**Paper entitled “Performance analysis of the proposed Reservoir Project in the State of West Bengal” by D. Roy and D. Banerjee**

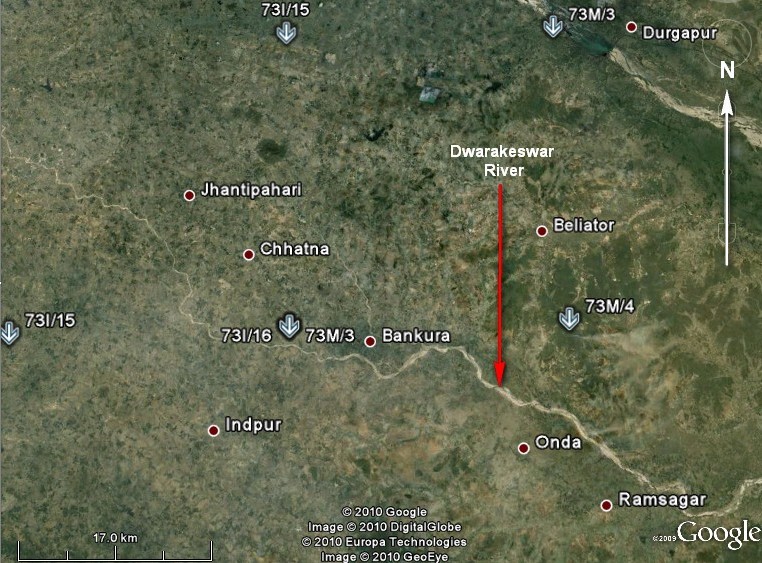
Answers to the comments of the **Anonymous Referee #1** are provided in the following Table

|  |  |
| --- | --- |
| **Comments** | **Answers** |
| **SPECIFIC/SCIENTIFIC COMMENTS**  1. Page 1376, Line 1: deterministic DP. Please explain what DP stands for.  2. Page 1378,  2 Study area Please provide general description of the D. basin such as mean annual  precipitation, temperature, evaporation | 1. DP stands for Dynamic Programming.  Annexure-I |
| **Interactive Comments**  Fig. 1: This figure is not acceptable. It doesn’t provide useful information regarding the location of the D. river basin. It also misses the legend, scale and north arrow. Please also provide the source of this satellite image | Annexure-II |
| Line 9, Geologically, the upper: : : It should be ‘geographically’.  Line 15, Does I&WD stand for Irrigation & Waterways Department? I couldn’t find the  full name of I&WD in the paper.  Line 22, please specify daily or monthly discharge data. It will be helpful to list available data in a table format rather than the current text description. The list should include:  1) data item; 2) source of data; 3) availability (e.g. 1990-2000) and 4) temporal scale  (e.g. daily or monthly).  Page 1379,  Fig. 2: This figure misses a scale bar and a north arrow. The numbers are hard to reqd. | Line 9---we accept it  Line 15--- Yes. I&WD stand for Irrigation & Waterways Department.  Line 22—monthly discharge data  Available data in a table format has been provided (see Annexure-III)  Page 1379,  Fig. 2: Annexure-IV |
| Page 1380,  Line 4, ‘command area’, is this referring to the ‘study area’?  Line 24, 19.38Mm3, is this a monthly or annual figure? Please specify.  Page 1381,  Line 15, The Reservoir storage table should be labelled as a table. What is ‘ham’?  Line 18, ‘If this process is considered stationary’ Can you comment on impact of climate change or variability on the projected stream flow? Is the study area susceptible to climate change or variability in the next 50 years or the life time of the reservoir project?  Page 1383, The 12-year historical record is short and insufficient to draw the statistical  mean and SD. Under the condition of short historical record, one needs to bear in mind that the conclusion the study is drawn upon is compromised.  Page 1384, Line 13, ‘(436.09-354.45)’, please explain the figure ‘354.45’. | Page 1380 Line 4, ‘command area’ is referring to area served by a Water Resource Project. It is part of the study area  Line 24, 19.38Mm3, is monthly figure  Page 1381,  Line 15, The Reservoir storage table has been labelled as a table. ( Annexure V)  ‘ham’ is hectare metre  Annexure VI  We understand it.  Page 1384, Line 13  354.45 Km2 is the existing cultivable land area |
| TECHNICAL CORRECTIONS: Please consider to rephrase or modify sentences listed  as follows:  Page 1375, Line 18: are. Acres model (Sigvaldson, 1976)  Page 1376, Line 14: areas of the Volta Basin, Ghana and Burkina Faso, Ghana.  Page 1377, Line 22-24: Again it may also be noted that since its inception in 1938,  Snyder’s method...  Page 1380, Line 23-24, ‘Irrigation and Waterways Department, Govt. of West Bengal’,  change to ‘I&WD, Govt. of West Bengal’. | Page 1375, Line 18  Acres model (Sigvaldson 1976), Streamflow Synthesis and Reservoir Regulation (SSARR) Model (USACE, 1987), the Interactive River System Simulation (IRIS) MODEL (Loucks et al 1989) and the Water Right Analysis Package (WRAP) (Wurbs et al., 1993) are some other well known simulation models.  Page 1376, Line 1  Liebe, et al. (2007) studied the operation of Small Reservoir Project to improve water availability and economic development in small semi-arid regions of the Volta Basin, Ghana and Burkina Faso, West Africa .  Page 1377, Line 22-24  Again it may also be noted that Snyder’s method of generation of unit hydrograph for ungauged catchments , since its **promulgation** in 1938, has been used by various researches worldwide (HEC-1 1968, Boggild et.al. 1999, HEC-HMS 2000, Das 2000, Atre et al 2005, Watershed Modeling System 2009)  It has been done |

**Annexure I**

The Dwarakeswar basin is characterized by a dry tropical climate with a very hot summer and a very cold winter. The cold weather starts from middle of November and lasts till end of February. The summer period lasts from March to May. The average annual rainfall has been found out to be 143.42 cm. The South-West monsoon rainfall occurs during middle of June to September. The hottest month is May with mean maximum temperature of about 38°C. The coldest month is January having mean minimum temperature of 10°C. The maximum monthly evaporation (about 175 mm) has been observed in the month of May and minimum monthly evaporation (about 65 mm) has been reported in the month of January.

**Annexure II**

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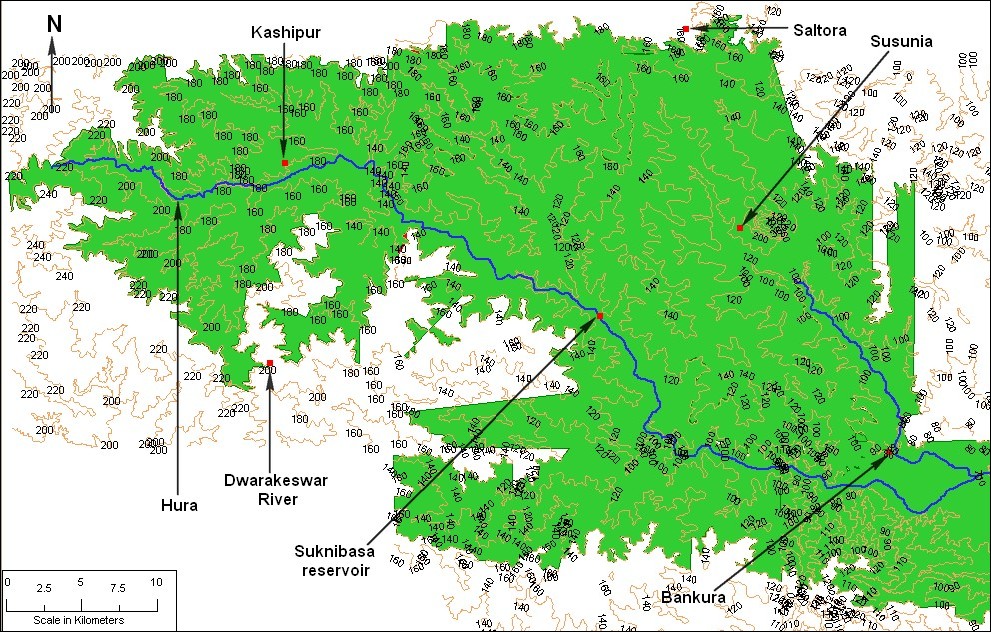
Source: Google Earth

**Annexure III**

**Table 1 Details of data used**

|  |  |  |  |
| --- | --- | --- | --- |
| data item | source of data | availability | temporal scale |
| rainfall for raingauge stations viz.,Hura, Kashipur, Susunia, Saltora | Investigation and Planning Division, I&WD, Govt. of West Bengal, Purulia | eleven years (1990-2000) | monthly |
| rainfall for the raingauge station located at Bankura | Irrigation Division, Govt. of West Bengal, Bankura | thirty four years (1975-2008) | monthly |
| meteorological data such as maximum and minimum air temperature, relative humidity, wind speed, solar radiation and vapor pressure for Bankura station | Meteorological observatory, Govt. of West Bengal, at Bankura | Ten years (1999-2008) | monthly |
| Discharge data at Suknibasa gauge station | Investigation and Planning Division, I&WD, Govt. of West Bengal, Burdwan. | 1995-2006 | monthly |
| Toposheets (73I/11, 73I/14, 73I/15, 73I/16, 73M/3 and 73M/4) | Survey of India, Govt. of India | NA | NA |
| Temporal distribution of rainfall at Bankura raingauge station | Investigation and Planning Division, I&WD, Govt. of West Bengal, Purulia. | NA | Hourly |

**Annexure IV**

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**Annexure V**

**Table 3: Reservoir Storage Volume vs. Level**

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| --- | --- | --- |
| Reservoir Storage | Volume (ham) | Level (m) |
| Full Storage | 9656 | 120.8 |
| Dead Storage | 2400 | 115.4 |
| Live Storage | 7256 | 119.2 |
| Initial Storage | 2400 | 115.4 |

**Annexure VI**

The hydrological condition that shall prevail under the projected climate condition in the basin is to be simulated In order to comment on Impact of climate change on projected stream flow . Such an approach is adopted as hydrological response is a highly complex process governed by climatological and catchment characteristics. This warrants a continuous time simulation of the hydrologic process.

The projected climate scenario (involving climatological data ) of the study area is to be analysed in order to know the susceptibility of the study area to climate change or variability in the next 50 years or the life time of the reservoir project. It may be noted that projected climate scenario may be obtained using output from Regional Climate Model HADRM2 (Regional Climate Model of the Hadley Centre ) as developed by IITM (Indian Institute of Tropical Meteorology), Pune, India.

Thus it is not possible to comment anything without undertaking the above noted exercise.