Projecting Municipal Water Needs With and Without Ample Data

Western Governor's Association
Western States Water Council

November 18, 2008

CDM

Demand Projections

- Demand projections are the basis of knowledge for a municipalities largest expenditures.
- Municipalities make very long-term commitments based on the best information available.
- What if the information is limited?

Water Demand Forecast Methods

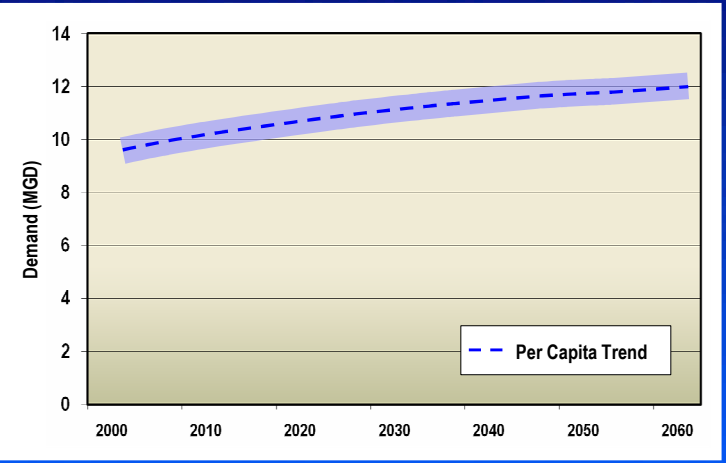
Three approaches:

- DOC Population Projection (Limited Data)
- Per Capita Trend (Average Data)
- Statistical Regression (Abundant Data)

DOC Population Projections (Limited Data)

- Most State Departments of Commerce maintain population projections for all municipalities within their state.
- Municipal providers know how much water they produce annually.
- A direct projection from these two data sources can give an indication of possible future needs.

DOC Population Projections (Limited Data)



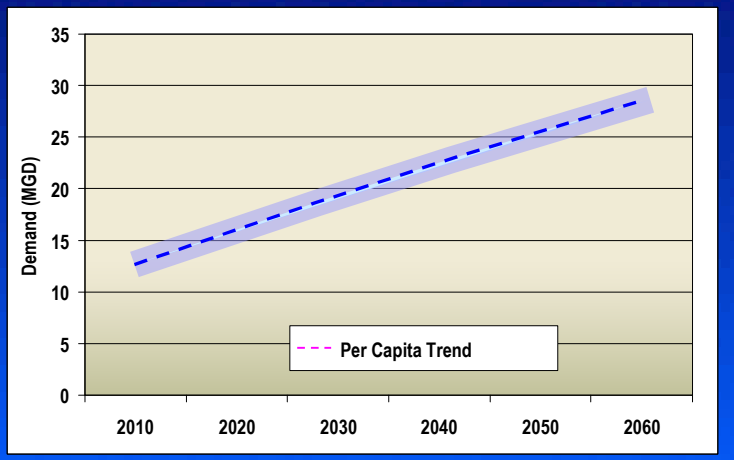
DOC Population Projections (Limited Data)

- Department of Commerce projections may be very accurate on a state-wide basis but may be very conservative for a fast growing community.
- Individual community profiles are very critical in this approach.

Per Capita Trend Method (Average Data)

- Historical water production divided by total population = per capita water use
- Takes trend in per capita water use from history to project future per capita water use
- Multiplies future per capita water use by projected population to obtain water demand forecast

Per Capita Trend Method (Average Data)



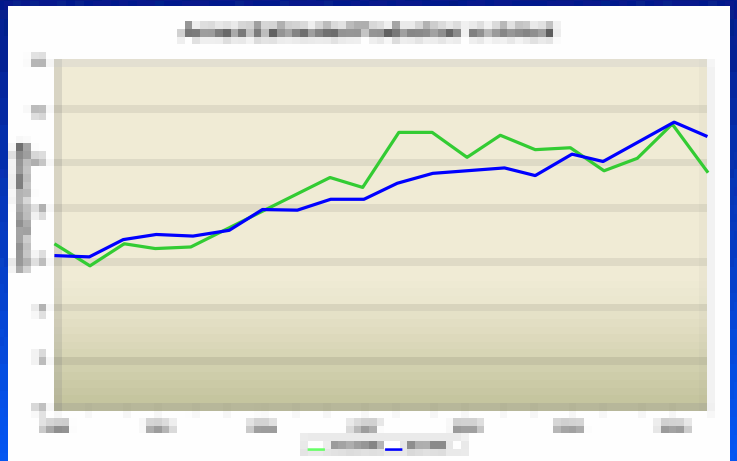
Per Capita Trend Method (Average Data)

- Per Capita Trend projections can be reasonably accurate with a reasonable amount of data.
- Individual community profiles can be accounted for with this approach.
- This approach reflects upon the past in an effort to predict the future using only municipal data.

Statistical Regression Model (Abundant Data)

- Correlates historical monthly water production with:
  - Population
  - Maximum Daily Temperature
  - Monthly Precipitation
- Can be used to explain “variations” in demand
- Projections assume “average” weather, based on a defined period of detailed records

Demand Projection Refined (Abundant Data)



Regression Model Form

Production = $e^{a} \cdot (\text{Population})^{b} \cdot (\text{Max Temp})^{b} \cdot (\text{Precipitation})^{b} \cdot (\text{Binary})^{b}$

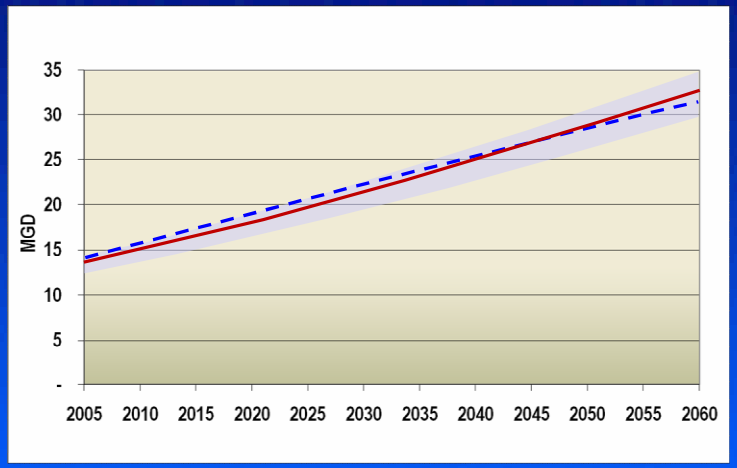
R2 = 0.76
Prob = <0.001

Coefficients:

Intercept	**-15.75**
Population	**1.29**
Max Temp	**0.93**
Precipitation	**-0.10**
Binary*	**0.29**

** Used during summer months for three specific years to account for data anomalies*

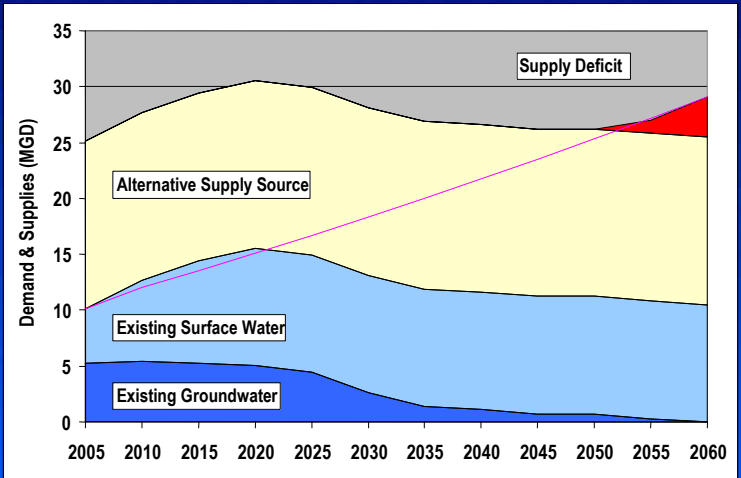
Statistical Regression Model (Abundant Data)



Statistical Regression Model (Abundant Data)

- Helps to understand the relation between human Consumption and our Natural Environment
- Relates physical to non-physical aspects of consumption
- Provides for a comprehensive review of the factors impacting water consumption

Using the Final Projection



How Accurate is the Result

- The accuracy of a project is only as accurate as the approach.
- All three examples given were developed for a community in the Oklahoma City region of Central Oklahoma.
- The Statistical Regression Model approach was used in this project and checked against the other two approaches.

Summary

Three approaches:

- DOC Population Projection (Limited Data)
- Per Capita Trend (Average Data)
- Statistical Regression (Abundant Data)

Projecting Municipal Water Needs With and Without Ample Data

Western Governor's Association
Western States Water Council

November 18, 2008

CDM