

Flood Run-off Analysis in the Large Scale Watershed of Afghanistan

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Introduction: River runoff can cause both flash floods and slow-onset floods. Afghanistan prone to natural disasters especially flash floods and extreme snowfalls affect the lives of thousands of Afghans. Severe flash flooding in 2007 – 2012. Made thousand homeless and destroyed agriculture lands, livestock and infrastructures through five large watersheds (Fig.1). Panj –e-Amu watershed is the most vulnerable for Afghanistan territories in North East part (Table 1). Floods are mostly created by heavy, intense rainfall and by snow melt water or the combination of both. Technical failures due to increase precipitation or snow melt water add to flash flooding. Flash floods start in March and continue until May because of rainfall and during June – July flooding from snow melting in Panj- Amu River Basin. The Panj-Amu River Basin runs for 2,400 km length and receives a large number of tributaries in Central Asia, but dries up in the Tura lowlands in Turkmenistan and Uzbekistan (Fig.2). Panj-e- Amu basin comprises seven Sub River Basin in Afghanistan (Fig.3). this paper introduces features flood run off analysis calculation results on Kokcha sub Basin of PARB through “IFAS”.

Flood Damage and Casualties in Panj-e-Amu River Basin from (2007-2012)					
No	Casualties people	livestock losses	Damages home	Channel Destruction/km	Damage to infrastructures (Roads,Bridge,Water Intakes,...Etc)
1	300	18913	14479	36492	767

Table (1): flood Damages in Panj-e Amu River Basin Source: WRD/MOEW Documents saved (translate)



Fig.1 Five large scale River Basin



Fig.2 Panj-e-Amu with international tributaries

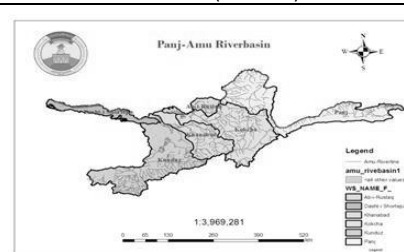


Fig3 Panj-e- Amu seven sub Watersheds in Afghanistan

Study area: kokcha watershed is located in Northeast of Afghanistan; it is a biggest tributary of Panj –e-Amu River Basin (Fig4), many cities and districts of Badakhshan province including Faizabad city lies along the kokcha.

- Watershed area:** 28200km²
- Temperature (mine, max, mean):** (-14, 36, 13)
- Annual total precipitation:** 2556mm
- Elevation:** upstream (5450m), Downstream (1310m).
- Water resources:** permanent snow and mountains glaciers.
- Watershed Length:** about 450km
- Latitude:** 37° 26' 41" N. **Longitude:** 71° 05' 11" E

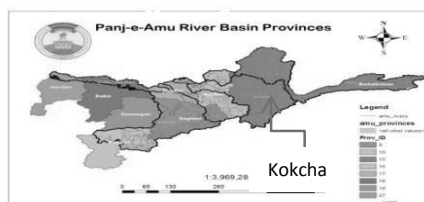


Fig4 showing Kokcha Watershed location



Picture 1: flood damage in Faizabad

Methodology: I did flood Runoff analysis through IFAS (integrated flood analysis system), flood runoff analysis system as a toolkit for more effective and efficient flood forecasting in developing countries. This system implements interfaces to input not only ground-based but satellite- based rainfall data, GIS functions to construct flood-run-off models, a default run-off analysis and river course models(Fig6). This makes it possible to predict and analysis the time and scale of flood events in insufficiently gauged basins. The automatic function of river course modeling based on Global Map, Import Global Map (Land cover) as the information for classification of land-use in IFAS (Fig5). So I create Rainfall-runoff modeling with IFAS for the Kokcha River basin than I compare the ground rainfall and water discharge data of Faizabad hydrological station with IFAS outcome data of rainfall (GSMAP-NRT) and Discharge.



Fig5. IFAS toolkits to implement flood run off analysis and stream

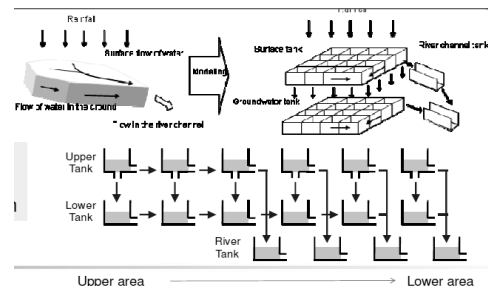


Fig6.Default Runoff analysis system by IFAS

Results & discussions: Developing flood forecasting and warning system is highly expected as a quick and efficient goal to reduce flood disaster and minimize human damage in large watershed of Afghanistan. However it's hard to say that, at present the progress of flood runoff for forecasting is satisfactory. In other hand lack of past hydrological data from RB of Afghanistan still makes identification of Rain fall – run off flooding relationship difficult. The cost of coupling a flood forecasting for flood runoff analysis system to each specific river basin of Afghanistan is difficult and high cost , so by using rainfall data from Global Satellites mapping precipitation – Near Real time (GSMAP-NRT) and implementing Runoff calculation and flood prediction without excessive dependence on ground observation hydrological data, it's possible to promote and development flood Runoff analysis on River Basin level of Afghanistan by IFAS (integrated flood Analysis system).

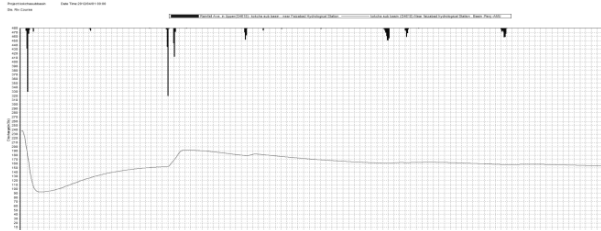
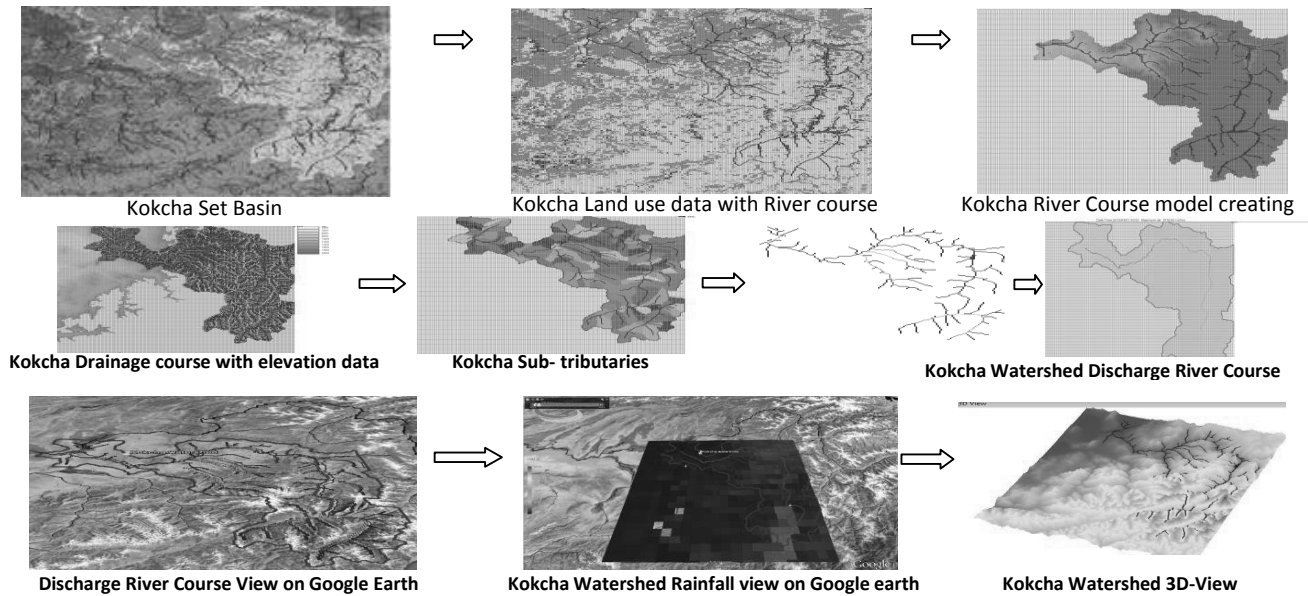


Fig7. Kokcha Hydrograph simulation at Faizabad Station

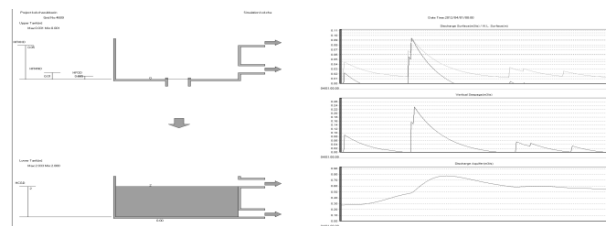


Fig8. Kokcha watershed River Tank Simulation at faizabad station April 2012

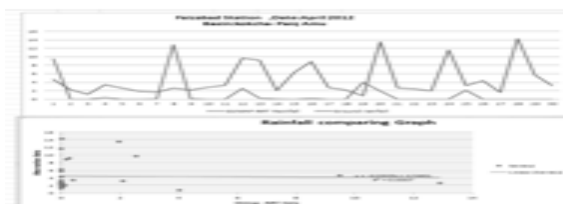


Fig9. GSMAP-NRT Rainfall data with ground observed data at faizabad station-April 2012

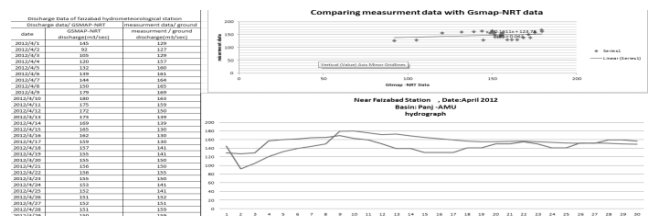


Fig10. IFAS Discharge with ground Measured Data at faizabad station

The fig (10) shows that GSMAP-NRT river discharge is relatively well with ground measured data, but Fig (9) showing difference between GSMAP-NRT rainfall data and ground observed data.

References:

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