Water Systems and Urban Economic Development

Presentation for the USDN Urban Water Learning Group

June 9, 2014

Innovation Network for Communities

Learning Question

In what ways can a city's water system be an asset for local economic development?

Are concerns about security or cost of water supply (due to climate change or other factors) **affecting location/investment decisions of water-intensive corporations**?

What are the different approaches a city/metro area can use to **develop a water technology business cluster** and what are the factors that contribute to building successful water clusters?

Research Conducted

Corporate Location/Investment	Interviews: • Jake Rouch, Vice President for Economic Development, Erie, OH Regional Chamber and Growth Partnership • Matthew Howard, Environmental Sustainability Director, City of Milwaukee, WI Documents: • Pacific Institute and VOX Global, "Bridging Concern with Action: Are U.S. Companies Prepared for Looming Water Challenges?" (April 2014), http://voxglobal.com/wp-content/uploads/Bridging-Concern-with-Action-Are-US-Companies-Prepared-For-Looming-Water-Challenges_FULL.pdf • "Tap Into Erie," www.tapintoerie.com
Water-Technology Business Clusters	Interviews: • Sally Gutierrez, Director Environmental Technology Innovation Cluster Development and Support Program, EPA Office of Research and Development, Cincinnati • Dean Amhaus, President and CEO, The Water Council, Milwaukee • Matthew Howard, Environmental Sustainability Director, City of Milwaukee • Rich Overmoyer, Fourth Economy, facilitator for the Pittsburgh Water Economy Network Documents: • EPA's Office of Water, "Promoting Technology Innovation for Clean and Safe Water: Water Technology Innovation Blueprint—Version 2 (April 2014), http://www2.epa.gov/sites/production/files/2014-04/documents/clean_water_blueprint_final.pdf • "Water Innovation Cluster: Round Robin Private Network Meeting—October 7, 2013) • http://www2.epa.gov/clusters-program • www.thewatercouncil.com • www.refreshmke.com • watereconomynetwork.org

FRAMING THE WATER SYSTEM & ECONOMIC DEVELOPMENT RELATIONSHIP

Economic Development is a New Factor for Urban Water System Planning & Development

How can urban water systems help cities to…

Pursue Economic Opportunities	Reduce/Manage Economic Risks
Business Investment and Development	Supply Disruption
Real Estate Development	Pollution
"Placemaking"	Climate Change

Pursuing Water-Based Economic Opportunities

Water Business Investment, Development & Job Creation

1. Water Sector Business Expansion (utilities, suppliers, service companies)
2. Water Technology Cluster Development
3. Water Research /Training
4. Water-based Commerce/Freight
5. Tourism/Recreation Revenues ("Blue Amenities")
6. Ecological Restoration/Protection & Access/Blueways
7. Commercial Fisheries
8. Grey Infrastructure Investment & Job Creation (engineering, construction, etc.)

Real Estate Development

1. Waterfront Redevelopment
2. Property Development & Neighborhood
3. Re-Development (Property Values)
   - Green Infrastructure Projects
   - Brownfield Restoration
   - Relocation of Industry No Longer Using Water Transport
4. Electricity Supplier (Import Substitution)
5. Hydropower
6. Steam Co-generation
7. District Scale Generation

Placemaking

Sustainable water as a lifestyle magnet (amenities, social and professional networks, resources, and opportunities) for talent, particularly young people

For overview of water & economy see John Austin, "Water, Michigan, and the Growing 'Blue Economy," Michigan Economic Center. 2013, http://www.mieconomiccenter.org/News/tabid/90/ID/52/REPORT-Water-Michigan-and-the-Growing-Blue-Economy.aspx

CORPORATE LOCATION/INVESTMENT

Water Intensive Industries

Humboldt State University

- Apparel
- Automobile
- Beverages
- Biotech/Pharmaceutical
- Chemical
- Food Manufacturing/Processing
- High Tech Electronics
- Paper Products
- Metal Mining
- Refining
- Coal Products

USGS

- Food
- Paper
- Chemicals
- Refined Petroleum
- Primary Metals

California Study –
Gallons per employee per day

- Petroleum and coal products (11,399)
- Lumber and wood products (2,144)
- Food and kindred products (1,967)
- Textile mill products (1,530)
- Primary metal industries (1,318)
- Stone, clay, glass and concrete (1,304)
- Paper and allied products (1,000)
- Chemical and allied products (833)

Yes, Corporations Increasingly Paying Attention to Water Risks, But…

1. Water only one of many concerns involved in location decisions
2. “True cost” of water greatly underestimated and not reflected in corporate analysis
3. Adaptation through increased efficiency and monitoring a more likely approach than relocation

2014 Survey of 50 Major U.S.-Based Corporations

- 79% said they currently face water challenges: physical, reputational, regulatory, or legal risks
- More than 80% said water challenges will affect their decision on where to locate facilities; 60% said company growth and profitability will be affected

Among the Respondents

Alcoa, AT&T, CH2M Hill, Cummins, Dell, DuPont, Intel, Merck, MillerCoors, Nestle Waters, Nike, Pepsi, Starbucks, Hershey, Unilever, Union Pacific Railroad

"Bridging Concern with Action," Pacific Institute & VOX Global

Other Business Concerns Treated as More Important

Survey of Corporations

- Although companies expressed concern about water-related challenges and risks, "the majority of companies surveyed do not appear to be planning corollary increases in the breadth and scale of their water risk management practices."

- Respondents identified as one of the two "most significant *internal* challenges to increased investment in water management: ***"Mitigating other business risks is a higher priority."***

Top 10 Location Factors for Manufacturing Sites – 2011

1. Highway accessibility
2. Labor costs
3. Tax exemptions
4. Occupancy or construction costs
5. State and local incentives
6. Corporate tax rate
7. Availability of skilled labor
8. Inbound/outbound shipping costs
9. Energy availability and costs
10. Availability of buildings

From *Area Development Magazine,* annual "Corporate and Consultant Survey"

Other Factors in Location Decisions:

Toyota Moves from Water-rich Kentucky to Water-scarce Texas!

- "Toyota announced Monday that it's consolidating its North American headquarters in Plano, just north of Dallas, and is closing its national sales office in Torrance, California, and a smaller corporate office in New York. Locally, Toyota will move about 1,000 administrative workers in accounting, finance and information systems to Plano, where the new headquarters is expected to open by early 2017."
- ***"States like Texas have an advantage. Thanks mostly to oil and gas revenue, Texas has no state income tax and aggressively pursues companies from the Midwest and California. Texas officials told the Associated Press on Monday that the state offered Toyota $40 million to relocate its headquarters to Plano."***
- Toyota spokesman said that Texas is a logical choice for the new headquarters, which also will include thousands of workers from California and New York, because of its central location and proximity to transportation hubs and international ports.

Cincinnati!com: http://www.cincinnati.com/story/news/2014/04/29/toyota-move-stuns-region-wounds-economy/8448529/

True Cost of Water

- "… a failure to adequately evaluate the true cost of water. As a stand-alone cost, water remains relatively cheap. When compared to a company's electricity costs, for example, water is substantially less expensive. For companies that have chosen to dig deeper… a wide variety of hidden costs associated with water." ("Bridging Action with Concern," 10)

Cummins

- Developed a management tool that identifies water costs embedded in activities such as pumping, electricity and chemical use.
- Using the tool at engine plant in Indiana, measured the fully embedded cost of water exceeded $20 per thousand gallons—more than five times the basic water and wastewater cost of under $3.
- "Calculating the total cost of water is critical to helping water projects compete, driving efficiency efforts." ("Bridging Action")

Adaptation through Increased Efficiency & Monitoring

From Corporate Survey:

- More than 75% of surveyed companies "are implementing some sort of water use efficiency or pollution reduction practices already."
- Measuring and monitoring water use "by far" the important management activity, according to survey respondents
- 55% of companies had set goals/targets for water efficiency/use reduction improvements

Did complying with Clean Water Act, which led to creation of water-saving efforts and purifying technologies, position companies better for driving their own business and revenue risk assessment and a propensity to invest in adaption rather than relocation to find water?

Rapid Growth of Water Risk Assessment Tools

- CDP Water Disclosure
- Ceres Aqua Gauge
- GEMI Local Water Tool
- GEMI Connecting the Drops
- RepRisk
- WWF/KWF Deg: The Water Risk Filter
- Water Footprint Assessment Tool
- Others

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Water Footprint Framework

- Operational
- Supply Chain
- End user/consumer
- Blue water (surface & groundwater)
- Green water (soil moisture)
- Gray water (polluted water)

www.waterfootprint.org

Corporate Water Efficiency Cases

AT&T

- Top 125 water-consuming facilities (small % of total real estate) accounted for nearly 50% of total water use.
- 31 of these facilities in water stressed regions
- Worked with Environmental Defense Fund to reduce water & energy use in cooling towers
- Goal of reducing water use by 150 million gallons by 2015

"We're beginning to see that relatively small capital investments can bring about nearly ten times the amount of savings in annual water and energy costs" – AT&T Asst VP, Sustainability Operations

"We work to manage our usage responsibly and proactively protect its quality and availability in the communities in which we operate." – MillerCoors Director of Sustainability

Hershey

- In 2009-10, conducted water audits at 8 plants in North America and Mexico to identify opportunities for water conservation and management
- In 2011 company established baseline water consumption measurement of 550 million gallons consumed annually and has been working to cut consumption in manufacturing operations

Miller Coors

- Facilities in 10 U.S. cities; 3 breweries in water scarce/stressed Texas, Colorado, and California
- Accounting for water use at every step in supply chain since 2008, after setting water efficiency goals
- Pilot project in Trinity River Basin in Texas with ranch owners—to test conservation practices and land management techniques to keep more water in the soil
- Result: native grass vegetation retains about 40% more water in the soil than non-native prairie grass vegetation.

From "Bridging Concern with Action"

Cheap Water Doesn't Sell "Tap into Erie" PA Case (1)

- Erie lost a major water customer when a paper mill shut down. Excess water supply capacity of 35-40 million gallons a day
- Erie Water Works adjusted water rates, lowering for residential and increasing for industrial customers. This drove dramatic water conservation by industrial customers, leading to even more oversupply and less revenue than rate change had projected.
- Scarcity of water supply in some regions of U.S. was becoming news.
- IN 2007 Erie Water hired a consultant to figure out how to bring in more business customers, targeting foreign-owned mini-steel mills; data centers; food and beverage processing; and craft brewers.
- In 2009 Erie Water offered a 40% rate cut over five years for new industrial customers, anchoring a package of relocation incentives and a state-of-the-art membrane system (attractive to beverage companies)
- BUT… the national economy did not continue to grow and it turned out that water scarcity was not a driver in relocation decisions in the targeted sectors.

Tap Into Erie (2)

- "Water, in and of itself, is not the key variable."
  - Data Centers were more motivated by power rates
  - Mini-steel mills were not expanding
  - Food processing needed to locate near suppliers of food; beverage processing needed to locate near markets
  - Craft brewers were an emerging sector; they were fickle and had to be approached at just the right time
- Water rates across regions vary a great deal and don't reflect "true cost"—so price comparisons are difficult to make.
- Erie shifted to a more diversified regional development strategy that includes water discounts.

In 2010 Milwaukee offered "Wave Rates" to attract industrial location

- Discontinued because no one used them
- "Availability of water is an important site selection factor, but not the cost of water. Larger users benefit from our declining block rate structure."

Summary Findings: Water as Factor in Corporate Location Decisions

1. Businesses more likely (for now) to adapt—increasing efficiency to reduce water dependency—than to move.
2. Water pricing not a strong factor in affecting business location decisions in North America
3. As companies recognize true cost of water, more likely to invest in conservation and efficiency

WATER TECHNOLOGY BUSINESS CLUSTERS

Defining "Water Technology"

EPA Framework for Technology Innovation

"It is difficult to envision sustainable solutions to our water challenges without technological innovations."

Needs/Opportunities	Technologies/Examples
Conserving and recovering energy	• Wastewater to energy • Biogas recovery (dairy/swine)
Recovering nutrients	• Treatment and recovery
Improving & greening water infrastructure	• Assessing, rehabilitating and retrofitting wastewater, drinking water, and stormwater infrastructure
Conserving and reusing water	• Water conservation technologies • Water reuse technologies
Water monitoring	• Water quality sensors (coupled with improved telemetry and information technology) • Remote sensing & satellite imagery • Storage, communication, analysis and visualization of water data
Water treatment	• High-efficiency Ultraviolet Disinfection

Defining "Water Technology"

Some Private Sector Frameworks

Steve Maxwell, "The Business of Water," 2010

- "Few observers believe that there are any truly revolutionary technological breakthroughs that will transform the treatment and use of water. However, incremental technological advances are ubiquitous, and thousands of technology developers are actively working on developing and commercializing better systems across all sectors of the industry."
- Technologies include: reverse osmosis, membrane filtration, UV radiation, chlorination, demineralization, ion exchange… electro-coagulation, sonication, cavitation, ozonation, electro-dionization, biocidal disinfection, electrodialysis reversal, multi-stage bubble aeration.

Goldman Sachs, "Water: Emerging Risks & Opportunities," 2013

"Several leading water technology companies discussed the current environment of constrained capital flow from the municipal sector and why low water tariffs make adoption of technologies less attractive. Despite the constraints, there are increasing opportunities for technologies that enable greater efficiency in existing water infrastructure systems and solutions that convert wastewater to a resource."

Smarter Water –increasing water efficiency	NetBase Water Management software, which provides municipalities with the data monitoring and analytics needed to manage water flow, system pressure, and water loss – ultimately promoting more informed decision-making
Water reuse / Energy efficient water	Companies are turning to technologies that can enable wastewater to become a resource. These recycle and reuse solutions can meet water demand needs for non-potable water intensive sectors such as power generation. Technology solutions are also addressing the energy intensity associated with water delivery and treatment.
Decentralized/ distributed systems	In the U.S., there are opportunities for technology to provide more modular on-site systems particularly to address industrial needs. For example, wastewater plants are addressing some of the water needs in the Pacific Southwest as much of the reusable water in large quantities can be redirected toward commercial purposes such as cooling water for power plants.

Water Technology Clusters…

Definition of a Cluster

- "Geographic concentrations of **interconnected** businesses, suppliers, service providers, and associated institutions." (Brookings Institute)

- **Collaboration** between business, educational, and planning entities to provide advances in research, development, and deployment of cost-effective, timely, and innovative solutions concerning water resource management. (EPA)

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Creating comparative advantages for businesses selling into targeted markets

Many Efforts Called "Clusters"

- 15 water "clusters" attended 2nd annual meeting of Water Innovation Clusters sponsored by Water Environment Federation and EPA, October 2013

Colorado Water Innovation Cluster—2 universities, 10 industrial organizations, 3 local governments	**Michigan Water Technology Initiative**—state and local governments, water corporations, universities	**Confluence Water Technology Innovation Cluster** (Ohio River Valley)—EPA laboratories, businesses	**Blue Tech Valley Cluster** (Central and Southern CA)
Milwaukee Water Cluster—150 companies, freshwater research institute, city government	**New England Water Innovation Network**	**Nevada Center of Excellence in Water** – research institute partnering with public and private partners, including IBM	**NorTech Water** (NE Ohio)
Pittsburgh Water Economy Network	**Southwest Water Cluster Initiative—**U of Arizona	**Urban Clean Water Technology Zone** (Washington State)	

EPA also following three international water technology cluster developments: Israel, Singapore, and Ontario

Cluster Profile

Milwaukee Water Council

- Council created by business and education leaders
- Council is choreographing development of an "ecosystem" for innovation, research, industry partnerships, and investment

Assets:

- 150 water technology companies
- Great Lakes Water Institute, largest freshwater research institute in Great Lakes
- U-Wisconsin: first school of freshwater sciences in U.S.
- Global Freshwater Seed Accelerator – a mentor-driven accelerator investing in technology development ($22 million in private capital)
- Reed Street Yards – a 15-acre water technology park for mixed use: office, educational, research and technology zone
- NSF Industry/University Collaborative Research Center
- Water law program and water business management program at local universities
- 100 academic scientists and researchers
- MOU with Tianjin, China for commercial and entrepreneurial exchange
- $80 million invested in buildings and infrastructure

Alignment:

* *ReFresh Milwaukee*, a vision for community sustainability for community sustainability (2013): Establish Milwaukee as America's Water-Centric City

Cluster Profile

Pittsburgh Water Economy Network (WEN)

- Vision: "… a global center for water sector research, innovation, business development and responsible water resource sustainability."
- Purpose: "help regional water sector stakeholders access new water sector business development opportunities, encourage new company formation through innovative technology development and deployment, attract both national and international water-related industries, and promote responsible water resource sustainability."
- 2011 assessment of opportunities in region's water-related industries, recommended cluster development, based on the Milwaukee model
- Key focus areas: Energy-Water Intersect; Industrial Water Retention & Storage; Water Reuse and Treatment; Navigation and Monitoring; Green Infrastructure and Stormwater Management
- Key WEN services: facilitating seed capital and investment funding; identifying project opportunities and facilitating teams to respond; making new industry connections; sharing information (technical/grants/project teaming)
- Industry leaders expressed interest in forming their own network to advance regional water innovation; WEN launched in September 2012
- Some board members: Carnegie Mellon University, Veolia Water, W VA Water Research Institute, Bayer Material Science, Port of Pittsburgh Commission, Sustainable Pittsburgh
- Some partners: EPA, Pittsburgh water & Sewer Authority
- Member dues range from $1-10,000 private sector; $1-5,000 higher education; $500-$5,000 nonprofit or government. WEN has $175,000 annual operating budget.
- WEN organized a $200,000 seed capital fund .

Cluster Profile

Confluence (Ohio River Valley)

The Process To Date

- EPA had idea to leverage its lab in Cincinnati, probably largest federal water research lab in U.S.
- EPA engaged community leaders in region: mayors, water utility executives, startup companies, etc.
- "When we started, many people didn't know they had this research lab. We didn't have relationships with businesses."
- Hired a cluster consultant, mapped water patents in 100 mile radius from Cincinnati, collected information about relevant research grants in the universities, and studied venture capital investments in drinking water.
- Presented all of the information to group of about 60 people, which agreed to pursue a water technology cluster.
- A small group (6-7 members) developed a proposal for the larger group. January 2010 larger group reconvenes and is convinced that the existing assets in region are basis for developing an environmental technology cluster, starting with focus on water.
- "EPA said all along, we're happy to engage stakeholders and support the effort, but we don't own it. It has to be owned by the stakeholders."
- Group established a nonprofit to serve as convener, with an executive director and dues paying members.

Factors for Success in Cluster Building

Dean Amhaus (Milwaukee Water Council)

- It has to be industry led, not community led.
- It takes a lot of money and the direct commitment of CEOs.
- You need to have academic institutions already focused on R&D, with researchers with the right attitude about commercialization, not just research.
- Network facilitation is key. It's all about people, and you need to have the right people at the right time with the right attitude. You need to know what collaboration means—sharing success, knowing when to be and not be front and center.
- Don't fall into the 'economic development trap.' We had people ask us how many jobs are you going to create? We don't know and we're not going down that road.
- We had CEOs that were interested in taking on big risks that would never make it through city government.

Factors for Success in Cluster Building

Rich Overmoyer, Fourth Economy (facilitator of WEN)

- Network building brings together novel combinations of players, which generates energy and exchange with outcomes that could not have been predicted. “We convene players across the system, and it has spawned collaborations in novel areas such as employee training.”
- An analysis and map of the region’s water sector makes visible a set of correlations that are not always obvious to the players in the region. It wasn’t until Pittsburgh leaders saw the map that was created that they realized the region held the potential for a water cluster.
- Regional clusters can connect with each other and make strategic alliances with assets outside of their region. Pittsburgh is seeking to commercial innovations in stormwater management with a partner in Germany.

EPA's Involvement

Sally Gutierrez, EPA

"The [EPA] Office of Water will support the regional water technology innovation clusters in their efforts to promote technology innovation, including efforts to verify emerging technologies, research and pilot promising technologies, and provide awards to encourage innovation."

- EPA doesn't want to get too boxed into whether something is a cluster or not. There are clusters and water initiatives. Some are narrowly focused on a few companies. Some are clearly building more of a textbook cluster (Milwaukee, Cincinnati). We want to see as much of this ideation and models as possible.
- During Ohio River Valley region cluster development, EPA made 3 commitments:
  - $5 million over 3-5 years for EPA lab research that would help cluster to evolve—establishing relationships with companies, move intellectual property from lab to companies
  - Set aside $1.5 million of (federal SBIR) funding for supporting water technology companies nationally
  - Establish a $4.1 million Small Drinking Water Systems center focused on partnerships for commercializing ideas. http://epa.gov/ncer/rfa/2013/2013_star_drinkingwater.html

Factors for Success in Cluster Building

Know Your Assets. Does the region have a critical mass of technical/business capacity to development and commercialize technology? ***Water clusters are unique ecosystems, each with its own orientation.***

- Milwaukee—Water-intensive businesses (brewing, water meters, pumps, and fixtures) & freshwater research capacity—business incubation focused
- Cincinnati—EPA laboratory

Align Many Players. Are the stakeholders aligned around a common vision and purpose for cluster building, and willing to participate, contribute, collaborate, and take risks? ***Water clusters are assembled by champions who have standing across sectors and stakeholder groups, and insight into the "organizing themes" for the cluster.***

- Pittsburgh, Milwaukee, Cincinnati alignment processes organized around analysis of assets, facilitated visioning, small group of leaders; process took several years.
- "There has to be a diversity of players, not just a business." (Gutierrez)

Role of City Government in Cluster Building

- **Assets.** Cities can play a role in organizing/funding initial assessment of water-sector assets and potential, BUT should not override the "brutal facts" with wishful thinking.

> "It's ridiculous that St. Louis came out with an initiative around high-tech water development. Cities need to look at their historical endowment and give it shape and form."

- **Alignment.** Cities can play a role in convening and organizing the stakeholders in the water sector, BUT building a cluster should not be led by city government and should not be a city government program. A technology cluster is ultimately about commercialization—business leadership is critical. "The whole development was industry led and the city was supportive. The city was an important player, but it is not a make or break variable." (Dean Amhaus, president & CEO, MWC)

- **Balance.** City government can support cluster development with technical expertise and financial capacity, and can align its own sustainability plan (e.g. ReFresh Milwaukee) as a critical complement to cluster's efforts, BUT should not try to direct the cluster's trajectory.

Summary Findings: Water-Tech Business Cluster Building

1. Should start with existing assets—technical, R&D capacity, business capacity. You can't grow a cluster from nothing.
2. Should have private sector leadership—for risk-taking, investment capital, sustainability, and bias toward commercialization.
3. City government should be an important collaborator and convener, aligning its vision/activities, support—but it should not try to drive cluster building.