



2018 National Capital Region Water Resources Symposium

**Resilient Solutions for Water Management in
Urban Environments: Advances in Research,
Technology, Financing and Policy**

Tamim Younos

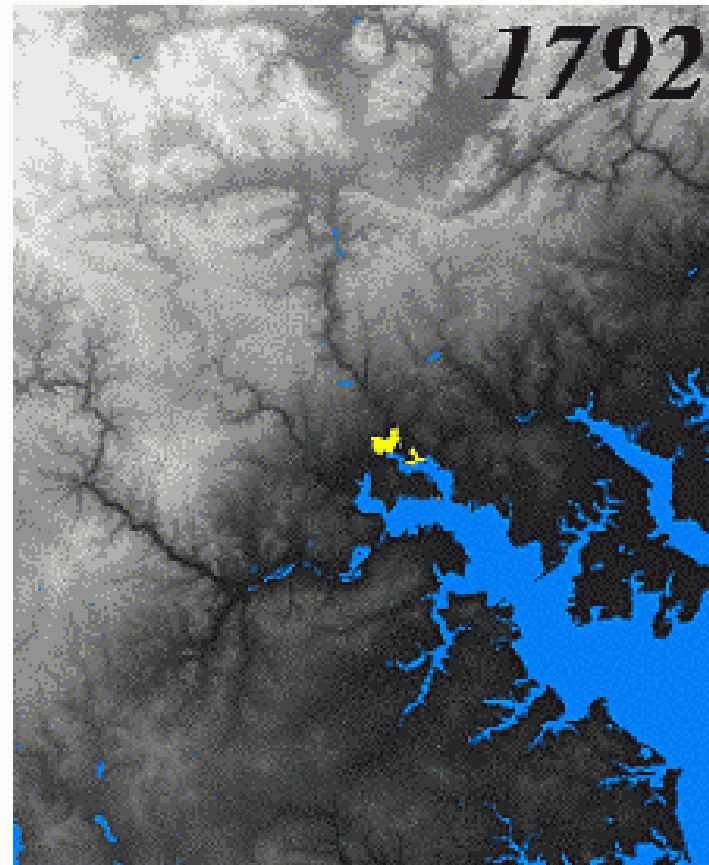
6 April 2018

University of the District of Columbia

Land Development and Urbanization

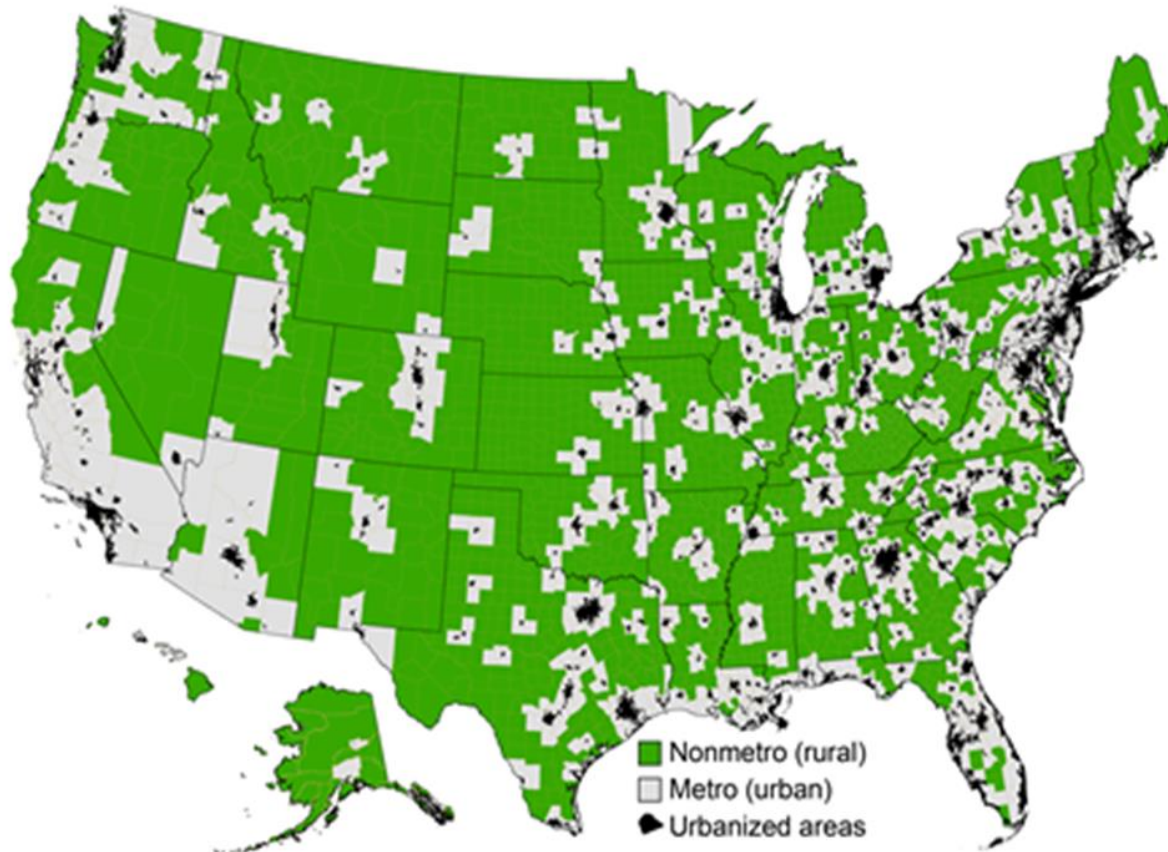
“Every day, America loses more than 4,000 acres of open space to development; that’s more than 3 acres per minute”

USDA Forest Service



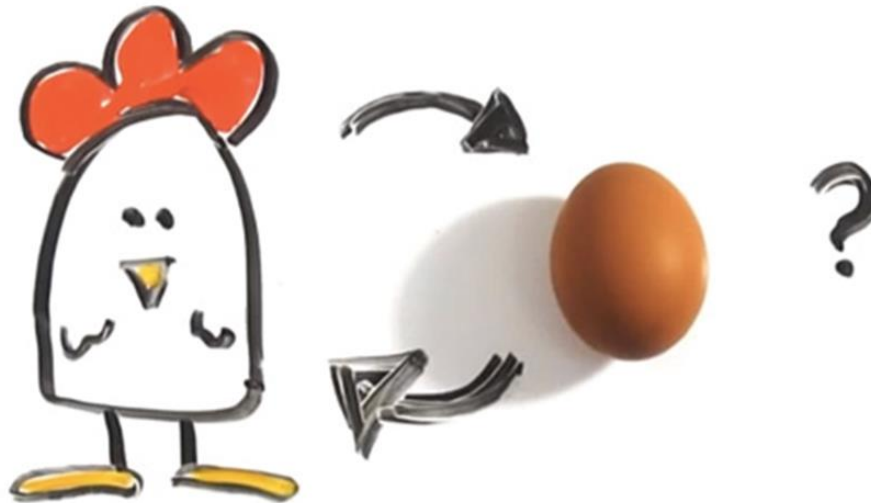
Over 80% of the U.S. Population Live in Urban Areas

Metropolitan and nonmetropolitan counties, 2013



Source: USDA, Economic Research Service, based on U.S. Office of Management and Budget 2013 delineation of metropolitan areas and urbanized area boundaries.

Land Development and Population Growth

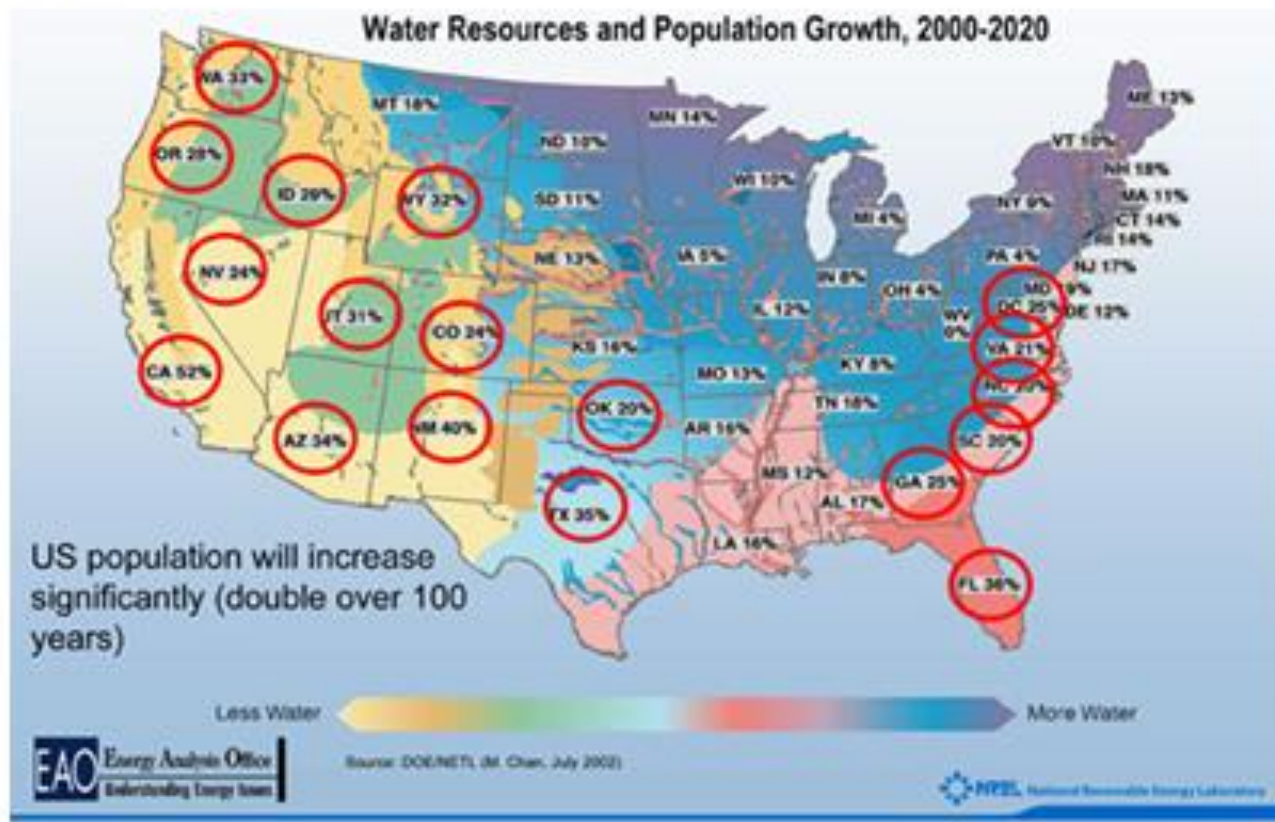


Example: Washington DC Population

1800 - 8,144

2017 - 693,972

Population growth is high in water-stressed areas



Problems could be exacerbated by climate change

Modern Water Infrastructure

20th Century Approaches

- **Potable Water System**
 - Water Sources, Water Treatment and Distribution
- **Wastewater Network**
 - Wastewater Drainage, Treatment Plants, Discharge
- **Stormwater (Runoff) Drainage Network**
 - Storage and disposal to surface waters

Urban Water Infrastructure Characteristics and Problems

- Planned, designed and managed as separate systems
- Interconnectedness of natural landscape and engineered systems are not considered
- Significant wastewater and stormwater runoff
- Dependence upon extensive pipe networks
- Dependence on chemicals
- Urban water infrastructure is energy intensive

Existing water infrastructure is not sustainable from environmental and cost perspectives

Quality of Life Criteria in Urban Environments

Our Goals and Expectations

Quality of Life Criteria 20 th Century	Quality of Life Criteria 21 st Century
Running tap water in each household	Running tap water free of chemicals
Sewer disposal for each household, industrial pollution control	Zero pollutant discharge
Develop surface water resources – build dams and reservoirs Excessive groundwater withdrawal	Develop alternative water sources - rainwater and stormwater capture, wastewater reuse, desalination of saline water
Accelerated urban development and stormwater drainage network	Low Impact Development and green urban environment, urban aesthetics
Affordable housing & buildings	Water/energy efficient housing & buildings
Develop fossil-fuel energy resources	Generate clean and renewable energy resources - decentralize
Import food, use pesticides for increased food production	Organic farming, urban agriculture, mixed land use
Develop communication infrastructure	Wireless and satellite technologies Cyber infrastructure

Challenges Facing Urban Water Management in the 21st Century

- Emerging Contaminants in Surface and Groundwater
- Half-Empty Aquifers Across the United States
- Potable Water Leakage and Contamination via Pipelines
- Chemicals in Drinking Water
- Anthropogenic Flood and Drought in Urban Areas
- Energy Demand in Water Infrastructure
- Climate Change and Consequences
- Cyber Security

2018 NCR Water Resources Symposium

Agenda

Morning Agenda

- Keynote
- Expert Panel
- Coffee Break & Poster Presentations
- Lunch & Luncheon Speaker

Afternoon Agenda

- Special Session: Water Reuse
- Con-Current Sessions & Poster Presentations
- Coffee Break & Poster Presentation Awards