Indiana freshwater use projection and spatial analysis for renewable water supply
Sanoar Rahman1,2 and Laura Bowling1,3
1Department of Agricultural and Biological Engineering, 2Ecological Sciences and Engineering, 3Department of Agronomy
Purdue University, West Lafayette, Indiana

Introduction

Often, when governmental and non-governmental entities attempt to make plans for future water supply and environmental flows they fall into the trap of developing strategies for specific locations rather than working together and approaching a problem from a basin or regional scale. The problem persists when lack of knowledge of local situations and confining management plans with city and county lines merge together. The purpose of this study is to project future water use and then to reveal if there is any pattern in renewable water supply in Indiana to provide a basis for policy makers and stakeholders to consider possible adaptations.

Data and Method

- **Data and Data Sources:**
  - Water use data (1985-2010) (USGS)
  - Population data (1985-2010) (USGS)
  - Projected population data (2015-2060) (USDA-RPA)
  - Per Capita personal income (1990-2012) (Indiana Department of Workforce Development)
  - Projected income data (2015-2060) (USDA-RPA)
  - Renewable supply predicted by the Variable Infiltration Capacity (VIC) model (Purdue Hydrologic Impact Group)

- **Projecting Water Withdrawals (2020-2060):**
  - Extrapolation of non-linear past trends in water use efficiency (water use per capita)
  - Calculated for different sectors: Domestic & Public (DP), Industrial & Commercial (IC), Thermoelectric (TF), Irrigation (IR), Livestock (LS), Aquaculture (AQ)
  - Following methods of Brown et al. (2013), Projected freshwater withdrawals in the United States under a changing climate, WRR.

- **Spatial Analysis:**
  - Two analysis techniques in ArcGIS were applied: Anselin’s USA, and Getis-Ord (Gi) statistics.

Comparison of Freshwater Use

![Comparison of Freshwater Use](image)

Spatial Analysis

![Spatial Analysis](image)

Conclusions

- Projected water use and renewable water supply together help to quantify water needs in the future and can become important information for stakeholders in decision making.
- Total withdrawals are projected to decrease slightly in the coming decades due to reductions in thermoelectric cooling water use.
- Pockets of high and low spatial association were identified with hotspot Analysis (Getis-Ord). Local level assessment indicated significant clustering of renewable water supply in southern Indiana.

Limitations:
- Water use extrapolation assumes that future water supply is not limiting to demands.
- Extrapolation of irrigation efficiency assumes zero growth and decay rates – i.e. irrigation water use per acre did not change in these projections, but acreage does.

Literature Cited:

Contact: rahman17@purdue.edu