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Center for Water-Energy Efficiency

How Innovative Software Can Advance Water Management Opportunities and Challenges

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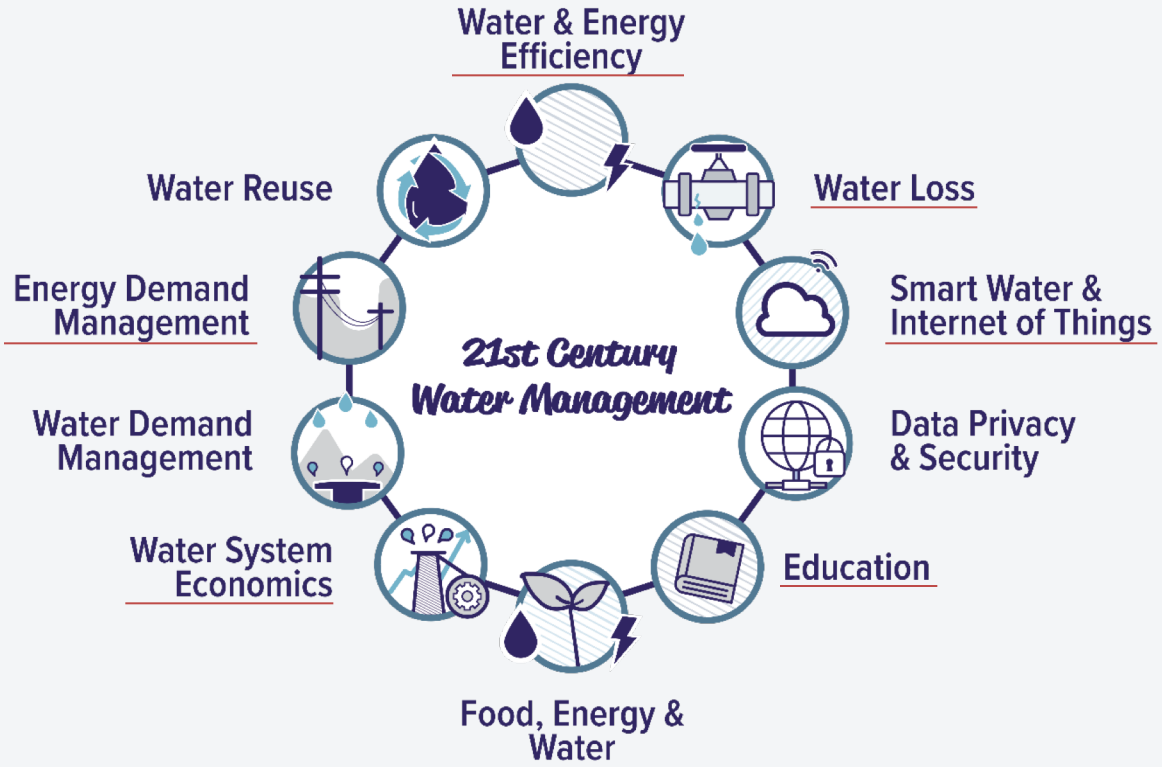
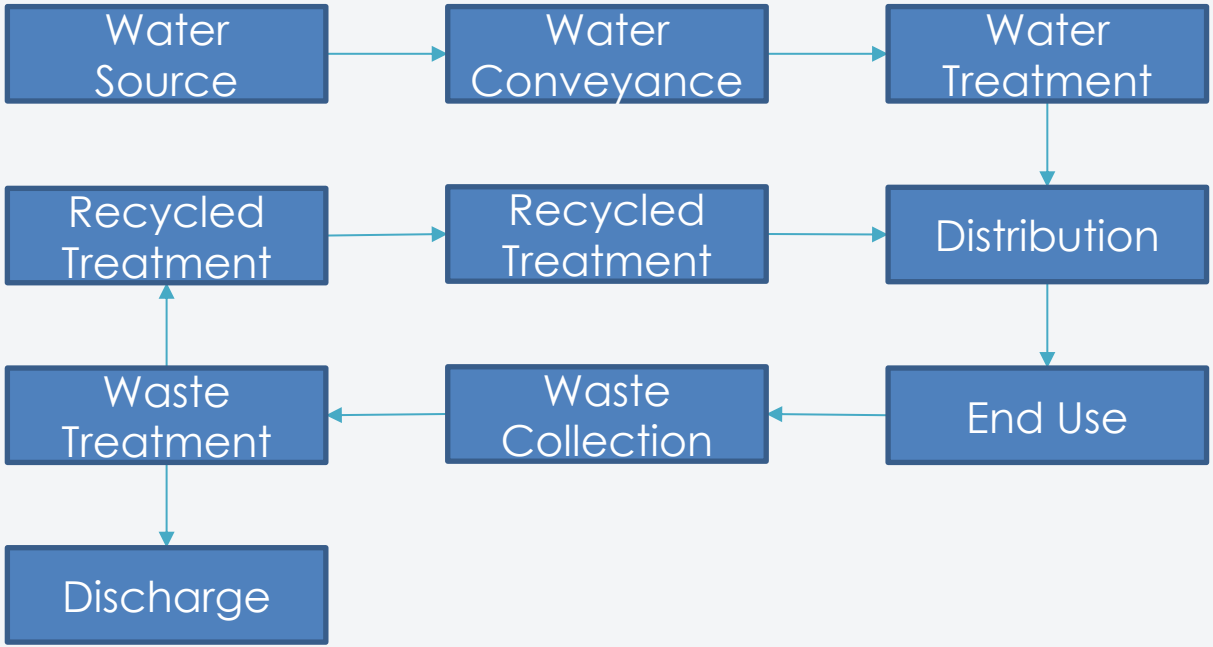


Scales of Operation



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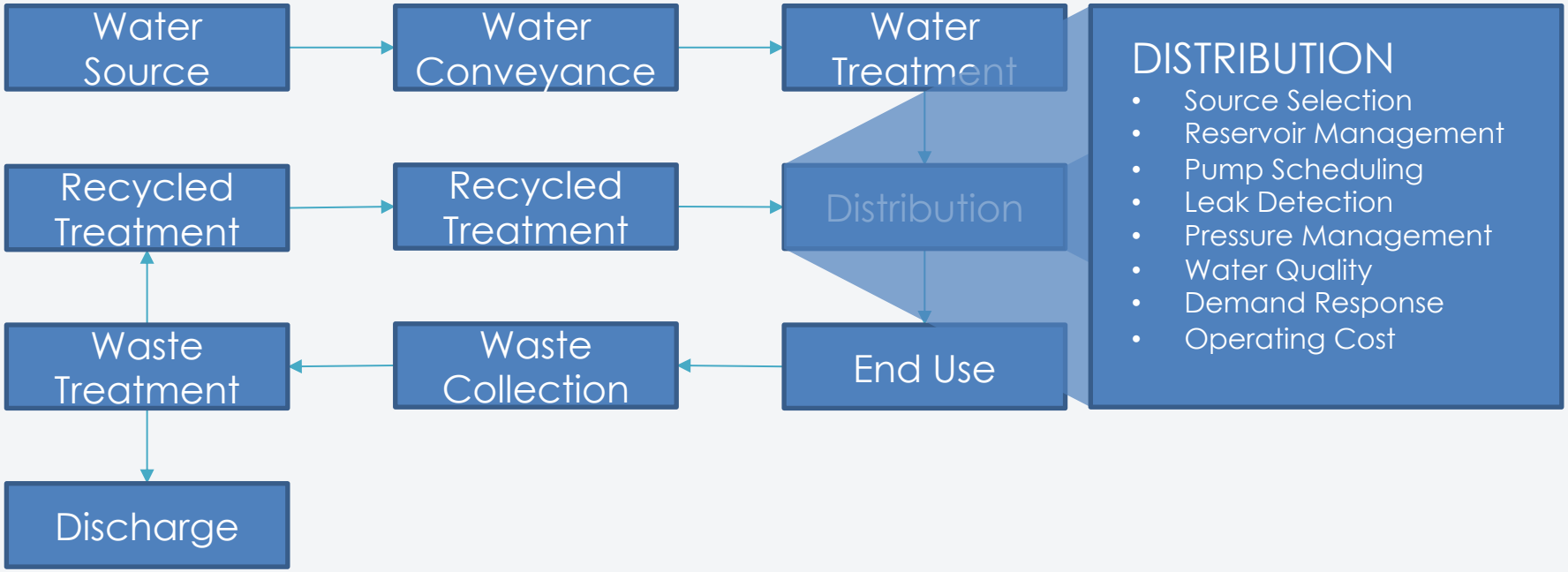


Operational and Management Responsibilities

- Source Selection
  - Ground water, surface water, wholesale, recycled **purchasing or production**
- Reservoir Management
  - **Local storage** for drinking, fire flow, etc.
- Pump Scheduling
  - **Rotation of lead pump** at pumping stations, planning for maintenance/emergency
- Leak Detection
  - SB555, **Water Loss Control** and Auditing
- Pressure Management
  - **Delivery, leak control, energy intensity, etc.**
- Water Quality
  - **Chlorine residual**, nitrification monitoring, water age
- Demand Response
  - Capacity to or plan to **reduce energy demand** and specific hours

Impact on Daily Operations and System Planning

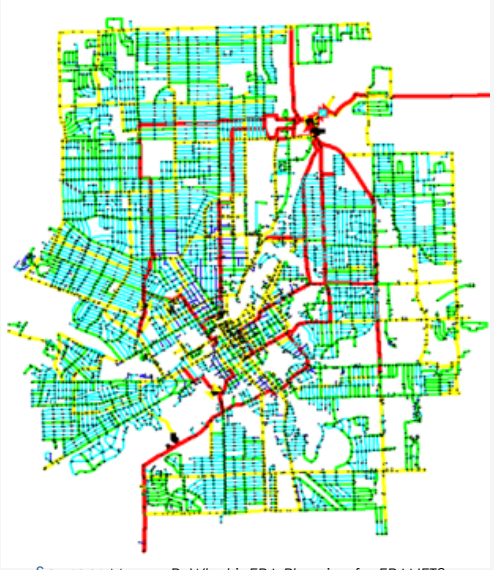
- Reservoir Management
  - **System operation** by scheduling the filling or draining utilizing **pump stations**
- Pump Scheduling
  - **System operation with** efficient pumps, or participation in Demand Response
- Leak Detection
  - **System planning and operations** with District Metered Areas, AMI, Ultrasonic Detection
- Pressure Management
  - **System planning** to reduce pressure where appropriate
- Demand Response
  - **System operation** to reduce demand when beneficial

Hydraulic Modeling

- Software that uses first principles of engineering (mass balance, energy balance) to simulate hydraulic and water quality at water distribution systems

- EPAnet & SWMM – 2002
- EPAnet-MSX – 2008 (last stable release)
- EPAnet-RTX – 2015

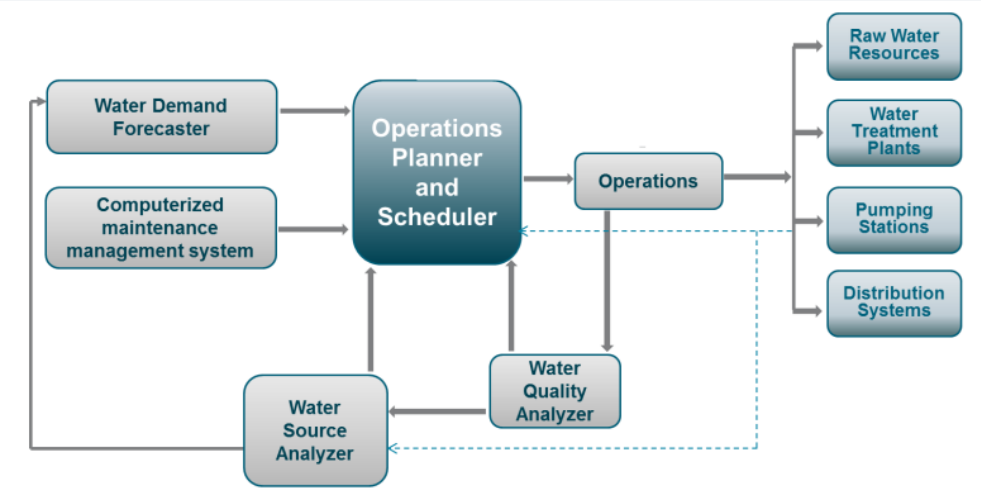
- Bentley: WaterGems, WaterCAD
- Innovyze: InfoWater
- DHI: MikeUrban
- Derceto: Aquadapt



Source: Murray, R. *What is EPA Planning for EPANET?* ASCE Visioning Summit, Reston, VA, April 03 - 04, 2018.

Energy and Water Quality Management System

- All stakeholders interested in software to optimize water system operations



Source: 2015 Water Research Foundation, Optimization of Energy and Water Quality Management Systems for Drinking Water Utilities, Mohammad Badruzzaman, Simon Bunn, Linda Reekie

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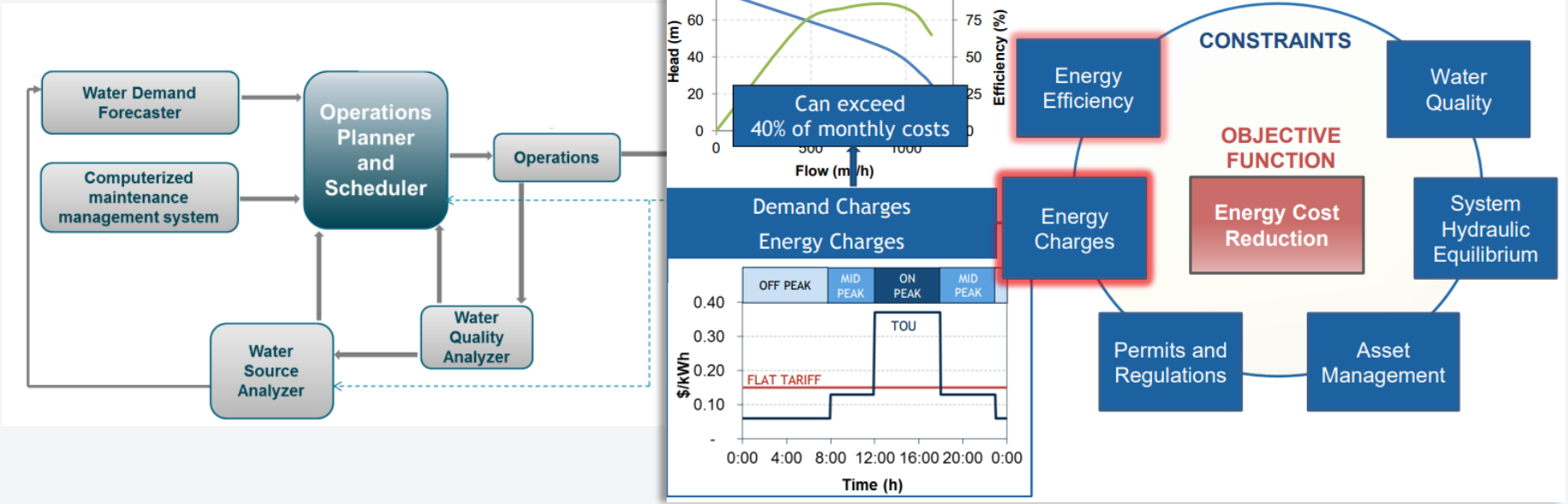

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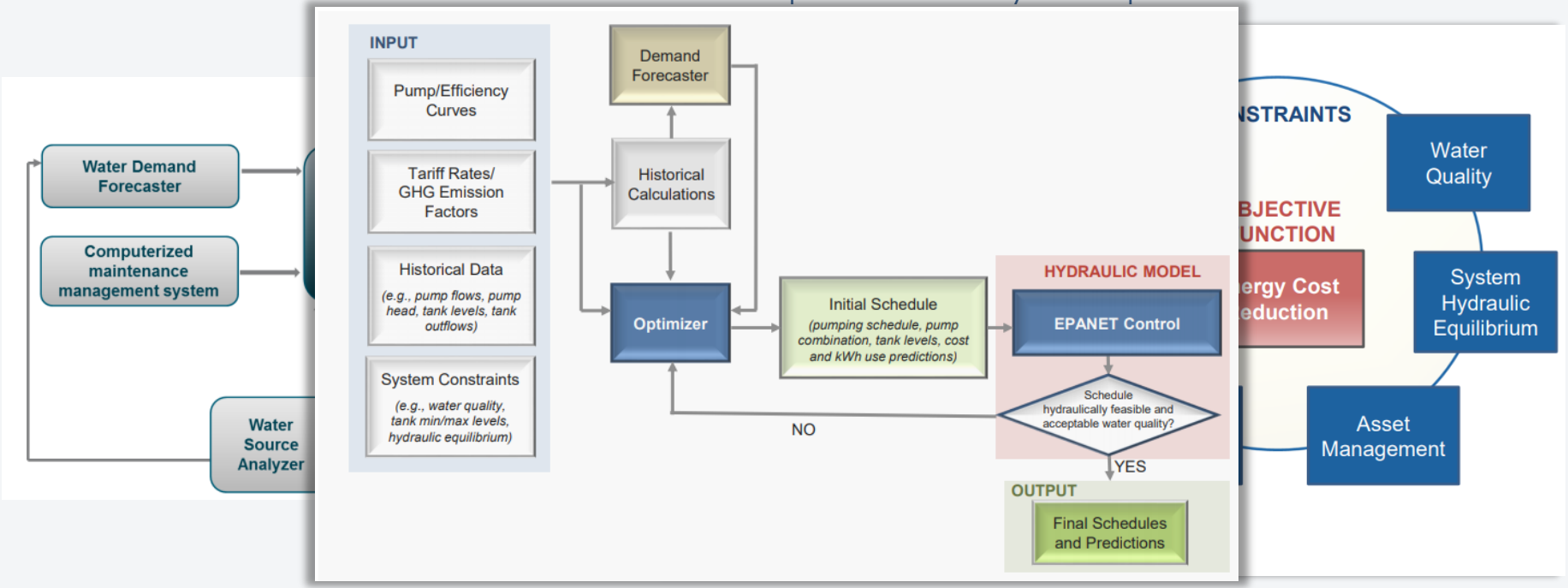

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Energy and Water Quality Management System

- All stakeholders interested in software to optimize water system operations
  - Dozens of pilots world-wide, no killer app yet

    - Requires accurate hydraulic model and data sources
      - Dedicated effort to maintaining GIS records
      - Direct relationship between SCADA and GIS

    - Requires significant trust from operators
      - Hydraulic model operations matching field
      - **Recommendation consistency**

    - Must reflect operations and availabilities *now*, not just typical
      - Pump Station Maintenance
      - Reservoir rollover

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A Day in the Life of a Water System Operator

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Introduction

You will be acting a **day-in-the-life** of an Operator

As an operator, your objective is to ***provide water to customers*** when they want it.

You can choose how much water to purchase each hour and put into your system.
The cost will vary depending on the hour

Your customers will drink from your purchased water immediately
– ***any they don't drink will be stored in a tank.***

If you don't supply enough water, ***the customers will drink from the tank.***

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How to Operate your Water System

Buying water will **cost you money,**
But your customers will **pay you** if you get them their water!

If the you don't have enough water, you **will receive a penalty**!