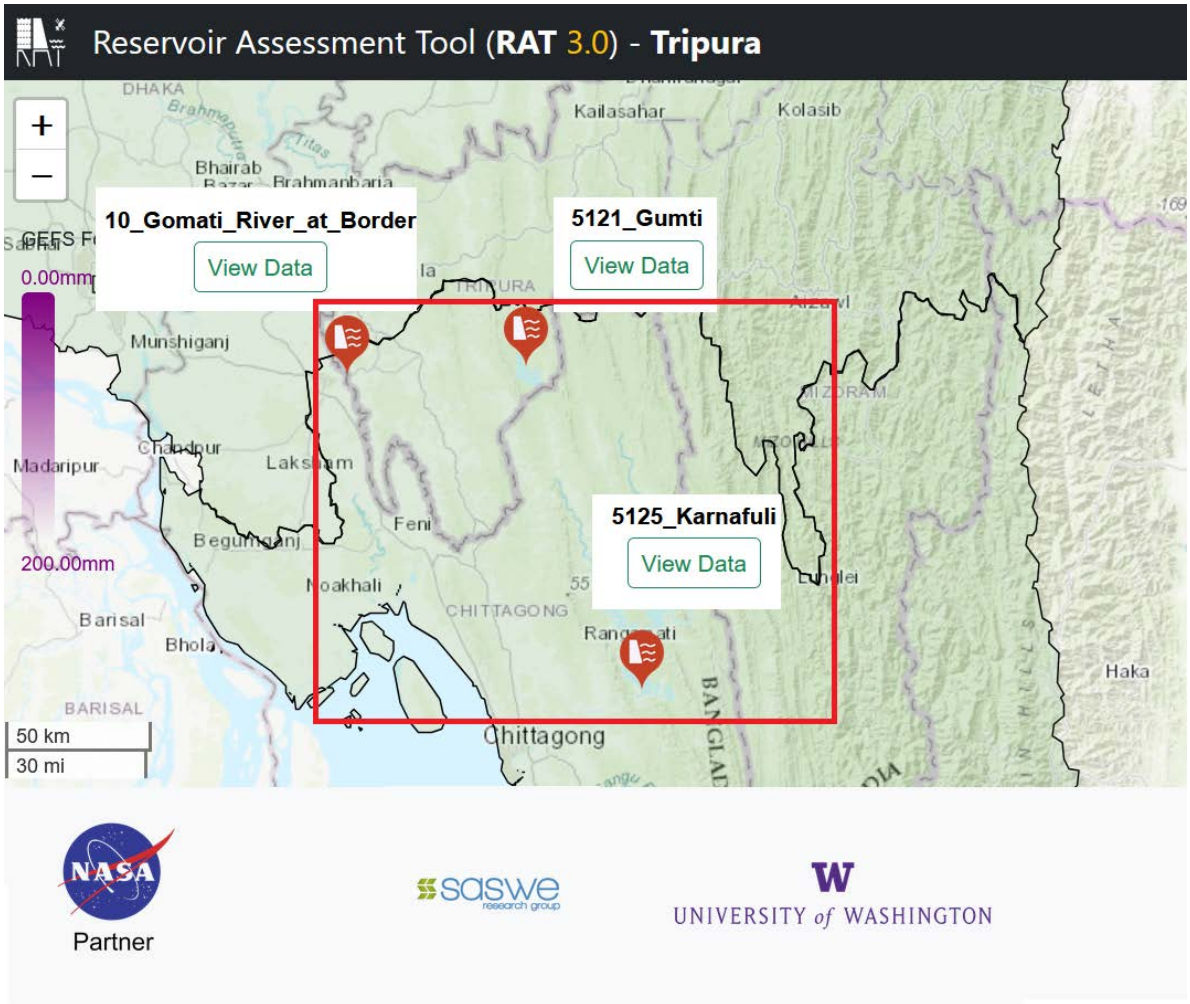
How to use RAT 3.0 - Tripura Website interface

- **URL:** https://depts.washington.edu/saswe/Tripura or http://tinyurl.com/IndoBDFloods
- **Why named 'Tripura'? –** The core design was by a native of Tripura, **Pritam Das**, ***who was desperate to help the people of India and Bangladesh by applying his data science skills with his colleague Sanchit Minocha***.
- RAT stands for Reservoir Assessment Tool and it models the reservoir state (inflow, outflow, storage change, surface area) for nowcast/historical and forecast conditions.
- See 'About' page of the website for the science and methodology behind RAT.
- RAT Tripura is set up for two dams – Dumboor on Gumti river and Kaptai on Karnaphuli river.

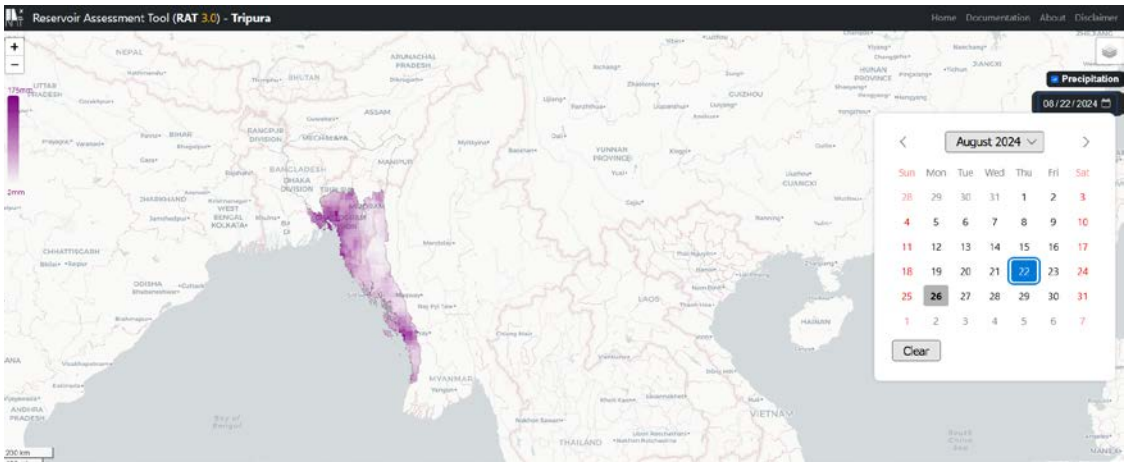
DISCLAIMER: *In addition to checking the disclaimer page, please note that RAT-Tripura is a 'starter' version to demonstrate an idea of what real time and forecast data (that is openly available) can do to improve decision making and flood preparedness using open science concepts. The onus is on the user (such as BWDB or Tripura Water Dept) to own and improve such an open-source system where University of Washington SASWE Group is happy to share all the scripts for the complete backend and front end tool.*



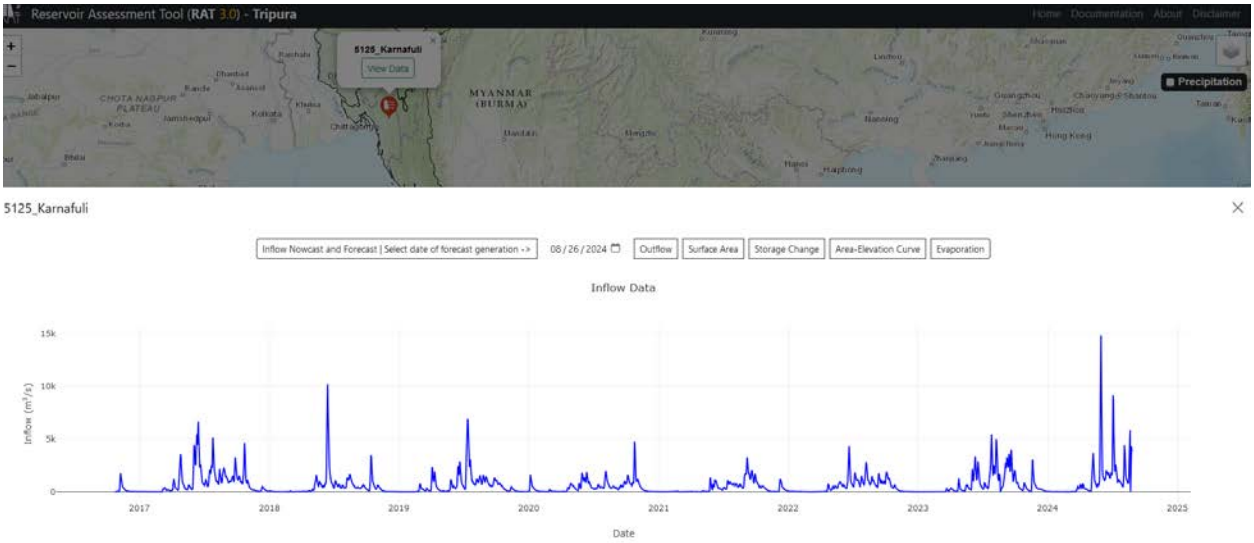
The landing page of the website contains the following elements and functionalities:

1. **Zoom controls:** The + and - symbols can be used to zoom-in and zoom-out of the map.
2. **Navigation Bar:** This sections contains the Documentation, the About section, and a link back to the Home page. The RAT logo on the left takes the user to the RAT Global website (at www.satellitedams.net).
3. **Dam Locations:** The red markers indicate the two reservoirs that are currently available in RAT 3.0. Currently only Dumboor and Kaptai are featured.
4. **Dam data:** The markers when clicked displays the reservoir name along with a 'View Data' button. This can be clicked on to view the RAT data for the particular reservoir.
5. **Map Layers:** This toggle can be clicked to view the various map layers available. The user can toggle between the various basemaps by clicking on the corresponding radio buttons

6. **Precipitation:** When toggled, displays the distribution of rainfall over the larger region, for a selected date. This includes nowcast, hindcast and forecast (up to 15 days). Forecast precipitation and the last 3 days of hindcast precipitation are from GEFS-CHRPS (a product of NOAA improved with station rainfall data). The precipitation values prior to 3 days from current date are from NASA Global Precipitation Measurement (GPM) Mission from a product called IMERG-Late. User can select the date for which the precipitation is to be displayed by clicking on the calendar icon and selecting the required date.



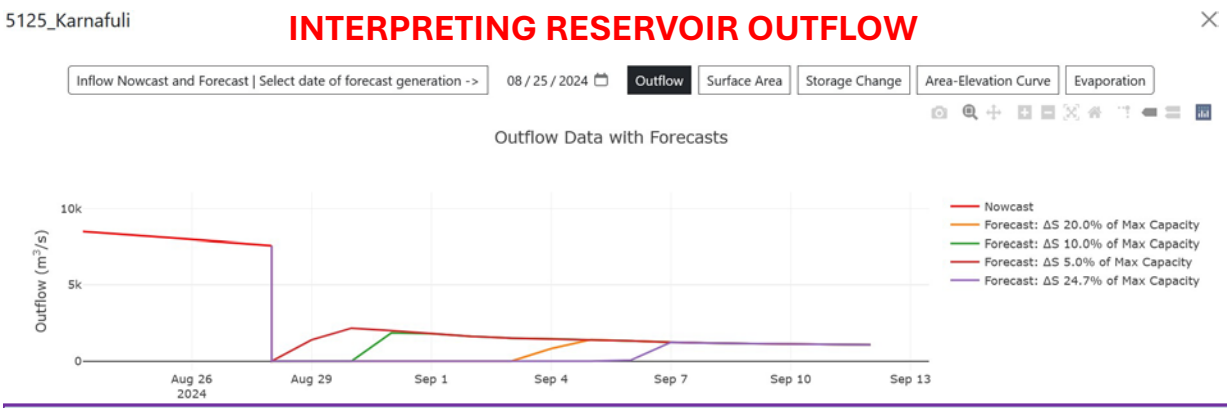
Reservoir Data



The Reservoir data screen contains the following:

1. **Plot Area:** Displays the plot of the selected feature such as inflow, outflow, reservoir surface area, storage change. Some of the items may not yet be fully functional
2. **Plot selection:** Users can click on the required feature to view the data on the plot area.
3. **Plot controls:** Used to interact with the plot area. The controls provide options such as the ability to zoom in to parts of the plot, pan around the plot, save the plot as picture etc. The **'Reset axes'** option can be used to restore the plot to its full size if it is in a zoomed-in state.
4. **Inflow:** Inflow to a reservoir is modeled using the VIC hydrologic model. The nowcast/hindcast inflow is based on IMERG satellite and GEFS (lead time zero) precipitation and weather data. The forecast inflow is based on GEFS-CHRPS forecast precipitation (available up to 15 day lead time)
5. **Outflow:** The nowcast/hindcast outflow of a reservoir is based on the mass balance concept used by RAT by tracking the storage change and evaporation (see RAT publications on the About page to learn more). The forecast outflow of a reservoir is based on scenarios of storage as it is impossible to forecast how a dam will operate in the future due to human decisions. Currently, forecasted reservoir outflow can be visualized for a few preselected storage scenarios such as: 1) when reservoir is 80% full; 2) when reservoir is 90% full; 3) when reservoir is 95% full and finally 4) actual storage condition of reservoir based on latest satellite data on surface area that is then used as a proxy for relative storage.

   See next page for a more visual interpretation and kindly note that a lot of these scenarios, legends and information on the plot may be edited later although the overall messaging goal remains the same.



- Reservoir Outflow scenarios are shown in different colors
- Outflow is calculated based on mass balance (Outflow= Inflow minus storage change minus evaporation). See 'About' page for RAT publications on this
- Nowcast with historical outflow is called Now Outflow' (red line)- derived from nowcast/hindcast precip
- "Delta S XX% of maximum capacity" means reservoir storage change as XX % of total reservoir storage capacity
- Thus "Delta S 20%" means the forecasted outflow if reservoir is 80% full and experiences a 20% of total capacity in storage increase as it routs the inflow through the reservoir
- The bottom most case that is not 20, 10 or 5%, is the scenario of outflow forecast based on actual storage condition that was estimated from most recent satellite data

6. **Date Picker/Calendar:** For visualizing forecast inflow and outflow user can select a date of the calendar. If a forecast is available that was generated for that date (15 days into the future), both the nowcast/hindcast (in blue/black) with forecast (in red) will be displayed.

7. **Download Data:** Although this appears in many plots, currently this feature is turned off for the sole reason that RAT Tripura is a starter (proof of concept version). Interested users can easily make this feature functional at their end with the open source scripts and data.

FINAL DISCLAIMER: *As a starter version that is a proof of concept on how NASA Earth observations can help via RAT-Tripura to improve decision-making, flood preparedness, planning and negotiations, user should remember that not all functions or features may run smoothly or stably every day. RAT-Tripura is a best-effort basis tool that was rapidly prototyped by University of Washington SASWE Research Group (www.saswe.net) out of the sheer desire to improve the technical capacity of water agencies such as Bangladesh Water Development Board and Tripura Water Department. UW SASWE Research Group understands that one tool or data alone cannot solve the entire gamut of a complex issue such as flooding and that this particular tool (RAT Tripura) should be viewed by stakeholder agencies as an additional but powerful tool in the existing arsenal to improve livelihoods and potentially save lives.*