



Application of Qual2k for Water Quality modelling in Bhadra River, Karnataka

Introduction

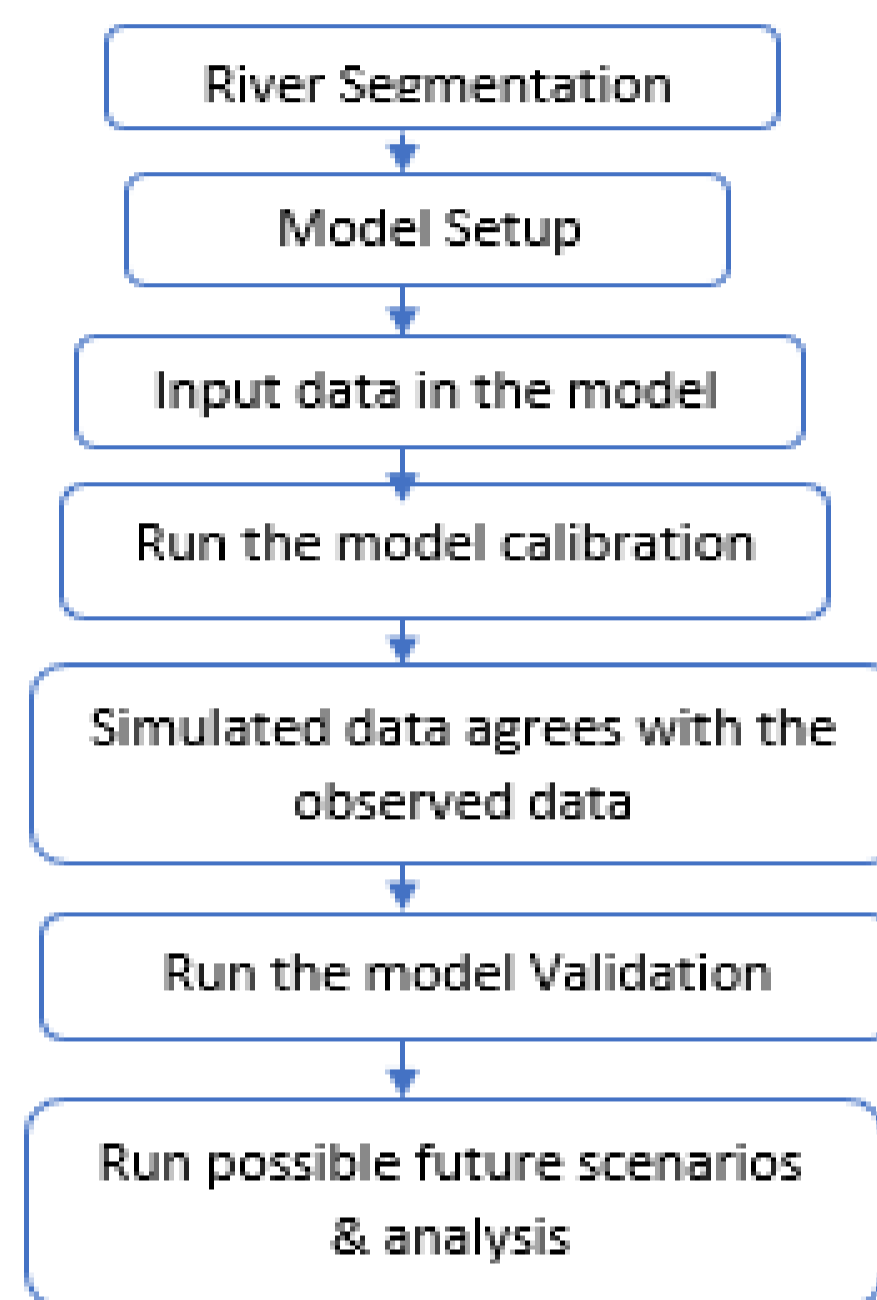
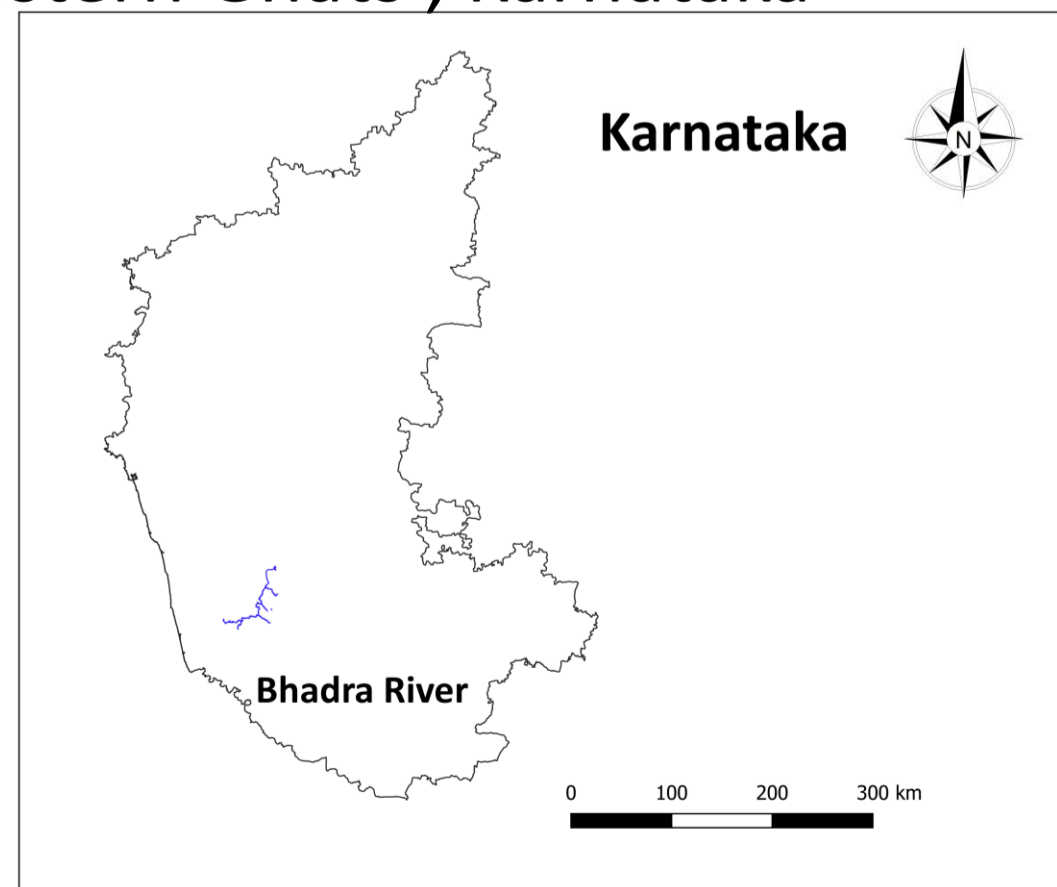
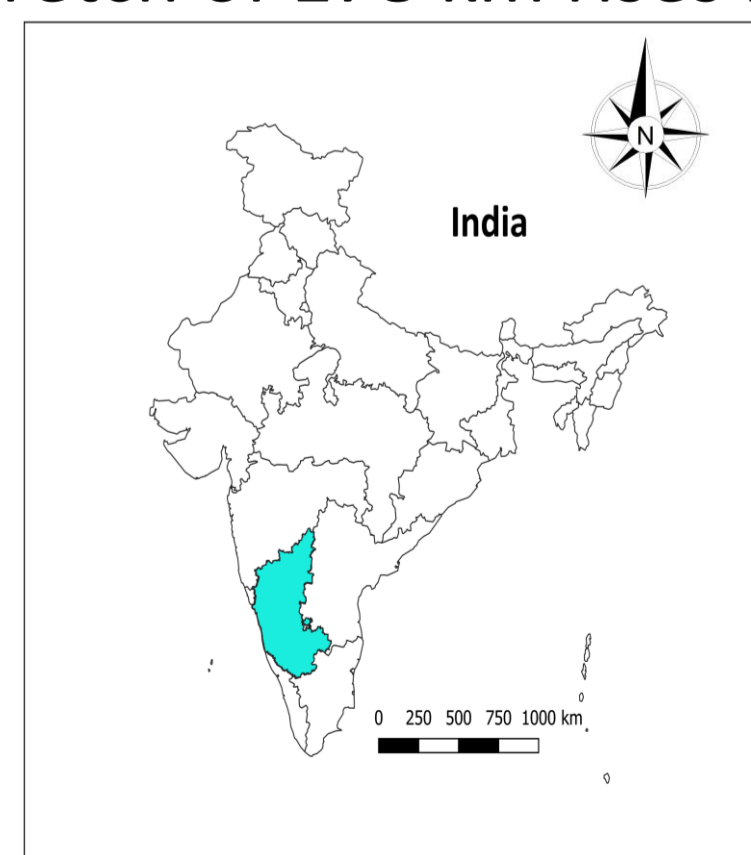
- Water is a natural resource whose availability strongly affects economic development and social welfare.
- Thus, any change in the natural quality and water distribution has potentially environmental effects.
- The term water quality refers to the physical, biological and chemical status of a water body.
- Surface water body is the receiver of all pollution including surface runoff from all positions within watershed level therefore surface water quality management at watershed level is more dominating.

Objectives

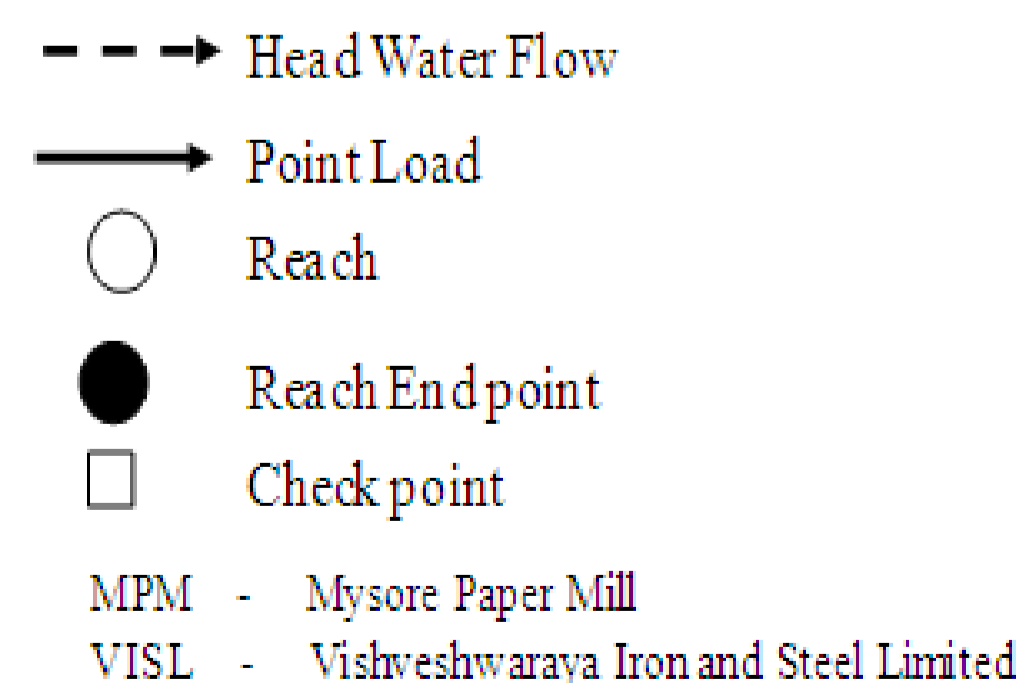
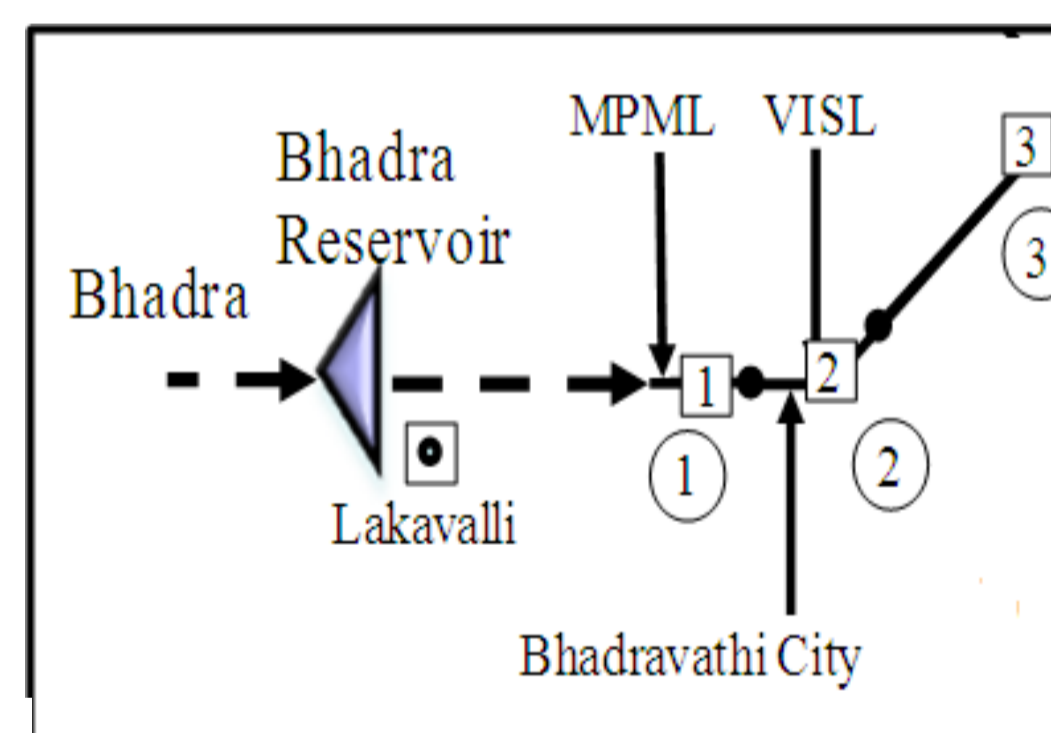
- To assess the surface water quality of Bhadra River in terms of water quality parameters using river quality model Qual2k
- Predict water quality parameters-DO (Dissolved Oxygen) and BOD₅ (Biochemical Oxygen Demand)
- To develop speculative scenarios to maintain DO concentration within the permissible limits.

Details of Study Area

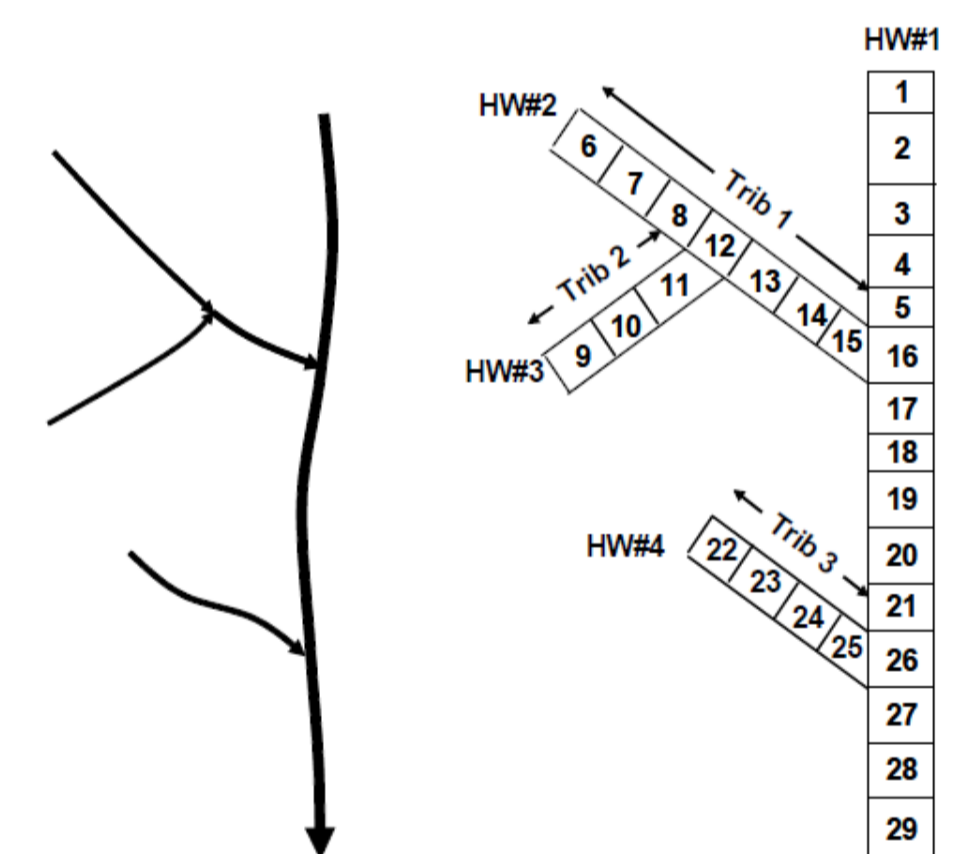
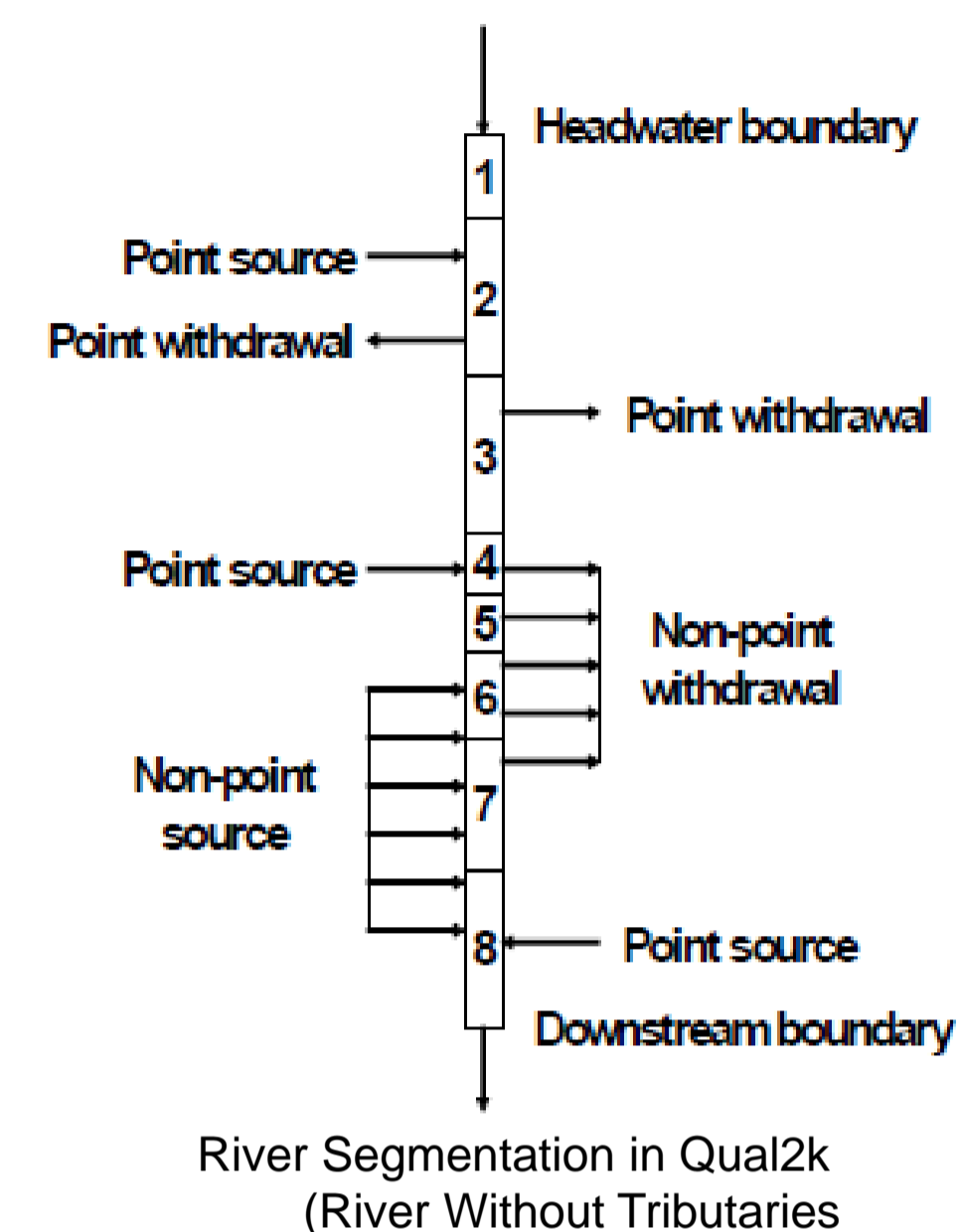
River Segment selected for this current study is Bhadra river stretch of 178 km rises in Western Ghats, Karnataka



The flow steps in developing Qual2k model



Simplified Diagram of Bhadra River system



River Segmentation In Qual2k (River with Tributaries)

Governing General Mass Balance Equation

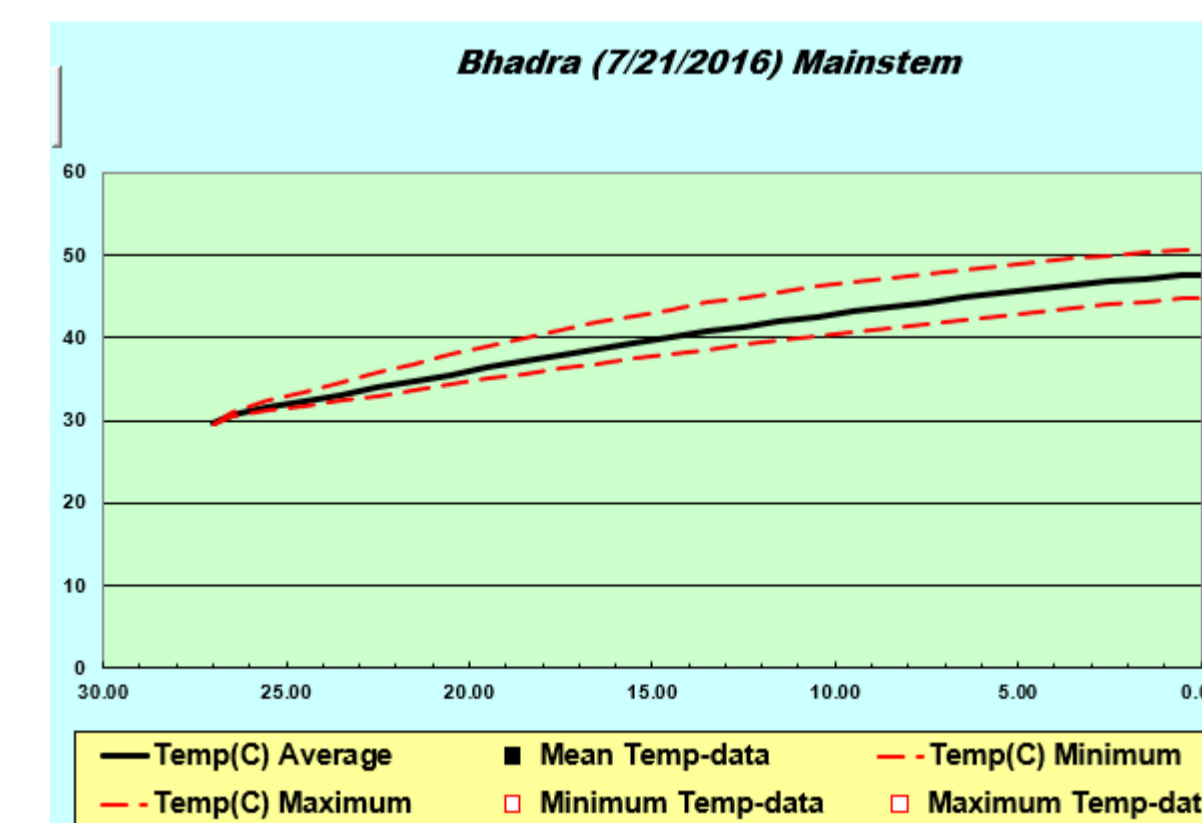
$$\frac{dC_i}{dt} = \frac{Q_{i-1}}{V_i} C_{i-1} - \frac{Q_i}{V_i} C_i - \frac{Q_{ab,i}}{V_i} C_i + \frac{E_{i-1}}{V_i} (C_{i-1} - C_i) + \frac{E_i}{V_i} (C_{i+1} - C_i) + \frac{W_i}{V_i} + S_i$$

where:-

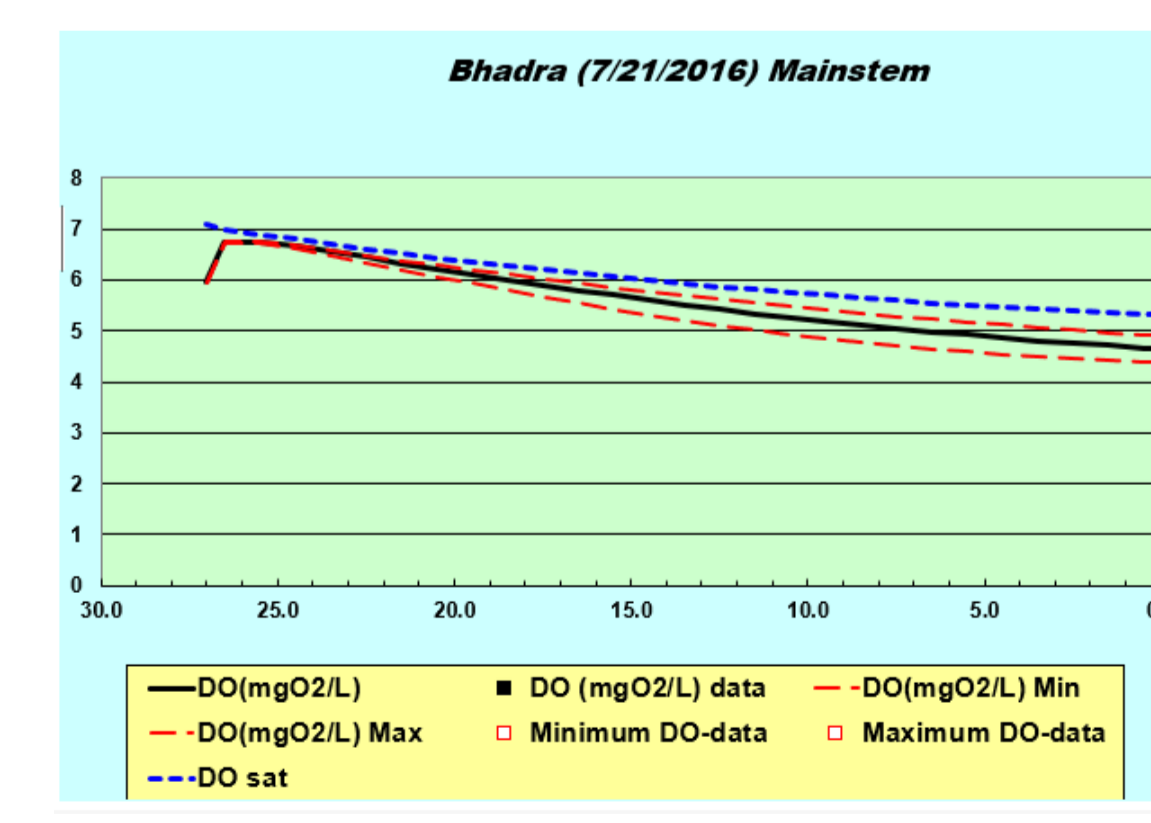
- C_i = variable concentration for segment i, (g/m³),
- V_i = volume of the segment i (m³),
- W_i = external loading of the constituent to segment i (g/d or mg/d),
- t = time (d),
- Q_i = outflow from segment i into segment i + 1, (m³/d)
- E_i = bulk dispersion coefficient between segments i and i + 1 (m³/d).

Result and Discussion

The predicted value of the model is compared with the observed values using statistical methods to test the applicability of the model for the study stretch



Model Output for Temperature for Bhadra River Stretch



Model Output for Dissolved Oxygen for Bhadra River Stretch