

OUT-OF-BOX APPROACH FOR PEAK FLOOD MODERATION OF JHELM RIVER NEAR SRINAGAR IN J&K STATE OF INDIA

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Background: Due to extremely heavy rainfall of the order of 617mm during first week of September 2014, the flood flow of the Jhelum river near Srinagar in J&K state of India attained an extremely high level of discharge of about 1,20,000 cusecs as against a safe carrying capacity of about 35,000 to 40,000 cusecs. As a result, several flood embankment breaches occurred with devastating floods in Srinagar city area causing many human casualties & destruction of properties.

Constraints: It could be learnt that even with raising & strengthening of existing flood embankments along with a flood diversion channel excavation from Dogripora to Wular Lake, besides dredging of wetlands etc., in all probability the Jhelum may not be able to convey more than about 70,000 cusecs. Here, the water level and storage capacity of Wular Lake will always remain as the prime downstream control constraint for any hydraulic analysis to help improve the conveyance capacity of Jhelum for desired peak flood attenuation during such kind of future cloud burst events.

The Suggested Approach: In such a stiff constraining scenario, a possible solution may be to explore an out-of-box flood peak moderation approach to

restrict flood flows near Srinagar (to the extent technically feasible) within the safe discharge carrying capacity of the Jhelum, which is briefly as narrated below –

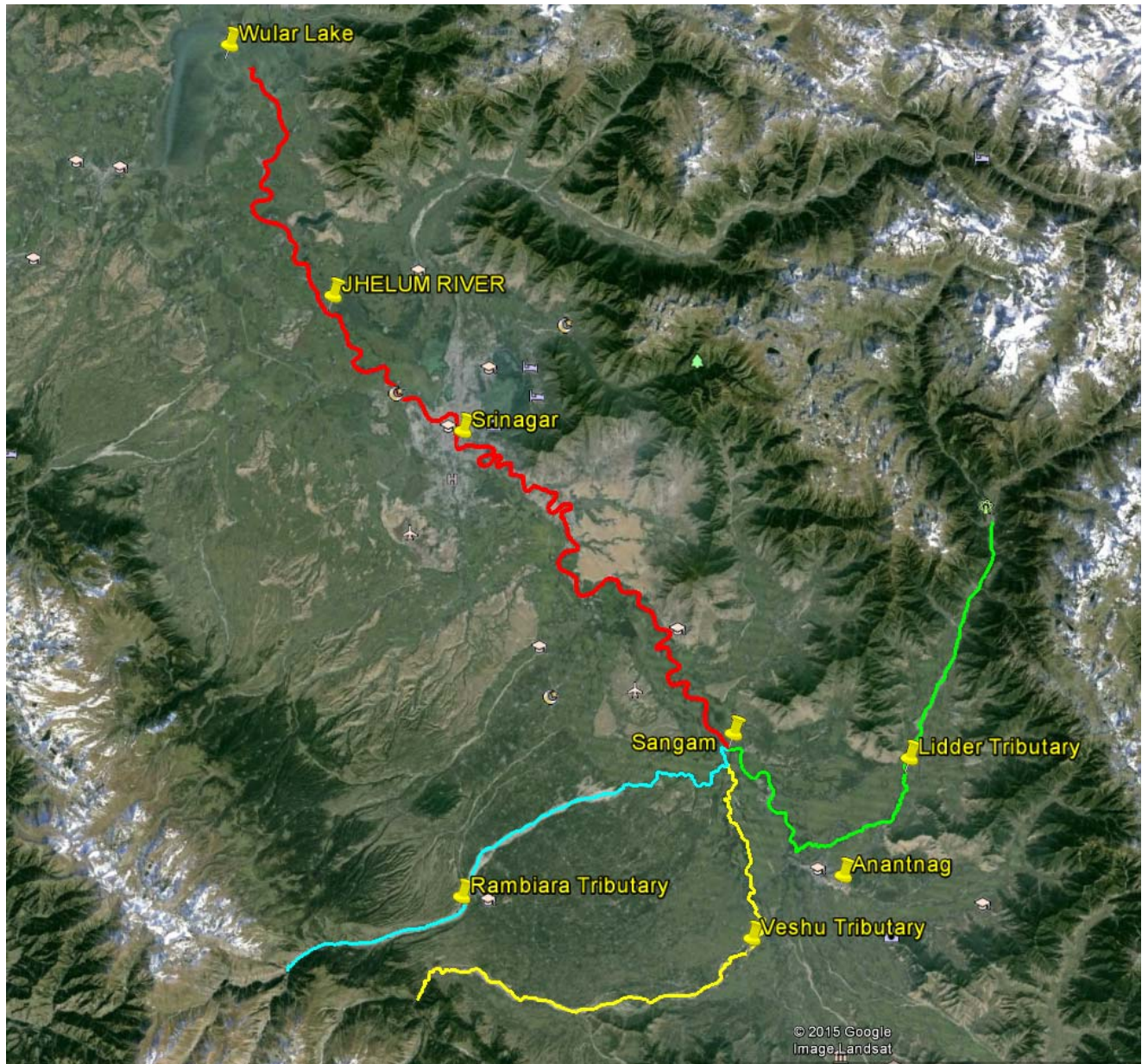
The three major tributaries of the Jhelum in South Kashmir namely Rambhara, Veshu, and Lidder are characterized by steep bed gradient, and these tributaries enormously contribute to the peak flood discharge of the Jhelum because of their high flood flow velocity coupled with very low time of concentration especially during heavy rainfall events in their catchment areas.

In view of above, it may perhaps be expedient to achieve desired flood peak moderation by installing at carefully selected vantage sites on the above three tributaries, cascades of hydraulically efficient robust Piano Key Weir (PKW) structures (which also promote unhindered passage of sediment inflows), so as to derive the following hydraulic functions –

- i) desired reduction in flood flow velocity by effecting artificial expenditure of turbulent kinetic energy through putting in place series of PKW in cascades along with possibly Block Ramps to significantly curb the fast rate of passage of flood flows propagating towards Srinagar,
- ii) artificially creating temporary in-channel flood flow detention storages within the backwater zones of PKWs and thereby restricting propagation of flood inflows towards Srinagar as much as hydraulically possible, and
- iii) handle cloud burst flood flows much more efficiently with PKWs in cascades, than possible with hydraulically much less efficient traditional check dams and conventional weirs.

For the above, besides other related analyses, in a nutshell the following studies are desirable –

- Generate DEM of 2.5 m resolution with the recent-most Cartosat-1 satellite data covering the entire area of interest.
- Identify LULC changes for narrowing down on the existing & potential soil erosion zones, and estimate soil loss from watershed areas using optical satellite data based NDVI values in conjunction with RUSLE model estimates – temporally & spatially, for the purpose of planning priority comprehensive catchment area treatment.
- Tentatively identify vantage locations of PKWs and also fluvial control structures like submerged vanes, trail dykes, Block Ramps etc. as required to safeguard embankments from erosion, improve channel conveyance, cut down river sediment concentration etc.
- Develop design configurations of PKWs, Submerged vanes, Trail Dykes, Block Ramps etc.
- Use Remote Sensing (Satellite borne / Air borne) LiDAR data for capacity appraisal of Wular Lake along with its topography changes, if any.
- Develop mathematical model for the entire study reach encompassing three tributaries, Jhelum upto its downstream control of Wular for comprehensive hydraulic analysis and for evolving designs to plan required channel conveyance improvements for peak flood moderation.



Google Picture Showing Jhelum River; Rambhara, Veshu & Lidder Tributaries along with Srinagar City, Sangam & Wular Lake