Modeling of Inland Surface Waters and Drainage System of Urbanized Srinagar City in Climate Change Scenario

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INTRODUCTION

➢Water is an overwhelming inexhaustible asset.

➢ Evaluation and the operation of water assets with respect to quality and amount is basic for appropriate use of these assets. By 2050 it is predicted that 67% of the world population is expected to be living in urban areas.

➢ Urbanization is often directly linked to the degradation of environmental quality, including quality of water. Concurrently, the climate is also changing.

➢As per IPCC (2007) the awareness of the extent to which change of climate can affect the environment, society, and economy is increasing

➢ Together, the negative impacts of climate change and urbanization result in urban heat island effect whereby urban areas have higher temperatures.

➢ And thus cause heavy precipitation events leading to increase in flood frequency of rivers.

➢Also, there is an impact on urban drainage system because the volume and flow rate may exceed the capacity of existing drainage system leading to frequent surcharging, surface flooding and water logging.

Figure 1. Ecologically degraded Gilsar Lake

OBJECTIVES

1. Quantifying the impact of urban sprawl on inland surface waters using geospatial approach.
2. Climate Change analysis by delta change approach using Mike Climate change tool.
3. Simulation of hydrological and hydraulic response and performance of inland surface waters and drainage system using MIKE 11 and MIKE URBAN

METHODS AND MATERIALS

1. Monitoring the spatial extent of the inland surface waters
2. Data collection and preparation
3. Derivation of parameters
4. Input data into the model
5. Calibrate and validate the model
6. Climate change analysis using delta change approach
7. Simulation of hydrological response of inland surface waters
8. Simulation of hydraulic performance of drainage system

RESULTS

Table 1: Water Spread Area

Inland Surface Waters	Percentage Change (2000-2010)	Percentage Change (2010-2020)
Dal Lake	-16.57	17.85
Nigeen Lake	-0.84	-0.85
Amir Khan Nallah	-10.28	-30.21
Gilsar and Khushalsar Lake	-7.83	-18.49
Anchar Lake	-43.92	-34.46
Brari Nambal	-12.18	-6.93
River Jhelum	-8.06	15.94

RESULTS

Figure 2: Water Spread Area Maps

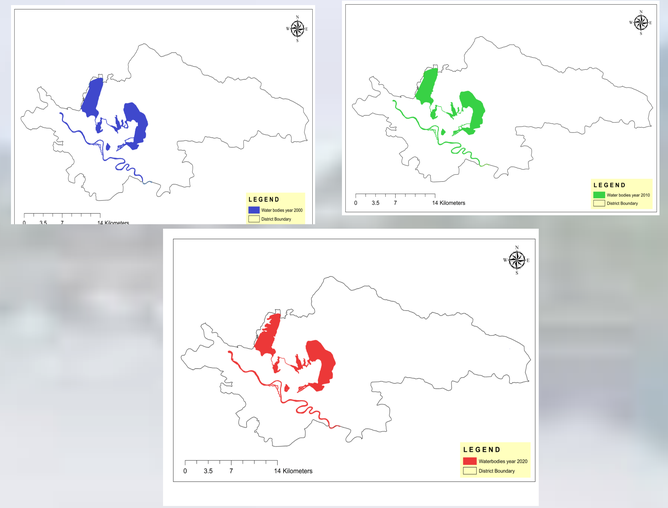


Figure 3: Mann-Kendall Statistics of Climatic Variables

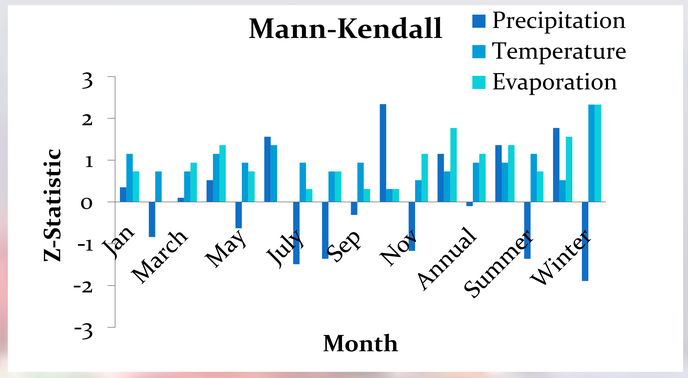
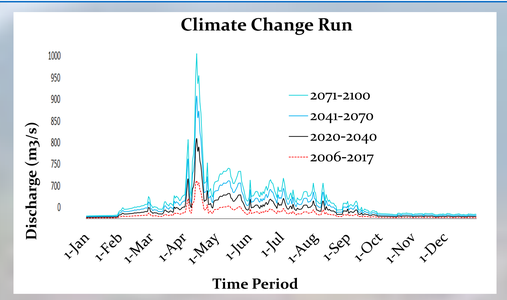
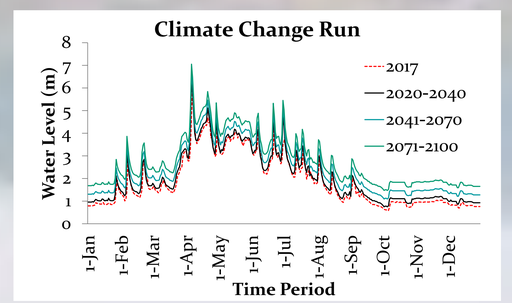


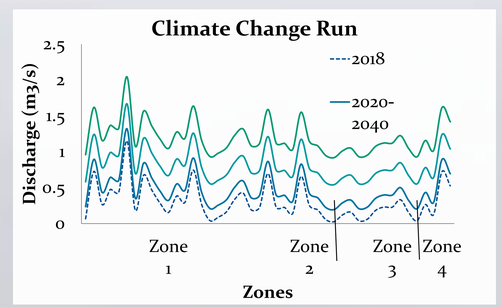
Table 2: Statistical Analysis

Model Accuracy Criteria			
Accuracy Criteria→	Nash-Sutcliffe Efficiency N_{SE}	Coefficient of Determination R^2	Root Mean Square Error
Hydrodynamic Modeling↓			
Average Value	*0.898*	*0.912*	*0.281*

Figure 4: Climate Change Run







CONCLUSIONS

•The inland surface waters are declining rapidly due to the urban sprawl.

• The statistical results reveal that there will be an impact on precipitation and evapotranspiration as temperature is expected to increase by 2.8 ºC .

• The statistical results of MIKE 11 and MIKE URBAN reveal that the models are efficient for simulations.

• The climate change run indicates an that the discharge, gauge water level and link discharge and thus flood threats and wtaerlogging risk will increase.