                | : 39                                                    |
| 5      | Population per Ward (Thousands)                                      | : 3,408                                                 |
| 6      | Total Number of Household as in 2011                                 | : 16900                                                 |
| 7      | Number of Household per Ward                                         | : 433                                                   |
| 8      | Surface Water Supply (MLD)                                           | : 0                                                     |
| 9      | Ground Water (GW) Supply (MLD)                                       | : 0.76                                                  |
| 10     | Number of Bore Wells                                                 | : 3                                                     |
| 11     | Ground Water Extraction per Bore Well (MLD)                          | : 0.38                                                  |
| 12     | Number of Hand Pumps/ Tubewells                                      | : 80                                                    |
| 13     | Ground Water Extraction per Hand Pump (lpcd)                         | : 500                                                   |
| 14     | Number of Pumping Stations for Water Supply                          | : NIL                                                   |
| 15     | Total Pumping Capacity (MLD)                                         | : NIL                                                   |
| 16     | Average Water Supply Rate from ULB Sources (lpcd)                    | : *                                                     |
| 17     | Total Water Supply from ULB and Non-ULB Sources (MLD)                | : 0.8                                                   |
| 18     | Average Water Supply Rate from ULB & Non-ULB Sources (lpcd)          | : *                                                     |
| 19     | Total Sewage Generation (MLD)                                        | : 1.6                                                   |
| 20     | Per Capita Sewage Generation (lpcd)                                  | : *                                                     |
| 21     | Sewage Collection (MLD)                                              | :                                                       |
| 22     | Percentage of Sewage Collection (%)                                  | : 200                                                   |
| 23     | Number of STPs                                                       | : NIL                                                   |
| 24     | Total Installed Capacity of STPs under GAP I & II (MLD)              | : NIL                                                   |
| 25     | Current Utilized Capacity of STPs (MLD)                              | : NIL                                                   |
| 26     | Percentage Utilization of Installed Capacity (%)                     | : NIL                                                   |
| 27     | Capacity of STPs Sanctioned under JNNURM & Others (MLD)              | : NIL                                                   |
| 28     | Pollution Load (Domestic) (Method 1: Actual Flow) (kg/d)             | BOD <sub>5</sub> :<br>COD :<br>TKN :                    |
| 29     | Pollution Load (Domestic) (Method 2: Per Capita Contribution) (kg/d) | BOD <sub>5</sub> : 403.2<br>COD : 483.8<br>TKN : 1196.4 |
| 30     | Wastewater Disposal Means                                            | : River Disposal                                        |
| 31     | Name of River/Streams for Wastewater Disposal                        | : River Anri-chunri                                     |
| 32     | Number of Drains/Nallah for Wastewater Disposal                      | : <a href="#">1**</a>                                   |
| 33     | Number of Water Bodies                                               | : 9                                                     |
| 34     | Gross Area of Water Bodies (Hectare)                                 | : NA                                                    |
| 35     | Area of Water Bodies as % of Total Area                              | : NA                                                    |

*\*Estimation based on one time survey by IT,BHU team on 29 Feb, 2012 at 2:00 - 5:00 PM.*

## **Water Balance & Pollution Load (Domestic) Fact Sheet**

**City: Dumra**

**State: Bihar**

| S. No. | Items                                                                | Value                                                      |
|--------|----------------------------------------------------------------------|------------------------------------------------------------|
| 1      | Total Area (sq km)                                                   | : 6                                                        |
| 2      | Population as in 2011                                                | : 55215                                                    |
| 3      | Population Growth Rate as in 2011 (%)                                | : ..                                                       |
| 4      | Total Number of Wards                                                | : 12                                                       |
| 5      | Population per Ward (Thousands)                                      | : 4,601                                                    |
| 6      | Total Number of Household as in 2011                                 | : 5200                                                     |
| 7      | Number of Household per Ward                                         | : 433                                                      |
| 8      | Surface Water Supply (MLD)                                           | : NIL                                                      |
| 9      | Ground Water (GW) Supply (MLD)                                       | : 4                                                        |
| 10     | Number of Bore Wells                                                 | : 2                                                        |
| 11     | Ground Water Extraction per Bore Well (MLD)                          | : 2                                                        |
| 12     | Number of Hand Pumps                                                 | : 4000                                                     |
| 13     | Ground Water Extraction per Hand Pump (lpcd)                         | : 500                                                      |
| 14     | Number of Pumping Stations for Water Supply                          | : 4                                                        |
| 15     | Total Pumping Capacity (MLD)                                         | : NIL                                                      |
| 16     | Average Water Supply Rate from ULB Sources (lpcd)                    | : 72.44                                                    |
| 17     | Total Water Supply from ULB and Non-ULB Sources (MLD)                | : 6.0                                                      |
| 18     | Average Water Supply Rate from ULB & Non-ULB Sources (lpcd)          | : 108.7                                                    |
| 19     | Total Sewage Generation (MLD)                                        | : 4.8                                                      |
| 20     | Per Capita Sewage Generation (lpcd)                                  | : 86.9                                                     |
| 21     | Sewage Collection (MLD)                                              | : NA                                                       |
| 22     | Percentage of Sewage Collection (%)                                  | : NA                                                       |
| 23     | Number of STPs                                                       | : NA                                                       |
| 24     | Total Installed Capacity of STPs under GAP I & II (MLD)              | : NA                                                       |
| 25     | Current Utilized Capacity of STPs (MLD)                              | : NA                                                       |
| 26     | Percentage Utilization of Installed Capacity (%)                     | : NA                                                       |
| 27     | Capacity of STPs Sanctioned under JNNURM & Others (MLD)              | : NA                                                       |
| 28     | Pollution Load (Domestic) (Method 1: Actual Flow) (kg/d)             | BOD <sub>5</sub> : NA<br>COD : NA<br>TKN : NA              |
| 29     | Pollution Load (Domestic) (Method 2: Per Capita Contribution) (kg/d) | BOD <sub>5</sub> : 13803.8<br>COD : 16564.5<br>TKN : 496.9 |
| 30     | Wastewater Disposal Means                                            | : River & Land Disposal                                    |
| 31     | Name of River/Streams for Wastewater Disposal                        | : Gandak River                                             |
| 32     | Number of Drains/Nallah for Wastewater Disposal                      | : 13                                                       |
| 33     | Number of Water Bodies                                               | : nil                                                      |
| 34     | Gross Area of Water Bodies (sq km)                                   | : 0                                                        |
| 35     | Area of Water Bodies as % of Total Area                              | : <<1.0                                                    |

## **Water Balance & Pollution Load (Domestic) Fact Sheet**

**City: Sitamarhi Town**

**State: Bihar**

| S. No. | Items                                                                | Value                        |
|--------|----------------------------------------------------------------------|------------------------------|
| 1      | Total Area (sq km)                                                   | : 8                          |
| 2      | Population as in 2011                                                | : 87279                      |
| 3      | Population Growth Rate as in 2011 (%)                                | : ..                         |
| 4      | Total Number of Wards                                                | : 28                         |
| 5      | Population per Ward (Thousands)                                      | : 3,117                      |
| 6      | Total Number of Household as in 2011                                 | : 13720                      |
| 7      | Number of Household per Ward                                         | : 490                        |
| 8      | Surface Water Supply (MLD)                                           | : NIL                        |
| 9      | Ground Water (GW) Supply (MLD)                                       | : 5                          |
| 10     | Number of Bore Wells                                                 | : 2                          |
| 11     | Ground Water Extraction per Bore Well (MLD)                          | : 3.5                        |
| 12     | Number of Hand Pumps                                                 | : 7000                       |
| 13     | Ground Water Extraction per Hand Pump (lpd)                          | : 500                        |
| 14     | Number of Pumping Stations for Water Supply                          | : 4                          |
| 15     | Total Pumping Capacity (MLD)                                         | : NIL                        |
| 16     | Average Water Supply Rate from ULB Sources (lpcd)                    | : 80.20256877                |
| 17     | Total Water Supply from ULB and Non-ULB Sources (MLD)                | : 8.5                        |
| 18     | Average Water Supply Rate from ULB & Non-ULB Sources (lpcd)          | : 97.4                       |
| 19     | Total Sewage Generation (MLD)                                        | : 6.8                        |
| 20     | Per Capita Sewage Generation (lpcd)                                  | : 77.9                       |
| 21     | Sewage Collection (MLD)                                              | : NA                         |
| 22     | Percentage of Sewage Collection (%)                                  | : NA                         |
| 23     | Number of STPs                                                       | : NA                         |
| 24     | Total Installed Capacity of STPs under GAP I & II (MLD)              | : NA                         |
| 25     | Current Utilized Capacity of STPs (MLD)                              | : NA                         |
| 26     | Percentage Utilization of Installed Capacity (%)                     | : NA                         |
| 27     | Capacity of STPs Sanctioned under JNNURM & Others (MLD)              | : NA                         |
| 28     | Pollution Load (Domestic) (Method 1: Actual Flow) (kg/d)             | BOD <sub>5</sub> : NA        |
|        |                                                                      | COD : NA                     |
|        |                                                                      | TKN : NA                     |
| 29     | Pollution Load (Domestic) (Method 2: Per Capita Contribution) (kg/d) | BOD <sub>5</sub> : NA        |
|        |                                                                      | COD : NA                     |
|        |                                                                      | TKN : NA                     |
| 30     | Wastewater Disposal Means                                            | : River & Land Disposal      |
| 31     | Name of River/Streams for Wastewater Disposal                        | : Lalakande & Baghmata River |
| 32     | Number of Drains/Nallah for Wastewater Disposal                      | : 20                         |
| 33     | Number of Water Bodies                                               | : 7                          |
| 34     | Gross Area of Water Bodies (sq km)                                   | : 0.167                      |
| 35     | Area of Water Bodies as % of Total Area                              | : <<1.0                      |

## **Water Balance & Pollution Load (Domestic) Fact Sheet**

**City: Gopalganj**

**State: Bihar**

| S. No. | Items                                                                | Value                                                                            |
|--------|----------------------------------------------------------------------|----------------------------------------------------------------------------------|
| 1      | Total Area (sq km)                                                   | : 11.11                                                                          |
| 2      | Population as in 2011/2001                                           | : 66624/ 54418                                                                   |
| 3      | Population Growth Rate as in 2011 (%)                                | : 22.43                                                                          |
| 4      | Total Number of Wards                                                | : 28                                                                             |
| 5      | Population per Ward (Thousands)                                      | : 2,379                                                                          |
| 6      | Total Number of Household as in 2011                                 | : 10125                                                                          |
| 7      | Number of Household per Ward                                         | : 362                                                                            |
| 8      | Surface Water Supply (MLD)                                           | : 0                                                                              |
| 9      | Ground Water (GW) Supply (MLD)                                       | : 1.25                                                                           |
| 10     | Number of Bore Wells                                                 | : 2                                                                              |
| 11     | Ground Water Extraction per Bore Well (MLD)                          | : 0.63                                                                           |
| 12     | Number of Hand Pumps/ Tubewells                                      | : 135                                                                            |
| 13     | Ground Water Extraction per Hand Pump (lpd)                          | : 500                                                                            |
| 14     | Number of Pumping Stations for Water Supply                          | : NIL                                                                            |
| 15     | Total Pumping Capacity (MLD)                                         | : NIL                                                                            |
| 16     | Average Water Supply Rate from ULB Sources (lpd)                     | : *                                                                              |
| 17     | Total Water Supply from ULB and Non-ULB Sources (MLD)                | : 1.3                                                                            |
| 18     | Average Water Supply Rate from ULB & Non-ULB Sources (lpd)           | : *                                                                              |
| 19     | Total Sewage Generation (MLD)                                        | : 1.9                                                                            |
| 20     | Per Capita Sewage Generation (lpd)                                   | : *                                                                              |
| 21     | Sewage Collection (MLD)                                              | : 1.9                                                                            |
| 22     | Percentage of Sewage Collection (%)                                  | : 100                                                                            |
| 23     | Number of STPs                                                       | : NIL                                                                            |
| 24     | Total Installed Capacity of STPs under GAP I & II (MLD)              | : NIL                                                                            |
| 25     | Current Utilized Capacity of STPs (MLD)                              | : NIL                                                                            |
| 26     | Percentage Utilization of Installed Capacity (%)                     | : NIL                                                                            |
| 27     | Capacity of STPs Sanctioned under JNNURM & Others (MLD)              | : NIL                                                                            |
| 28     | Pollution Load (Domestic) (Method 1: Actual Flow) (kg/d)             | <div>BOD<sub>5</sub> : </div> <div>COD : </div> <div>TKN : </div>                |
| 29     | Pollution Load (Domestic) (Method 2: Per Capita Contribution) (kg/d) | <div>BOD<sub>5</sub> : 476.1</div> <div>COD : 571.3</div> <div>TKN : 599.6</div> |
| 30     | Wastewater Disposal Means                                            | : River Disposal                                                                 |
| 31     | Name of River/Streams for Wastewater Disposal                        | : R. Gandaki                                                                     |
| 32     | Number of Drains/Nallah for Wastewater Disposal                      | : <a href="#">12**</a>                                                           |
| 33     | Number of Water Bodies                                               | : 5                                                                              |
| 34     | Gross Area of Water Bodies (Hectare)                                 | : NA                                                                             |
| 35     | Area of Water Bodies as % of Total Area                              | : NA                                                                             |

*\*Estimation based on one time survey by IT,BHU team on 28 Feb, 2012 from 9:00 am to 12:00 pm*



## **Water Balance & Pollution Load (Domestic) Fact Sheet**

**City: Motipur**

**State: Bihar**

| S. No. | Items                                                                | Value                                                    |
|--------|----------------------------------------------------------------------|----------------------------------------------------------|
| 1      | Total Area (sq km)                                                   | : 12.77                                                  |
| 2      | Population as in 2011                                                | : 26852                                                  |
| 3      | Population Growth Rate as in 2011 (%)                                | : ..                                                     |
| 4      | Total Number of Wards                                                | : 15                                                     |
| 5      | Population per Ward (Thousands)                                      | : 1,790                                                  |
| 6      | Total Number of Household as in 2011                                 | : 3657                                                   |
| 7      | Number of Household per Ward                                         | : 244                                                    |
| 8      | Surface Water Supply (MLD)                                           | : NIL                                                    |
| 9      | Ground Water (GW) Supply (MLD)                                       | : 2.47                                                   |
| 10     | Number of Bore Wells                                                 | : 2                                                      |
| 11     | Ground Water Extraction per Bore Well (MLD)                          | : 1.325                                                  |
| 12     | Number of Hand Pumps                                                 | : 2650                                                   |
| 13     | Ground Water Extraction per Hand Pump (lpcd)                         | : 500                                                    |
| 14     | Number of Pumping Stations for Water Supply                          | : 4                                                      |
| 15     | Total Pumping Capacity (MLD)                                         | : NIL                                                    |
| 16     | Average Water Supply Rate from ULB Sources (lpcd)                    | : 91.98569939                                            |
| 17     | Total Water Supply from ULB and Non-ULB Sources (MLD)                | : 3.8                                                    |
| 18     | Average Water Supply Rate from ULB & Non-ULB Sources (lpcd)          | : 141.3                                                  |
| 19     | Total Sewage Generation (MLD)                                        | : 3.0                                                    |
| 20     | Per Capita Sewage Generation (lpcd)                                  | : 113.1                                                  |
| 21     | Sewage Collection (MLD)                                              | : NA                                                     |
| 22     | Percentage of Sewage Collection (%)                                  | : NA                                                     |
| 23     | Number of STPs                                                       | : NA                                                     |
| 24     | Total Installed Capacity of STPs under GAP I & II (MLD)              | : NA                                                     |
| 25     | Current Utilized Capacity of STPs (MLD)                              | : NA                                                     |
| 26     | Percentage Utilization of Installed Capacity (%)                     | : NA                                                     |
| 27     | Capacity of STPs Sanctioned under JNNURM & Others (MLD)              | : NA                                                     |
| 28     | Pollution Load (Domestic) (Method 1: Actual Flow) (kg/d)             | BOD <sub>5</sub> : NA<br>COD : NA<br>TKN : NA            |
| 29     | Pollution Load (Domestic) (Method 2: Per Capita Contribution) (kg/d) | BOD <sub>5</sub> : 6713.0<br>COD : 8055.6<br>TKN : 241.7 |
| 30     | Wastewater Disposal Means                                            | : River & Land Disposal                                  |
| 31     | Name of River/Streams for Wastewater Disposal                        | : river                                                  |
| 32     | Number of Drains/Nallah for Wastewater Disposal                      | : nil                                                    |
| 33     | Number of Water Bodies                                               | : NIL                                                    |
| 34     | Gross Area of Water Bodies (sq km)                                   | : 0                                                      |
| 35     | Area of Water Bodies as % of Total Area                              | : <<1.0                                                  |

## **Water Balance & Pollution Load (Domestic) Fact Sheet**

**City: Kanti**

**State: Bihar**

| S. No. | Items                                                                | Value                     |
|--------|----------------------------------------------------------------------|---------------------------|
| 1      | Total Area (sq km)                                                   | : 6.6                     |
| 2      | Population as in 2011                                                | : 25542                   |
| 3      | Population Growth Rate as in 2011 (%)                                | : ..                      |
| 4      | Total Number of Wards                                                | : 14                      |
| 5      | Population per Ward (Thousands)                                      | : 1,824                   |
| 6      | Total Number of Household as in 2011                                 | : 4257                    |
| 7      | Number of Household per Ward                                         | : 304                     |
| 8      | Surface Water Supply (MLD)                                           | : NIL                     |
| 9      | Ground Water (GW) Supply (MLD)                                       | : 1.58                    |
| 10     | Number of Bore Wells                                                 | : 2                       |
| 11     | Ground Water Extraction per Bore Well (MLD)                          | : 1.25                    |
| 12     | Number of Hand Pumps                                                 | : 2500                    |
| 13     | Ground Water Extraction per Hand Pump (lpd)                          | : 500                     |
| 14     | Number of Pumping Stations for Water Supply                          | : 4                       |
| 15     | Total Pumping Capacity (MLD)                                         | : NIL                     |
| 16     | Average Water Supply Rate from ULB Sources (lpcd)                    | : 61.85889907             |
| 17     | Total Water Supply from ULB and Non-ULB Sources (MLD)                | : 2.8                     |
| 18     | Average Water Supply Rate from ULB & Non-ULB Sources (lpcd)          | : 110.8                   |
| 19     | Total Sewage Generation (MLD)                                        | : 2.3                     |
| 20     | Per Capita Sewage Generation (lpcd)                                  | : 88.6                    |
| 21     | Sewage Collection (MLD)                                              | : NA                      |
| 22     | Percentage of Sewage Collection (%)                                  | : NA                      |
| 23     | Number of STPs                                                       | : NA                      |
| 24     | Total Installed Capacity of STPs under GAP I & II (MLD)              | : NA                      |
| 25     | Current Utilized Capacity of STPs (MLD)                              | : NA                      |
| 26     | Percentage Utilization of Installed Capacity (%)                     | : NA                      |
| 27     | Capacity of STPs Sanctioned under JNNURM & Others (MLD)              | : NA                      |
| 28     | Pollution Load (Domestic) (Method 1: Actual Flow) (kg/d)             | BOD <sub>5</sub> : NA     |
|        |                                                                      | COD : NA                  |
|        |                                                                      | TKN : NA                  |
| 29     | Pollution Load (Domestic) (Method 2: Per Capita Contribution) (kg/d) | BOD <sub>5</sub> : 6385.5 |
|        |                                                                      | COD : 7662.6              |
|        |                                                                      | TKN : 229.9               |
| 30     | Wastewater Disposal Means                                            | : River & Land Disposal   |
| 31     | Name of River/Streams for Wastewater Disposal                        | : Gandak River            |
| 32     | Number of Drains/Nallah for Wastewater Disposal                      | : 20                      |
| 33     | Number of Water Bodies                                               | : 5                       |
| 34     | Gross Area of Water Bodies (sq km)                                   | : 0.4391                  |
| 35     | Area of Water Bodies as % of Total Area                              | : <<1.0                   |

## **Water Balance & Pollution Load (Domestic) Fact Sheet**

**City: Bairgania**

**State: Bihar**

| S. No. | Items                                                                | Value                                                      |
|--------|----------------------------------------------------------------------|------------------------------------------------------------|
| 1      | Total Area (sq km)                                                   | : 5.5                                                      |
| 2      | Population as in 2011                                                | : 42500                                                    |
| 3      | Population Growth Rate as in 2011 (%)                                | : ..                                                       |
| 4      | Total Number of Wards                                                | : 12                                                       |
| 5      | Population per Ward (Thousands)                                      | : 3,542                                                    |
| 6      | Total Number of Household as in 2011                                 | : 3952                                                     |
| 7      | Number of Household per Ward                                         | : 329                                                      |
| 8      | Surface Water Supply (MLD)                                           | : NIL                                                      |
| 9      | Ground Water (GW) Supply (MLD)                                       | : 3                                                        |
| 10     | Number of Bore Wells                                                 | : 1                                                        |
| 11     | Ground Water Extraction per Bore Well (MLD)                          | : 1.5                                                      |
| 12     | Number of Hand Pumps                                                 | : 3000                                                     |
| 13     | Ground Water Extraction per Hand Pump (lpcd)                         | : 500                                                      |
| 14     | Number of Pumping Stations for Water Supply                          | : 4                                                        |
| 15     | Total Pumping Capacity (MLD)                                         | : NIL                                                      |
| 16     | Average Water Supply Rate from ULB Sources (lpcd)                    | : 86.11780916                                              |
| 17     | Total Water Supply from ULB and Non-ULB Sources (MLD)                | : 4.5                                                      |
| 18     | Average Water Supply Rate from ULB & Non-ULB Sources (lpcd)          | : 129.2                                                    |
| 19     | Total Sewage Generation (MLD)                                        | : 3.6                                                      |
| 20     | Per Capita Sewage Generation (lpcd)                                  | : 84.7                                                     |
| 21     | Sewage Collection (MLD)                                              | : NA                                                       |
| 22     | Percentage of Sewage Collection (%)                                  | : NA                                                       |
| 23     | Number of STPs                                                       | : NA                                                       |
| 24     | Total Installed Capacity of STPs under GAP I & II (MLD)              | : NA                                                       |
| 25     | Current Utilized Capacity of STPs (MLD)                              | : NA                                                       |
| 26     | Percentage Utilization of Installed Capacity (%)                     | : NA                                                       |
| 27     | Capacity of STPs Sanctioned under JNNURM & Others (MLD)              | : NA                                                       |
| 28     | Pollution Load (Domestic) (Method 1: Actual Flow) (kg/d)             | BOD <sub>5</sub> : NA<br>COD : NA<br>TKN : NA              |
| 29     | Pollution Load (Domestic) (Method 2: Per Capita Contribution) (kg/d) | BOD <sub>5</sub> : 10625.0<br>COD : 12750.0<br>TKN : 382.5 |
| 30     | Wastewater Disposal Means                                            | : River & Land Disposal                                    |
| 31     | Name of River/Streams for Wastewater Disposal                        | : Gandak River                                             |
| 32     | Number of Drains/Nallah for Wastewater Disposal                      | : 7                                                        |
| 33     | Number of Water Bodies                                               | : 5                                                        |
| 34     | Gross Area of Water Bodies (sq km)                                   | : 0.0808                                                   |
| 35     | Area of Water Bodies as % of Total Area                              | : <<1.0                                                    |

## **Water Balance & Pollution Load (Domestic) Fact Sheet**

**City: Belsand**

**State: Bihar**

| S. No. | Items                                                                | Value                                                    |
|--------|----------------------------------------------------------------------|----------------------------------------------------------|
| 1      | Total Area (sq km)                                                   | : 4                                                      |
| 2      | Population as in 2011                                                | : 20000                                                  |
| 3      | Population Growth Rate as in 2011 (%)                                | : ..                                                     |
| 4      | Total Number of Wards                                                | : Nil                                                    |
| 5      | Population per Ward (Thousands)                                      | : Nil                                                    |
| 6      | Total Number of Household as in 2011                                 | : 2500                                                   |
| 7      | Number of Household per Ward                                         | : Nil                                                    |
| 8      | Surface Water Supply (MLD)                                           | : NIL                                                    |
| 9      | Ground Water (GW) Supply (MLD)                                       | : 3                                                      |
| 10     | Number of Bore Wells                                                 | : nil                                                    |
| 11     | Ground Water Extraction per Bore Well (MLD)                          | : 0.85                                                   |
| 12     | Number of Hand Pumps                                                 | : 1700                                                   |
| 13     | Ground Water Extraction per Hand Pump (lpcd)                         | : 500                                                    |
| 14     | Number of Pumping Stations for Water Supply                          | : 4                                                      |
| 15     | Total Pumping Capacity (MLD)                                         | : NIL                                                    |
| 16     | Average Water Supply Rate from ULB Sources (lpcd)                    | : 50                                                     |
| 17     | Total Water Supply from ULB and Non-ULB Sources (MLD)                | : 1.9                                                    |
| 18     | Average Water Supply Rate from ULB & Non-ULB Sources (lpcd)          | : 92.5                                                   |
| 19     | Total Sewage Generation (MLD)                                        | : 1.5                                                    |
| 20     | Per Capita Sewage Generation (lpcd)                                  | : 74.0                                                   |
| 21     | Sewage Collection (MLD)                                              | : NA                                                     |
| 22     | Percentage of Sewage Collection (%)                                  | : NA                                                     |
| 23     | Number of STPs                                                       | : NA                                                     |
| 24     | Total Installed Capacity of STPs under GAP I & II (MLD)              | : NA                                                     |
| 25     | Current Utilized Capacity of STPs (MLD)                              | : NA                                                     |
| 26     | Percentage Utilization of Installed Capacity (%)                     | : NA                                                     |
| 27     | Capacity of STPs Sanctioned under JNNURM & Others (MLD)              | : NA                                                     |
| 28     | Pollution Load (Domestic) (Method 1: Actual Flow) (kg/d)             | BOD <sub>5</sub> : NA<br>COD : NA<br>TKN : NA            |
| 29     | Pollution Load (Domestic) (Method 2: Per Capita Contribution) (kg/d) | BOD <sub>5</sub> : 5000.0<br>COD : 6000.0<br>TKN : 180.0 |
| 30     | Wastewater Disposal Means                                            | : River & Land Disposal                                  |
| 31     | Name of River/Streams for Wastewater Disposal                        | : Gandak River                                           |
| 32     | Number of Drains/Nallah for Wastewater Disposal                      | : NIL                                                    |
| 33     | Number of Water Bodies                                               | : Nil                                                    |
| 34     | Gross Area of Water Bodies (sq km)                                   | : 0                                                      |
| 35     | Area of Water Bodies as % of Total Area                              | : <<1.0                                                  |

## **Water Balance & Pollution Load (Domestic) Fact Sheet**

**City: Jonakpur Road (Pupri)**

**State: Bihar**

| S. No. | Items                                                                | Value                                                    |
|--------|----------------------------------------------------------------------|----------------------------------------------------------|
| 1      | Total Area (sq km)                                                   | : 5                                                      |
| 2      | Population as in 2011                                                | : 18000                                                  |
| 3      | Population Growth Rate as in 2011 (%)                                | : ..                                                     |
| 4      | Total Number of Wards                                                | : 10                                                     |
| 5      | Population per Ward (Thousands)                                      | : 1,800                                                  |
| 6      | Total Number of Household as in 2011                                 | : 4000                                                   |
| 7      | Number of Household per Ward                                         | : 400                                                    |
| 8      | Surface Water Supply (MLD)                                           | : NIL                                                    |
| 9      | Ground Water (GW) Supply (MLD)                                       | : 1                                                      |
| 10     | Number of Bore Wells                                                 | : 1                                                      |
| 11     | Ground Water Extraction per Bore Well (MLD)                          | : 1.5                                                    |
| 12     | Number of Hand Pumps                                                 | : 3000                                                   |
| 13     | Ground Water Extraction per Hand Pump (lpcd)                         | : 500                                                    |
| 14     | Number of Pumping Stations for Water Supply                          | : 4                                                      |
| 15     | Total Pumping Capacity (MLD)                                         | : NIL                                                    |
| 16     | Average Water Supply Rate from ULB Sources (lpcd)                    | : 86.11780916                                            |
| 17     | Total Water Supply from ULB and Non-ULB Sources (MLD)                | : 2.5                                                    |
| 18     | Average Water Supply Rate from ULB & Non-ULB Sources (lpcd)          | : 71.8                                                   |
| 19     | Total Sewage Generation (MLD)                                        | : 2.0                                                    |
| 20     | Per Capita Sewage Generation (lpcd)                                  | : 111.1                                                  |
| 21     | Sewage Collection (MLD)                                              | : NA                                                     |
| 22     | Percentage of Sewage Collection (%)                                  | : NA                                                     |
| 23     | Number of STPs                                                       | : NA                                                     |
| 24     | Total Installed Capacity of STPs under GAP I & II (MLD)              | : NA                                                     |
| 25     | Current Utilized Capacity of STPs (MLD)                              | : NA                                                     |
| 26     | Percentage Utilization of Installed Capacity (%)                     | : NA                                                     |
| 27     | Capacity of STPs Sanctioned under JNNURM & Others (MLD)              | : NA                                                     |
| 28     | Pollution Load (Domestic) (Method 1: Actual Flow) (kg/d)             | BOD <sub>5</sub> : NA<br>COD : NA<br>TKN : NA            |
| 29     | Pollution Load (Domestic) (Method 2: Per Capita Contribution) (kg/d) | BOD <sub>5</sub> : 4500.0<br>COD : 5400.0<br>TKN : 162.0 |
| 30     | Wastewater Disposal Means                                            | : River & Land Disposal                                  |
| 31     | Name of River/Streams for Wastewater Disposal                        | : Buri Gandak River                                      |
| 32     | Number of Drains/Nallah for Wastewater Disposal                      | : 8                                                      |
| 33     | Number of Water Bodies                                               | : 9                                                      |
| 34     | Gross Area of Water Bodies (sq km)                                   | : 1.1816                                                 |
| 35     | Area of Water Bodies as % of Total Area                              | : <<1.0                                                  |