Global Water Ventures Of Cleveland

The Cleveland Water Center Feasibility Study

A Project of EcoCity Cleveland and The Cuyahoga County Planning Commission

Final Report

December 2007
Thank you to the contributors to the Cleveland Fresh water Feasibility Study and the resulting concept for Global Water Ventures of Cleveland. This groundbreaking approach to improving global fresh water quality is the result of countless hours of research, analysis and debate. The contributors generously invested time, insight, expertise and support.

David Beach, Executive Director of EcoCity Cleveland, and Paul Alsenas, Director of the Cuyahoga County Planning Commission, provided the vision, passion, direction and funding for this effort.

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The consulting firm, *enlight*¹, provided the research, analysis, recommendations and project management for this project.

¹ Additional information about *enlight* in the Appendix and at [www.enlightadvisors.com](http://www.enlightadvisors.com).
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Making Cleveland a business center for freshwater sustainability

For many years, people in Cleveland have asked, "Why can’t we establish a major center for water here and leverage our location on the Great Lakes?"

This study seeks to answer that question. It takes a hard look at global water issues, identifies gaps in current water-related activities and organizations, and proposes an entrepreneurial model for a Cleveland center — a center that can have international impact on the sustainability of freshwater while contributing to the economic development of Northeast Ohio.

Our research, which involved business consultants and an advisory committee of community leaders, came to the following conclusions:

- Freshwater is the substance of life and the world’s most vital resource, more important than oil. Human civilization needs to transform its relationship to water.
- Improving access to clean water is essential for the health and quality of life of billions of people around the world. Restoring freshwater ecosystems is essential for the continued existence of millions of plant and animal species. These needs will grow in the 21st century.
- There are gaps in the process of providing water quality products and services — gaps related to research not being linked to user needs, a bias toward high-tech rather than appropriate technologies, insufficient support for product prototyping and field testing, and insufficient financial support and business acumen for commercializing products and services.
- A center in Cleveland can plug these gaps and leverage the region’s strengths in water remediation, biosciences, health care, industrial design, polymers, higher education, and other areas.

The center we are recommending has an innovative, nonprofit business model. It focuses on three areas of activity:

- Water intelligence: Understanding stakeholder needs, compiling best practices and innovations, analyzing and identifying market opportunities.
- Incubation: Investing in innovative technologies, assisting the start-up of viable businesses, supporting the prototyping and field testing of new products and services.
- Implementation: Leveraging practical knowledge of real-world conditions and user needs (especially in markets in the developing world) to support business success and growth.

Our study presents a phased business plan for developing this center. The bottom line is that an investment in the range of $14 million could create a nonprofit business center that could be financially self-sustaining at the end of five years from the sale of proprietary information, consulting, licensing fees, conferences, and other revenue streams. Thus, we could create a permanent resource that would make Cleveland a global epicenter for water products and services.

This center will accelerate innovation and have the potential to help millions of people around the world. It also will attract new companies and jobs to Northeast Ohio, strengthening the
region’s economy while promoting a new consciousness about water — a “water culture” — that will have profound impact.

We are extremely excited by this concept — and we now have a sense of urgency about moving forward. Although Cleveland is well positioned to turn this concept into reality, it is not uniquely positioned to do so. Other cities could seize the opportunity if we delay. Therefore, we hope to move quickly into the next phase of developing Global Water Ventures of Cleveland.

David Beach  
EcoCity Cleveland

Paul Alsenas  
Cuyahoga County Planning Commission
Executive Summary

Starting in late 2006, David Beach of EcoCity Cleveland and Paul Alsenas of the Cuyahoga County Planning Commission kicked off a feasibility study for establishing a “Center” for fresh water sustainability in Cleveland. Their vision was born of a passion for making the world a better place and contributing to the economic turnaround of Northeast Ohio. With Cleveland poised on the banks of the Great Lakes, which comprise 20% of the world’s fresh surface water, and benefiting from a 30-year legacy of remediation, the concept seemed a perfect fit.

The objectives of the feasibility study were to:
- Evaluate the feasibility of a major “center” for fresh water research, technology, education and/or policy in Cleveland
  - What fresh water issues should be addressed?
  - Who should be involved in establishing the center?
  - How could the center’s startup and operations be financed?
  - How would the center be structured and evaluated?
  - What would be the center’s expected impact on life and the economy of the region?
- Assuming feasibility, determine the ideal strategy

The guiding principles of the study were the following priorities:
- Focus on fresh water sustainability
- Ability to achieve measurable, global impact
- Action-oriented operations, as opposed to advocacy or research
- Big ideas, disruptive change
- Potential to generate revenue and attract funding

Water Creates Life and Fuels Economic Development

Less than one one-hundredth of one percent (<1/100 of 1%) of the world’s fresh water is both fresh and renewable — through rain, snow and groundwater. The remainder is considered to be fossil water, located deep in aquifers and not renewable. In the next two decades, the average amount of fresh water available per person is expected to decline by one third. Many people believe that in the coming decades reliable access to clean water — more than oil — will drive economic development. This is because of fresh water’s importance in supporting both life and industry and its relative scarcity. Fresh water issues can be summarized in the following categories:
- Quality — fresh water is polluted by point sources and non-point sources
- Quantity — Supply and Demand - mismatch of supply and demand; exacerbated by over use in areas of abundance
- Governance — policy about access, pricing, ownership and management

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2 Postel, Sandra. Liquid Assets: the Critical Need to Safeguard Freshwater Ecosystems. Worldwatch Institute, 2005. 10
Water is the substance of life — all life. Access to clean water is critical for human health, biodiversity and environmental health.

Economic development is driven by (and drives) population and industrial growth. It also drives increased wealth. Population growth increases water consumption and pollution from individuals. Industrial growth increases pollution and consumes more water via production methods and as a production input. Increased wealth drives changes in behavior that consume more water and increase pollution.

The net effect is typically diminished water quality and quantity — negatively impacting water’s ability to support life — and governance complexity.

These effects are summarized by considering the sustainable development model depicted below. The Society components relate to public health:

- More than 2 million people, mostly children under five, die each year due to poor water quality.5
- Poor water quality causes illness and degraded health
- 1.1 billion people live without improved water supply; 2.4 billion live without improved sanitation.6
- Extending improved water and sanitation to unserved would reduce infection and disease by 17%.7
- Universally piped, well-regulated water and sanitation would reduce infection and disease by 70%.8

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6 Ibid.
7 Ibid.
The Environment components relate to environmental health:
- There’s been a 30% decline in the global fresh water vertebrate population in the last 30 years.\(^9\)
- Invasive species diminish biodiversity. There have been more than 140 invasive species found in the Great Lakes in the last 45 years.\(^10\)

The Economy components relate to planning and management:
- One liter of wastewater pollutes eight liters of fresh water — primarily caused by poor sanitation and industrial abuse.\(^11\)
- Most major cities suffer from insufficient and/or aged infrastructure.
- Industrial development consumes more water and pollutes the environment if not managed properly.

Breaking the vicious cycle of water creating life and economic development only to be depleted and polluted at faster rates requires a disruptive approach to improving water quality.

### Identify Current Gaps And Areas Of Focus

The figure below illustrates the value chain for new product development activities, with key areas of focus and gaps highlighted. The presence of Companies, Users and Experts creates the context for this process.

Companies represent those corporations and startups that are developing technologies to address fresh water issues, as well as the venture capital firms and others that invest in those efforts. Experts represent the countless researchers in labs and the devoted members of nongovernmental organizations (NGOs) and other organizations that work to alleviate these problems every day. Users include individuals, companies and governments that consume or utilize fresh water in their daily existence and benefit from the identification and application of fresh water solutions.

The individual steps of the process can be summarized into three categories: Identify, Create and Apply. ‘Identify’ includes identification of User needs to drive Ideation, Research and either the development of a New Product or Service or the adaptation of an Existing Product or Service to solve the User’s problem.

‘Create’ includes developing the Developing the Prototype, Field Testing and Commercializing the product or service. Often, this part of the process also includes establishing a viable business to support the ongoing application and implementation of the product or service.

‘Apply’ is the Installation of the Product — or Skill Transfer of the Service or Process — and its ongoing Maintenance.

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\(^8\) Ibid.
According to the research, current areas of focus include Research, New Product Development and Product Installation. There are significant numbers of talented researchers throughout the world developing new products to meet the world’s fresh water needs. Most of this work results in new, higher tech, products and their installation.

This study revealed a set of gaps in this process that essentially relate to increasing business acumen applied to the entire process, with an eye toward increasing the pace and amount of overall investment in the opportunities in the coming months and years.

The following gaps were discovered with respect to ‘Identify’:

- Ideation and Research, while teeming with activity, are not directly tied to applications and User needs.
- Identification of Existing Products or Services that would be appropriate for a given situation is often overlooked in favor of developing new, high tech solutions. This is especially true of various blue sky or low tech solutions that have yet to be embraced by the mainstream, such as living machines.

12 Concept developed by enlight
‘Create’ gaps include the following:
- Insufficient financing, facilities and support for Prototyping and Field Testing
- Insufficient financial support, business acumen and native knowledge when commercializing products and services

‘Apply’ gaps all relate to insufficient native knowledge, link with Users and link with the mainstream.
The strategy for Global Water Ventures of Cleveland was developed based on the outcome of this analysis, and was validated by interviews with key individuals. The strategy leverages existing business models in new ways to improve global fresh water quality. Additionally, these efforts will significantly improve the overall impact of other efforts simply by creating better connections among stakeholders.

The Intelligence team will analyze market opportunities — size, scope, needs, etc. — to better position investors and companies to fill these gaps. The analytical output will be available via a host of proprietary standard reports, custom reports and consultations. Intelligence will also identify and codify best practices to enable future efforts to benefit from the learning curve experienced by previous endeavors. Finally, the Intelligence team will establish and maintain relationships and partnerships with a variety of stakeholders throughout the globe.

The Incubator will provide the business acumen, native knowledge and the prototyping and field testing support to establish viable businesses and solutions. This group will also selectively invest in potential businesses and opportunities.

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13 **enlight** analysis and research
The Implementation team is a consulting arm that is responsible for hands on support installing products or transferring the skills for remediation and sustainable operations.
The Vision of Global Water Ventures of Cleveland is the following:
To improve or maintain biodiversity, quality of life, and environmental and public health by impacting fresh water quality issues throughout the world.

The Mission is to:
Connect with key stakeholders and end users to identify, create and apply sustainable fresh water quality solutions via Intelligence, Incubation and Implementation.

The most immediate goal is to increase the pace of impact by shifting the investment curve. Consider the amount of time it takes to attract interest (and investment) in causes where the social benefit is perceived to outweigh the financial benefit. Significant mainstream investment typically occurs only after years of small-scale investment by a handful of visionaries. An example is investment in advanced energy, which while recently in vogue, has limped along at a dismal level for decades.

Our concern is that, left to market forces and human nature, the same will happen with fresh water technologies. Global Water Ventures of Cleveland will shift the inflection point for fresh water investment to an earlier date by greasing the skids with information, connecting good ideas with funding and support and demonstrating the potential benefits via Implementation. This will enable the world to achieve strides in fresh water quality technologies sooner than would otherwise happen.

In order to achieve this objective, Global Water Ventures will focus on the following initiatives in the near term:
- Validate water industry size and scope to attract increased investment
- Connect experts with user needs to maximize effectiveness of solutions
- Connect experts with business acumen to ensure business viability and optimal reach
- Remediate water quality and instill sustainability culture

14 enlight analysis and research
Beyond access to 20% of the world’s fresh surface water in the Great Lakes and a legacy of remediation, Northeast Ohio has a vast array of attributes that make it an ideal place for this effort.

The various industry clusters that exist or are emerging will complement this effort:

- Bioscience & Healthcare
- Polymers & Advanced Technology
- Power & Propulsion
- Information Technology
- Instrumentation & Controls

Additionally, the region houses key functional expertise

- Advanced Manufacturing
- Industrial Design
- Green Buildings
- Business Incubation

The region’s excellence in higher education will be both a benefactor and beneficiary of this effort. The institutions have the potential to be primary partners and suppliers of talent to the organization. Also, our research has revealed that there is no single institution in the world that is renowned for fresh water quality technology. There is an opportunity for a local institution to stake this claim, which would benefit both Global Water Ventures of Cleveland and the region.

Finally, this effort capitalizes on the convergence of regional economic development efforts. And, it can serve as a means of focusing the talent, energy and passion on a cause of global importance which greater Cleveland is uniquely positioned to impact.

Leveraging the region’s strengths to successfully implement the Global Water Ventures of Cleveland strategy will result in:

**Creating New Knowledge:** related to user needs and fresh water market opportunities

- Attract increased fresh water investment
- Establish the business case for sustainability and biodiversity
- Convert the mainstream to leverage sustainable solutions
- Speed the pace of action by connecting key stakeholders
- Represent the U.S. on the global fresh water stage

**Achieving Global Impact:**

- Save more lives faster
- Reduce illness and improve the quality of human life
- Safeguard biodiversity
- Influence global fresh water policy and investment
- Facilitate UN Millennium Development Goal progress

**Creating Economic Value for Cleveland:**

- Establish Cleveland as the epicenter of fresh water innovation
- Leverage Northeast Ohio strengths to drive global impact
- Establish academic center(s) of excellence
- Attract new businesses (~15/year)
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- Increase travel and tourism – peaking at -$6 million/year, with a major global event and a variety of local events*

* Economic impact of events based on spending per event estimates provided by the Cleveland Convention and Visitors Bureau - ExPact 2005. Refer to the Financials section of Why Global Water Ventures? for more details.
Financial projections for Global Water Ventures of Cleveland are based on a phased approach:
- **Bridge** - 18 months
- **Start Up** - 18 months
- **Operations** - 10 years and beyond

The organizational structure of Global Water Ventures is yet to be determined, although it is expected to be an independent 501c(3) nonprofit.

The Bridge phase is expected to require a $1.1M investment. The objective of the Bridge phase is to refine the financial and operation plan for Global Water Ventures of Cleveland. The primary activities include hiring the Social Entrepreneur (CEO) who will develop the business plan and start up the organization, seat an Advisory Board with a global sphere of influence, and develop a social network map of the fresh water space. The bulk of the investment will be spent on Social Entrepreneur (CEO) selection, salary, benefits and travel; Advisory Board compensation and travel, social network mapping and project manager support and legal support.

A search firm will staff the Social Entrepreneur (CEO) search. Once hired, the Social Entrepreneur (CEO) will develop the strategic plan and secure Start Up funding. The Advisory Board is expected to consist of 15 members from throughout the globe with relevant experience in a variety of disciplines. There will be four meetings per year and a high expectation for contribution of time and talent.

The social network mapping project will map the relationships and communications related to fresh water to simplify relationship management for ongoing operations, inform the knowledge management component of the Intelligence team and support recruitment efforts.

The project manager will drive progress with the process, including providing support for the Social Entrepreneur search, the social network mapping project and setting up the legal structure of the organization. The Project Manger will be expected to interface with key Global Water Ventures of Cleveland stakeholders including the Advisory Board and the sponsors. The project manager will not be responsible for content development or strategic planning. Legal support is expected to cover organization setup and related counsel.

The Bridge phase is structured so that there are several check points for evaluating continued investment:
- Establishing the Advisory Board
- Hiring the Social Entrepreneur (CEO)
- Creating the social network map of global fresh water activities
- Refinement of the high level financials and operating model
- Development of the business plan and detailed start-up plan
The graph below summarizes the expected costs for the Bridge and Start Up phases.

![Bridge & Start Up Costs By Division](chart)

The Start Up is expected to require $2.7M, and will include hiring the heads of the Intelligence and Implementation teams and the Marketing VP. These 18 months will be spent building the operating model for the two divisions, solidifying key global relationships, developing the marketing and development strategy and laying the groundwork so that Year One of Operations starts with impact. Start Up also includes hiring an executive assistant to support the growing organization.

The Social Network Mapping consultant will continue to refine the framework developed in the Bridge phase. The Search Firm will assist with placement for the additional employees, and the Legal support will provide appropriate organizational counsel.

Based on current projections, Global Water Ventures of Cleveland will break even in Year Five of Operations and steadily improve its performance over time. Initially, investments in personnel and marketing will outweigh income, resulting in nearly $14M in required investment. However, by Year Five of Operations, Intelligence, the Incubator and Marketing and Development should be financially self-sufficient. If the Incubator — slated for launch in Year Three of Operations — generates the expected returns, they will offset the expected losses generated by the Implementation and Executive leadership teams. More analysis and evaluation should be conducted to validate and refine all of the estimates, especially the Incubator and Implementation teams, which are expected to generate the most significant revenues and costs.

15 Based on enlight estimates. Refer to the Financials section of Why Global Water Ventures? and the Financial Estimate Details of the Appendix for more details. (FTEs = Full-Time Employees; PTEs = Part-time Employees).
The success of Global Water Ventures depends on several key components, which should be considered while pursuing funding, refining the plan and initiating operations. The key success factors fall into the following categories:

- Securing Funding - Bridge, Start Up, ongoing Operations, Corporate Sponsorships
- Recruiting the Social Entrepreneur (CEO) and heads of Intelligence, Incubation & Implementation
- Refining the operating model for each of the divisions — Intelligence, Incubation & Implementation
- Executing the business plan and daily operations
- Social Network Map of fresh water activity and stakeholders
- Seating the Advisory Board

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16 Based on enlight estimates. Refer to the Financials section of Why Global Water Ventures? and the Financial Estimate Details of the Appendix for more details.
Water creates life and fuels economic development. Unfortunately, both life and development impact fresh water quality and availability. To date, that impact has primarily been negative. Many people believe that reliable access to clean water — more than even oil — will drive economic development in the coming decades. This is because of fresh water’s importance in supporting both life and industry and its relative scarcity. Changing the vicious cycle of water consumption and pollution will require disruptive change.

Less than one one-hundredth of one percent (<1/100 of 1%) of the world’s fresh water is both fresh and renewable — through rain, snow and groundwater. The remainder is considered to be fossil water, located deep in aquifers and not renewable. In the next two decades, the average amount of fresh water available per person is expected to decline by one third.

Basic water facts tell us that:

- Water covers nearly 75% of the earth’s surface, in total ~344mi3 of water
- The total usable fresh water supply for ecosystems and humans is less than 0.01% of the global water supply
- 97.5% of the global water supply is salt water, and 2.5% is fresh water
- Of the fresh water, 68.9% is glaciers and permanent snow cover; 30.8% is groundwater and the remainder is usable surface water
- 1.2 billion people worldwide do not have access to clean water

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18 Postel, Sandra. Liquid Assets; the Critical Need to Safeguard Freshwater Ecosystems. Worldwatch Institute, 2005. 10.
19 Fossil Water - also called paleowater - groundwater that has remained in an aquifer for millennia (http://en.wikipedia.org/wiki/fossil_water).
23 Ibid.
24 Ibid.
1.5 million gallons of water are required to produce the food eaten by the average American each year.\(^{26}\)

Fresh water issues can be summarized in the following categories:

**Quality**
- Access to Clean Water
- Sanitation
- Other Point Source Pollutants
- Nonpoint Source Pollutants
- Invasive Species

**Quantity**
- Supply
- Demand
- Infrastructure

**Governance**
- Ownership, Access & Stewardship
- Pricing

These issues combine to impact public health, biodiversity and the environment, and can only be addressed by focusing on key levers.

**Macro Concerns**
- Public Health
- Environmental Health
- Economic Development

**Levers**
- Remediation
- Preservation
- Policy

These macro concerns are often summarized by the sustainability model shown at the right. The intersection of the Social, Environmental and Economic concerns creates opportunities for sustainable development (or preservation), as well as opportunities to remediate and the need to craft policy to ensure long term viability.

It’s important to consider the challenges created by different global contexts. One approach has been to distinguish between challenges faced in the developed and developing world. In general, the differences between the two can be defined as follows:

- Developed world — increased urban sprawl, aged infrastructure, increased industrial pollution
- Developing world — increasing populations in urban areas, insufficient and aged infrastructure, insufficient sanitation and inadequate policy

Further research suggested that, in addition to understanding the different contexts between the developed and developing worlds, it is important to distinguish between issues caused by

\(^{27}\) enlight analysis and research.
\(^{28}\) enlight analysis and research.
\(^{29}\) Image Source: www.dfes.gov.uk/aboutus/sd/images/image002.jpg
point source pollution\textsuperscript{30} sources and nonpoint source pollution\textsuperscript{31} sources. While the developed world has spent decades addressing point source pollution problems, the developing world has many opportunities to apply this learning. Policy and practice in the developing world has not yet caught up. Nonpoint source pollution, on the other hand, presents more complicated challenges. Nonpoint source pollution is, by definition, indirect which poses a host of challenges for elimination or remediation of the pollution source.

The following graphic illustrates the primary problems and opportunities presented by point source and nonpoint source pollution.

\[\text{Point Source Pollution}\]
- Industrial waste
- Inadequate sanitation
- Inadequate or non-existent remediation
- Inadequate or non-existent policy

\[\text{Opportunity}\]
- Increase access to clean water
- Improve sanitation
- Influence policy through actionable results

\[\text{Nonpoint Source Pollution}\]
- Inadequate or non-existent identification of pollution source
- Inadequate or non-existent infrastructure
- Inadequate or non-existent education & knowledge
- Focus on sustainability

\[\text{Opportunity}\]
- Ensure continued access to clean water
- Remediate polluted water
- Ensure long-term sustainability
- Decrease contaminants caused by development
- Mitigate and improve quality of runoff

\section*{Quality}

\section*{Access to Clean Water}
Individuals must have clean water for drinking, cooking, washing and sanitation.\textsuperscript{33} Humans need a minimum of two liters of drinking water per day to survive.\textsuperscript{34} Globally, there is a direct link between access to clean water and sanitation. Global coverage figures from 2002 indicate that of every 10 people,\textsuperscript{35}
- 5 have a connection to a piped water supply at home (dwelling, plot or yard)
- 3 use another improved (i.e. potable) water supply, such as protected well or public standpipe
- 2 are unserved
- 4 live without improved sanitation

This means that approximately 1.1 billion people live without access to improved water supply and by 2050, it is estimated that the number will increase to 2 - 7 billion. The map below highlights where users have access to improved drinking water and estimates of per capita water storage.

Improved drinking water includes the following:
- Household connection
- Public standpipe
- Borehole
- Protected dug well
- Protected spring
- Rainwater collection

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**Improved Drinking Water**

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<th>Percentage of population using improved drinking water sources, 2002</th>
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<td>Less than 50%</td>
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**Water Storage**

- Ethiopia: 43
- S. Africa: 746
- Thailand: 1,287
- Laos: 1,406
- China: 2,486
- Brazil: 3,255
- Australia: 4,729
- N. America: 6,150

Source: Adapted from UNICEF and WHO, “Meeting the MDG Drinking Water and Sanitation Target,” 2004.


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Sanitation
From a sanitation perspective, currently 2.6 billion people are without access to improved sanitation. While 1 liter of wastewater pollutes 8 liters of fresh water, about 90% of sewage and 70% of industrial wastes in developing countries are discharged into water courses without treatment, often polluting the usable water supply.

The following chart illustrates the undeniable link between improved drinking water and improved sanitation. Improved sanitation includes the following:
- Connection to a public sewer
- Connection to a septic system
- Pour-flush latrine
- Simple pit latrine
- Ventilated improved pit latrine

India's fresh water and sanitation problems are representative of the challenges facing the developing world.

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- >700 million (~2/3 of the population) do not have adequate sanitation
- Half of sewage deposited in the Yumma river in New Delhi goes untreated
- 45% of New Delhi is not connected to public sewage system
- 25% of New Delhi households have no access to piped water
- ~2 million households in New Delhi have no toilet

In China, the government indicates that one-third of the rural population, an estimated 360 million people, lack access to safe drinking water, and more than 70% of the rivers and lakes are polluted. Improved access to clean drinking water has been declared a priority.45

In Sub-Saharan Africa, it is estimated that half the people in 25 countries will lack access to potable water by 2025 unless action is taken now.46 Africa’s HIV/AIDS epidemic is exacerbated by poor access to clean water, especially with respect to transmission from mother to child. HIV positive women often choose to breastfeed their children because it is perceived to be safer than giving them formula that is made with dirty water.

In the developed world, sanitation issues are also a problem, but on a much smaller scale and in a more regulated policy environment. The sanitation pollution results from sanitary sewer overflows, where the demands on municipal sewer systems exceed capacity, causing overflows of raw sewage. These problems are typically caused by severe weather, improper system operation and maintenance or vandalism. These overflows pollute water, damage property and threaten public health.47

Other Point Source Pollutants
Point source pollution occurs when discrete conveyances, such as pipes or manmade ditches, discharge pollutants into waters.48 Poor sanitation is not the only cause of point source pollution; there are a variety of other sources that have been defined by the US EPA. These causes can be categorized in the following ways: Municipal, Industrial or Agricultural.

In addition to sanitary sewer overflows, municipal pollution may derive from combined sewer overflows or storm water discharges. Combined sewers are sewers that carry industrial waste, rainwater runoff and domestic sewage. At times these sewers overflow for many of the same reasons that a sanitary sewer may overflow. Storm water discharges result from runoff from land and areas such as pavement and rooftops that are impervious. This runoff often contains pollutants in quantities that could adversely affect water quality.49

Industrial pollution includes all of the potentially harmful discharge from industrial and commercial activities that find their way into the municipal sewer system or directly into

surface water. Agricultural point source pollution primarily comes from the concentrated discharge from confined animal feeding operations.

**Nonpoint Source Pollutants**

Nonpoint source pollution can come from a variety of sources and is caused by rainfall or snowmelt moving over and through the ground. This runoff picks up sediment and other pollutants, eventually depositing them into surface waters or transporting them to underground water sources. Nonpoint sources, like point sources, pollute water, damage property and threaten public health. Nonpoint sources of pollution can be categorized in the following ways: agricultural, transportation, individual, municipal and industrial.

Agriculture is the leading cause of nonpoint source pollution affecting water quality in the United States. Nonpoint sources of agriculture pollution include manure, fertilizer, ammonia, pesticides and other toxins trapped in runoff from barnyards, feedlots and cropland. Nonpoint source pollution caused by transportation — cars, trucks, motorcycles, boats, or anything else that burns gasoline — results from oil, antifreeze, grease and emissions. Thousands of gallons of water can be contaminated by one quart of oil. Americans contaminate approximately 1.5 trillion gallons of water every year by dumping motor oil.

Individual behaviors contribute to nonpoint source pollution via use of lawn and garden fertilizers, insecticides, household cleaners and other chemicals. Additionally, improper lawn or septic system maintenance contributes to the problem. Pet waste and improper disposal of paint oil and other chemicals are additional ways that individuals contribute to nonpoint source pollution.

Municipal sources of nonpoint pollution primarily result from the storm water runoff from building, streets and sidewalks, as well as the emissions from vehicles. This storm water runoff flows into storm drains and is neither treated nor filtered before flowing into surface water. Industrial sources of nonpoint source pollution are essentially the same as the other sources, simply emitted in the course of making, selling or transporting goods and services or during the construction of buildings and infrastructure.

**Invasive Species**

Invasive species are non-native plant or animal species whose introduction results in economic, environmental and public health declines. The economic impacts include direct economic losses and management costs. Additionally, invasives alter ecosystems that support commercial and recreational activities. According to the U.S. EPA, “Invasive species

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53 Ibid.
55 Ibid.
represent the second leading cause of species extinction and loss of biodiversity in aquatic environments worldwide. Other environmental effects include diminished native populations, changes to the water table and in runoff dynamics, among others. The public health impacts are primarily via the diminished food and water on which entire populations rely. In the Great Lakes alone, more than 140 invasive species have been identified since 1959.

Ballast water is a key source of invasive introduction worldwide. Ship ballast water carries organisms from one body of water to another. More than two-thirds of recent non-native introductions are likely due to ship-borne transfers.

Supply
“The quantity of water delivered and used for households is an important aspect of domestic water supplies, which influences hygiene and therefore public health.” Fresh water scarcity is a problem globally particularly because a vast majority is not renewable.

- Less than 1/100 of 1% of earth’s fresh water is fresh and renewable including less than 1% of water in the Great Lakes. The remainder is considered “fossil water”.
- In the next two decades, average amount of water available per person will decline by 1/3
- By the middle of this century... at worst 7 billion people in 60 countries will be water-scarce
  - at best 2 billion people in 48 countries will be water-scarce
- Climate change is expected to increase water scarcity by 20%

Although water will become scarcer, certain areas will be more affected than others. The map below illustrates the challenge of uneven global distribution, where supply does not match demand.
Demand
The illustration below highlights the demand side of the equation. The vast majority of fresh water use, globally, is for agriculture purposes (70%), while industrial and domestic use account for 22% and 8%, respectively. In developed countries, the use is more balanced — 30% agriculture, 59% industrial and 11% domestic. In developing countries the stats are 82%, 10% and 8%, respectively.

The vast majority of the agricultural use is for irrigation. Unfortunately, much of the irrigation methods used throughout the world, especially in developing countries, are inefficient, wasting millions of gallons of water each year. More effective methods, such as drip irrigation, have not yet penetrated the developing countries.

Typically, in areas where water is relatively abundant, farmers over irrigate their crops. For example, in many parts of India, farmers drill deeper and deeper wells to maintain irrigation

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71 Ibid. 9.
73 Ibid.
flow. These wells, if drilled too deep, can become contaminated with arsenic and render the water supply useless for either human consumption or agricultural use.74

This problem has been exacerbated by a realization that the water may be more valuable than the crops that are grown on the land. As a result, many farmers in India have attached tanker trucks to their wells and are selling the water to supplement their farm income.75 Unfortunately, this abuse of their water supply may deplete the water more quickly than it can be replaced, or contaminate it to the extent that it is no longer potable.

Industrial uses include water that is used in the product of goods and in the processing of foods and beverages. In most developed countries, water used in the production process is highly regulated and has largely been engineered to minimize the overall impact on the fresh water supply through various treatments and the use of closed-loop systems.

Domestic use includes the water that is necessary for human consumption. The graph below highlights the disparity of per capita fresh water consumption throughout the world.

Fresh water demand is increasing thanks to the dual effects of global population growth and greater consumption that comes with increased wealth. Therefore, as economic development spreads across the developing world, the problems of fresh water quality and scarcity will worsen. Globally, water usage increased six times in the last century and will double again by 2050, primarily due to agricultural use.77 Global annual industrial water use, which comprises 22% of withdrawals, is expected to rise by 50% from 1995 to 2025.78

Water that becomes imbedded in foods, beverages and other goods (such as paper) is referred to as virtual water. Virtual water can result from agriculture practices such as irrigation or industrial processes such as food processing and ultimately results from individual consumption.

75 Ibid.
The chart below highlights the differences in virtual water contained in various common foods:\textsuperscript{79}

<table>
<thead>
<tr>
<th>Virtual Water</th>
<th>Food</th>
</tr>
</thead>
<tbody>
<tr>
<td>140 litres</td>
<td>1 cup coffee</td>
</tr>
<tr>
<td>900 litres</td>
<td>1 kg maize</td>
</tr>
<tr>
<td>1,000 litres</td>
<td>1 kg milk</td>
</tr>
<tr>
<td>1,350 litres</td>
<td>1 kg wheat</td>
</tr>
<tr>
<td>3,000 litres</td>
<td>1 kg rice</td>
</tr>
<tr>
<td>16,000 litres</td>
<td>1 kg beef</td>
</tr>
</tbody>
</table>

The amount of virtual water in diets varies, as illustrated in the statistics below.\textsuperscript{80}

<table>
<thead>
<tr>
<th>Diet</th>
<th>Daily Per Capita Consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>Survival</td>
<td>1 m\textsuperscript{3}</td>
</tr>
<tr>
<td>Vegetarian</td>
<td>2.6 m\textsuperscript{3}</td>
</tr>
<tr>
<td>American Style Meat-based</td>
<td>5.3 m\textsuperscript{3}</td>
</tr>
</tbody>
</table>

Demand increases are outpacing replenishment. At present rates of consumption, by 2025, 5 billion of the world’s 7.9 billion people will live where clean water is scarce.\textsuperscript{81} Additionally, the pressures of economic development and population growth result in aggressive efforts to secure more land for development. The result is shortsighted planning decisions that further erode fresh water quality and availability.

Water stress occurs when the demand for water exceeds the available amount during a certain period or when poor quality restricts its use. Water stress causes deterioration of fresh water resources in terms of quantity (aquifer over-exploitation, dry rivers, etc.) and quality (eutrophication, organic matter pollution, saline intrusion, etc.).\textsuperscript{82} The following map illustrates the degree of water stress throughout the world. Significant portions of the United States, Africa, the Middle East and Asia are considered to be severely water stressed, while much of Europe is experiencing at least moderate water stress.

The maps below illustrate the amount of water that is expected to be withdrawn in 2025 relative to the amount that is naturally available, in comparison with the same statistic for 1995. This is a predictor of future water stress, and highlights that the issue of fresh water scarcity is worsening.

[Map of water stress levels in 1995 and 2025]

Source: Adapted from UN-Habitat, WHO, and UNDESA, “Cities: Competing Needs,” 2003.¹

Infrastructure

There are two issues with respect to infrastructure: insufficiency and age. Throughout the developing world, major cities lack the fundamental underlying infrastructure of pipes, sewers and treatment facilities to ensure delivery of clean water to homes and businesses. In the developed world, sprawl drives infrastructure problems, as municipalities have to extend sewers and pipes and expand treatment facilities to support increased geographic coverage areas. Where infrastructure exists, much of it is relatively old and/or poorly constructed. Major cities around the world — the US included — lose 20 to 50% of water due to leaks.\(^{85}\)

In developing countries, the existence of cities — old streets, buildings, etc. — complicates any efforts to install new infrastructure. Individuals in developed countries see this infrastructure as a public good provided by the government and do not expect to pay for its expansion or repair.

In India, annual water use exceeds the amount of water in Lake Erie, and by 2050 the country’s needs are expected to nearly double.\(^{86}\) The following are examples of the problem:\(^{87}\)

- 25-40% of New Delhi’s water leaks out of pipes
- 78% of New Delhi’s groundwater is overexploited
- 27% of New Delhi households have water for less than three hours per day

Ninety percent Africa’s water use is for agriculture, and 40-50% of this water is lost to seepage and evaporation because of inefficient irrigation practices.\(^{88}\)

In Mexico, 36% of the country’s water is lost due to leaky pipes.\(^{89}\) Current estimates suggest that it will require more than $3 billion to repair the infrastructure, and only 10% of that amount is budgeted for repairs in the coming years.\(^{90}\)

In the U.S., most of the infrastructure was installed either between the late 1800s and the 1950s or in the 30 years following World War II.\(^{91,92}\) Most of these pipes have an average lifespan of between 75 years (for the post World War II pipes) to 120 years for the ones dating back to the late 1800s.\(^{93}\) This means that most of the pipes in the U.S. will require major repairs or replacement between now and 2025.

\(^{87}\) Ibid.
\(^{90}\) Ibid.
The U.S. EPA estimates the funding gap for these repairs and replacements to be $122 billion for clean water capital costs and $102 billion for drinking water capital costs. In contrast, the Water Infrastructure Network’s (WIN) Clean & Safe Water for the 21st Century report estimates the cumulative replacement cost to be approximately $700 billion for the next 20 years. This includes $24 billion per year in additional spending plus $11 billion annually to cover the gap between current spending and the overall need.

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Governance

Governance issues relate ownership, access and stewardship and pricing. Ownership, access and stewardship are complex concerns. Most surface waters in the world are clearly owned — either publicly or privately — and the surface water issues relate more to access and stewardship. Access rights to bodies of fresh water are primarily managed through more than 200 treaties. Water conflicts are rarely across borders and rarely violent. In the past 50 years of the 37 recorded violent conflicts, only seven were outside of the Middle East.

However, experts predict that the coming decades will bring increased conflict over access to fresh water. In the U.S., the Pentagon expects one of the biggest challenges facing the military this century will be short, sharp regional wars over water. The UN reports that more needs to be done to beef up legal agreements and treaties among African nations to reduce tensions and avoid instability in the future. It is widely believed that the main conflicts in Africa during the next 25 years could be over access to fresh water. In general, the UN Development Program (UNDP) report indicates that potential ‘water wars’ are likely in areas where rivers and lakes are shared by more than one country.

Stewardship refers to the responsibility of management and maintenance of the bodies of water to ensure their availability for future generations. The concept of stewardship has emerged in recent years with increases in demand and global awareness of past poor management decisions. For example, in the last century 50% of wetlands were lost to drainage.

More specifically, in 2005 engineers began to try to prevent the northern part of the Aral Sea from draining completely. The Aral Sea, in central Asia, was once the world’s fourth largest lake. According to Liquid Assets, a recent Worldwatch Paper:

A half-century after Soviet officials decided that the two rivers feeding the lake would be more valuable for irrigating cotton, the Aral has lost 80% of its water...Most of the fish — and the 60,000 fishing jobs — have disappeared. Winds crossing the exposed seabed pick up millions of tons of salt and dust laden with pesticide residues, poisoning the air and land. The 3 million people in the “disaster zone” suffer from high rates of cancers, respiratory ailments, anemia, and other illnesses. Thousands have fled the area.

Mexico City provides another example of inadequate or shortsighted water governance. Originally, the Aztecs built a series of dikes, levees and canals to manage the floodwaters of the lakes surrounding the city. After the Spaniards conquered the Aztecs, they simplified the

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97 Ibid.
99 Ibid.
103 Postel, Sandra. Liquid Assets; the Critical Need to Safeguard Freshwater Ecosystems. Worldwatch Institute, 2005. 9.
process by draining the water. “The result over five centuries is the most drastic reordering of the natural environment that just about any city has carried out...Where there was once an excess of water, there is now a looming shortage.”104 Today, Mexico City and the surrounding areas extract water from the aquifers at more than twice the rate it is replenished. One solution has been to take water from the pine-forested mountains to the west of the city, depriving the area’s poorest people of their water supply.105

Closer to home, a 62-mile stretch of the Owens River outside of Los Angeles is flowing again after nearly a century. The river was essentially drained as a result of diverting the upstream water that fed the river for more than 200 miles to fill swimming pools and bathtubs in the city. The city’s water management decisions also led to the drying up of Owens Lake, which was once more than three times the size of Manhattan.106 “Los Angeles agreed in December to expand efforts to control toxic dust storms that erupt from what is left of the lake...The lake’s salty, mineral-laced basin has been the largest single source of particulate pollution in the country.”107

Pricing is another governance issue, closely tied to ownership, access and stewardship. Many people view water as a basic human right. Unfortunately, the infrastructure required to provide reliable supplies of clean water can be expensive. And, the infrastructure needs grow significantly when in water stressed or water scarce areas. Therefore governments are faced with the challenge minimizing water prices so as not to disenfranchise the poor, while appropriately charging heavy users for their increased consumption. And, the owners of bodies of water are faced with the added challenge of determining when to sell access to their water and at what price.

Privatizing water utilities has been a recent global trend attempting to address the first issue. Unfortunately, initial indications are that the private utilities are not effective at meeting the dual mission of providing affordable water to the poor and extracting appropriate fees from heavy users. In fact, in many parts of the world, privatized water utilities are being converted back to state-owned entities. According to The New York Times, “private companies have managed to extend water service to just 10 million people, less than 1 percent of those who needs it. Some 1.1 billion people still lack access to clean water.”108 For example, in Bolivia, a subsidiary of Bechtel was pushed out after it failed to improve service despite raising rates.109

With respect to the second issue, a U.S. entrepreneur wants to ship water to Middle East in returning tankers.110 What will be the source of that water and how can the price accurately reflect the issues of scarcity and replenishment. Many cities surrounding the Great Lakes are pressured every day to sell water to communities outside the Great Lakes basin.

105 Ibid.
107 Ibid.
109 Ibid.
There are even rumors of a desire to build huge pipes connecting Mexico and Canada for the transport of a variety of goods, including water.\textsuperscript{111} When will the short-term benefits of those deals be outweighed by a newfound water stress in the area surrounding 20\% of the world’s fresh surface water?

Despite relatively transparent ownership of surface waters, throughout most of the world, there are no hard and fast rules about who owns groundwater. Determination of access and stewardship responsibilities are complicated enough when ownership is understood and virtually insolvable when it is not. Pricing is equally complicated.

The best examples of ground water exploitation by “owners” are in India where farmers are drilling deeper and deeper wells to pump water for the purposes of irrigation and sale. Today there are 23 million wells in India; 30 years ago there were 2 million wells.\textsuperscript{112} Unfortunately, when they drill too deep, arsenic and saltwater can poison the well forever. Additionally, wealthier users install pumps powerful enough to draw the water from their neighbors’ land as well, and then sell the water back to them.\textsuperscript{113} Most of the newer wells are drilled at the edge of the road, to make it easier for tanker trucks to gain access. Many of the farmers make more money selling water than they net on their crops.\textsuperscript{114}

According to John Briscoe, the World Bank’s country director in Brazil and the bank’s former senior water advisor, “The problem with groundwater is that it actually can become irreversible. If you wait too long and waste too much, there is no way back. I worry that that is happening in India. They need innovation. More conservation, more variation in crops.”\textsuperscript{115}

### Public Health

In the developing world, fresh water quality is a life or death matter. Water related diseases are among the most common causes of illness and death. For example, in 2000:\textsuperscript{116}

- More than 2 million people died because of sanitation and hygiene associated diseases — mostly children under 5 years of age
- 1.8 million people died from diarrheal disease (80\% of these deaths are due to unsafe drinking water, poor sanitation or poor hygiene)
- Approximately 1 million deaths were caused by malaria
- More than 2 billion people were infected with vector borne diseases, caused by unclean water
- 300 million people became seriously ill — mostly children under the age of 5

Current estimates suggest that with basic water management, illness and death can drastically be reduced. For example,\textsuperscript{117}


\textsuperscript{113} Ibid.

\textsuperscript{114} Ibid.

\textsuperscript{115} Ibid.


\textsuperscript{117} Ibid.
Extending improved water and sanitation to the unserved would drive a 17% annual decrease in infectious disease.

Universally piped, well regulated water and sanitation would achieve a 70% annual decrease.

In developing countries, treatment at the point of use is generally considered to have more impact than treatment at the water source. Unfortunately, treatment at the point of use is no easy task, as it requires developing products to be used in individual homes, educating people about how to use the products and placing the products in the homes – not to mention the difficulty of developing a product for in-home use without an intimate understanding of the conditions in the home and the overall social and economic context of the situation.

With respect to public health, the U.S. has one of the safest drinking water supplies in the world; however, public health issues related to fresh water are more prevalent than expected in the U.S. Due to industrial pollution, run-off, the quality of the source and many other factors, water quality in the U.S. varies. 118

According to the Centers for Disease Control, ground water systems were associated with 68 outbreaks that caused more than 10,000 illnesses from 1991 to 2000, and contaminated source water was the cause of 79% of the outbreaks. In 2005, a Texas Tech study found percolate (used in explosives and rocket fuel) in water delivered to 4 million people through contaminated irrigation and in 99% of milk samples studied. It also found that the average concentration of percolate in breast milk was five times higher than dairy limits and 10 times higher than EPA limits.

Environmental Health
Fresh water quality also impacts biodiversity and the environment. Globally, species populations are shifting, although the specifics vary by species and location. Approximately 45,000 vertebrate species live in and around lakes, rivers, streams and wetlands. 119 Between 1970 and 2003, there was a 30% decline in the fresh water vertebrate population and a 50% decline in the non-bird fresh water vertebrate population. 120 While it is difficult to place an economic value on biodiversity, the rate at which populations are declining is alarming. The map below illustrates examples of the population decline.

120 Ibid.
Economic Development
Many people are currently attempting to place an economic value on a healthy ecosystem and demonstrate the environment’s importance to economic development. Even in the absence of that data, there remains a strong logic for the importance of the environment to economic development. Fundamentally, an individual’s well-being has key linkages to a healthy ecosystem, in which access to fresh water plays a key role. Economic development and business growth cannot be successful without healthy customers and employees. For this reason alone business should be acutely attuned to the importance of the environment.

The diagram below illustrates the complexity of the linkages among a healthy ecosystem and individual well-being.

These strong linkages of a healthy ecosystem and water scarcity are of particular importance to the business community and are reinforced in the Millennium Ecosystem Assessment (MA) commissioned by the United Nations. In the MA, water scarcity was one of the six major changes identified as having a profound negative impact on ecosystems. The MA asserts that water scarcity will have a substantial impact on the business community because of the following:

- Businesses will compete for water
- Rising water costs may substantially increase operating costs
- Access to fresh water will be a primary factor in site selection for new locations
- Recycling will become increasingly important
- New products and processes that improve water quality of increase the efficiency of water use will be valuable
- Marketing and selling water will be a lucrative business

Another concern for many developing countries that will have a massive impact on economic development is the role women and girls play in securing water. In most developing countries, women and girls are responsible for securing the family’s water supply. This can mean waiting at home for the water delivery—which may never arrive—or walking nearly four miles each day to acquire water. Either prospect is essentially a day’s work, which means that women are unable to work outside of the home, and girls are unable to attend school. The magnitude of the economic impact of approximately 50% of a nation’s eligible workforce unable to work—or unprepared to contribute due to insufficient education—is not fully understood, but not insignificant.

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123 Ibid. 10.
125 Ibid.
There are essentially three ways of addressing the problems created by poor water quality and its relative scarcity:

1) Remediation: repair the damage of prior actions
2) Preservation: change behaviors so that future damage is not done
3) Policy: enact appropriate laws, oversight and penalties to reinforce the goals of remediation and preservation

Remediation
Remediation primarily refers to the technical approach to restoring natural environments that have been damaged by extensive pollution caused by industrial, agricultural or individual choices. Significant time and money have been invested in remediation throughout the developed world in recent decades. Unfortunately, this is not the case in much of the developing world, creating an opportunity to apply the remediation lessons of recent years in those parts of the world.

Preservation
Preservation refers to changing behaviors and attitudes to reduce or eliminate future damage. Perspectives about preservation can be considered on a continuum with minimizing damage at one end of the spectrum and 100% sustainability at the other:

Minimum Damage  Zero Net Impact  100% Sustainability

Minimum damage refers to an approach to minimize the environmental impact with traditional, industrial solutions. Examples include installing scrubbers in smokestacks and building water treatment facilities. A zero net impact approach is more sustainable, but does not fully account for the long-term environmental costs when evaluating solutions. The result is typically a more sustainable version of an existing, industrial solution as opposed to a truly sustainable solution. An example is a closed-loop water system in a manufacturing plant.

True sustainability is, in itself, an evolutionary quest. However, there are many existing approaches that could be applied to mainstream behaviors that would make strides in the overall approach to sustainability. Examples include living machines that can purify water without the need for a capital intensive treatment plant.

While attitudes and behaviors are shifting closer and closer to a 100% sustainable approach, current behaviors still largely fall somewhere between minimum damage and zero net impact. True sustainability will not be reached until the human consciousness is altered to seek harmony with the environment, as opposed to mastering it.

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126 enlight analysis and research.
127 Living Machines - a form of biological wastewater treatment designed to mimic the cleansing functions of wetlands; Living Machine is a trademarked term held by Living Designs Group, LLC of Taos, New Mexico. Living machines fall within the emerging discipline of ecological engineering, and many similar systems are built in Europe without being dubbed “Living Machines.” (http://en.wikipedia.org/wiki/Living_machines).
For example, China’s issues relate to desert expansion, resulting from drought, overgrazing, overuse and logging.¹²⁸

- 1 million acres become new desert each year
- More than 200 million people suffer — either from loss of land, livelihood or water or some other loss
- $7.7 billion dollars are lost each year due to desertification

As a result, the Chinese have resorted to using silver iodide to make fake rain. The government has taught 35,000 farmers to “shoot” clouds with silver iodide.¹²⁹ The Chinese government has also begun establishing shelter belts of grass and trees and reforesting certain regions of the country. Additionally, the industrial mismanagement and inefficiency is evident in the fact that the amount of water used to produce one ton of steel is approximately four to ten times that of U.S. and Japan.¹³⁰

In the United States, individuals use nearly 100 gallons of water per person per day.¹³¹ If this usage goes unchecked, 36 states will endure water shortages by 2013.¹³² Conservation efforts and improved watershed planning in major cities have proven successful in reducing near-term water usage. Examples include the Boston conservation effort of 2004 and New York City’s avoidance of constructing a new wastewater treatment plant thanks by employing better watershed management practices.¹³³,¹³⁴

Policy

Policy is the primary means of government control of business, agriculture and individual choices. The status of environmental policy — and more specifically water policy — globally varies. In much of the developed world, through organizations such as the Environmental Protection Agency and its counterparts, many of the behaviors that lead to point source pollution have been identified and are highly regulated. Nonpoint source pollution, on the other hand, is of primary concern.

Unfortunately, in developing countries, policy about point source pollutants lags that of the developed world. And, even in cases where the policy is appropriate, there is often insufficient oversight, inconsequential penalty or blatant corruption. The corruption occurs when officials turn a blind eye to infractions because of their desire for economic development and “progress.” Nonpoint source pollution is far from the radar screen in most instances.

Policy alone cannot solve the problems related to fresh water, but it is an important component. Without the threat of short-term penalty, it is often difficult induce businesses and individuals to make decisions in the interest of the long term.

¹³⁴ Ibid.
Conclusions

Through extensive research, interviews and analysis, it has been determined that Global Water Ventures of Cleveland will initially focus on matters related to fresh water quality. This focal point was defined for the following reasons:

1) Focused efforts
2) Cleveland relevance
3) Cleveland benefits

It is widely accepted that a new undertaking should be focused in its efforts in order to simplify the management challenge and increase its ability to have a measurable impact and build credibility. Trying to do too much too fast or be all things to all people results in organizational and market-based chaos and wasted time and money. Management challenges are simplified when individuals have a small scope of expectations and clearly understand how their efforts contribute to the organizational objective. With a focused mission, an organization is likely to achieve impact more quickly than with a broad mission. The combination of a clearly articulated, focused mission and demonstrable impact enable an organization to achieve widespread credibility and recognition.

In the interest of focus, fresh water quality presents unique opportunities for Greater Cleveland relative to quantity and governance issues. Both quantity and governance issues are largely influenced by policy decisions. There are countless organizations focused on fresh water or environmental policy, so carving out a niche is a relatively difficult proposition. On the other hand, there are few organizations that are taking a holistic approach to addressing fresh water quality issues.

Given Greater Cleveland’s legacy of remediation and recent forays into sustainability, the local relevance of fresh water quality is obvious. When the strength of the local health care and bioscience industry is included, fresh water quality makes even more sense. Finally, with the abundance of fresh water in the region, it is expected that a focus on supply and demand issues would be deemed less compelling to the community.

Finally, the Greater Cleveland benefit could be significant with a fresh water quality focus, thanks to the need for new products and services. These products and services will most likely be developed and launched in the region — either to new or existing businesses — and the economic benefits of that can not be underestimated. Given that the quantity and governance issues are more likely addressed through policy, the opportunity to local economic impact related to a focus on either of those topics is considerably less.

It is important to note that once the organization has achieved measurable impact with respect to fresh water quality, it may be appropriate to expand the focus to include related issues of quantity and governance. This expanded scope should not be considered for several years and should be carefully evaluated at that time based on the organization’s competencies and global needs.
Once it was determined that fresh water quality would be the topical focus for Global Water Ventures of Cleveland, the approach and operations needed to be defined. This was accomplished via a systematic process to achieve the following:

1) Understand current fresh water quality efforts
2) Identify areas of focus and gaps
3) Fill gaps with proven methods
4) Increase the pace of impact
5) Define key operational details
6) Understand non-financial implications
7) Estimate financial performance and needs

The chart below highlights the approaches employed by a representative sample of organizations evaluated.

Based on this analysis of current activity it is evident that there is little focus on new product development (incubation) or implementation. An additional gap was identified with respect

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135 The name “Global Water Ventures of Cleveland” was selected to convey a new kind of organization that will achieve impact in new ways. It is intended to be a working title and is expected to evolve as the specifics are defined and investors are aligned.

136 enlightened analysis and research.
to a thinktank devoted to fresh water concerns. Meanwhile, education, research and collaboration-based missions were abundant.

The concepts of incubation and implementation are attractive thanks to their likelihood of achieving the dual benefits of impacting the global problem of fresh water quality while creating economic value for Cleveland. Given this, it is important to understand the overall context for identifying product or service opportunities and creating and implementing solutions.

The figure below summarizes the general approach to developing and applying new products or services.

The presence of Companies, Users and Experts creates the context for this process. Companies represent those corporations and startups that are developing technologies to address fresh water issues, as well as the venture capital firms and others that invest in those efforts. Experts represent the countless researchers in labs and the devoted members of NGOs and other organizations that work to alleviate these problems every day. Users include individuals, companies and governments that consume or utilize fresh water in their daily existence and benefit from the identification and application of fresh water solutions.

The individual steps of the process can be summarized into three categories: Identify, Create and Apply. ‘Identify’ includes identification of User needs to drive Ideation, Research and either the development of a New Product or Service or the adaptation of an Existing Product or Service to solve the User’s problem.

‘Create’ includes developing the Prototype, Field Testing and Commercializing the product or service. Oftentimes, this part of the process also includes establishing a viable business to support the ongoing application and implementation of the product or service.

\[137\text{ enlight analysis and research.}\]
‘Apply’ is the Installation of the Product — or Skill Transfer of the Service or Process — and its ongoing Maintenance.

Identify Areas Of Focus And Gaps

The figure below illustrates the same value chain with key areas of current focus and gaps highlighted.

According to our research, current areas of focus include Research, New Product Development and Product Installation. There are significant numbers of talented researchers throughout the world developing new products to meet the world’s fresh water needs. Most of this work results in new, higher tech, products and their installation.

The research also revealed a set of gaps in this process that essentially relate to increasing business acumen applied to the entire process, with an eye toward increasing the amount of overall investment in the opportunities in the coming months and years.

The following gaps were identified with respect to ‘Identify’:
- Ideation and Research, while teeming with activity, are not directly tied to applications and User needs.

enlight analysis and research.
Identification of Existing Products or Services that would be appropriate for a given situation is often overlooked in favor of developing new, high tech solutions. This is especially true of various blue sky or low tech solutions that have yet to be embraced by the mainstream, such as living machines.

‘Create’ gaps include the following:
- Insufficient financing, facilities and support for Prototyping and Field Testing
- Insufficient financial support, business acumen and native knowledge when commercializing products and services

‘Apply’ gaps all relate to insufficient native knowledge, link with Users and link with the mainstream.

### Fill Gaps With Proven Methods

The strategy for Global Water Ventures of Cleveland was developed based on the outcome of this analysis, and was validated by interviews with key individuals. The strategy leverages existing business models in new ways to improve global fresh water quality. Additionally, these efforts will significantly improve the overall impact of other efforts simply by creating better connections among stakeholders.

<table>
<thead>
<tr>
<th>Identify</th>
<th>Create</th>
<th>Apply</th>
</tr>
</thead>
<tbody>
<tr>
<td>“We would pay for data about the size and scope of the opportunity so that we could better position our investment portfolio.”</td>
<td>“…we haven an amazing ability to develop a product or process to solve any problem. We fall short in our attempts to commercialize the resulting products. We’re researchers, not businessmen.”</td>
<td>“In the global water arena, many ‘good ideas’ fail because of lack of understanding of”</td>
</tr>
</tbody>
</table>
| -Manager, VC Firm | -Manager, Research Lab | - Customers/users  
- Local culture, dynamics  
- Role of NGOs, governments, etc  
- The Economics of the situation  
- Water Manager, Microlender |

### Intelligence
- Business Analysts
  - Understand stakeholder needs
  - Codify best practices and innovation
  - Analyze and identify market opportunities

### Incubation
- Business Experts
  - Invest in innovative technologies
  - Create viable businesses
  - Prototype and field test potential technologies

### Implementation
- Consultants
  - Leverage native knowledge
  - Develop place-based, sustainable solutions
  - Instill new knowledge

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139 enlight analysis and research.
The Intelligence team will analyze the market opportunity — size, scope, needs, etc. — to better position investors and companies to fill these gaps. The analytical output will be available via a host of proprietary standard reports, custom reports and consultations. Intelligence will also identify and codify best practices to enable future efforts to benefit from the learning curve experienced by previous endeavors. Finally, the Intelligence team will establish and maintain relationships and partnerships with a variety of stakeholders throughout the globe.

The Incubator will provide the business acumen, native knowledge and the prototyping and field testing support to establish viable businesses and solutions. This group will also selectively invest in potential businesses and opportunities.

The Implementation team is a consulting arm that is responsible for hands on support installing products or transferring the skills for remediation and sustainable operations.

**Increase The Pace Of Impact**

The Vision of Global Water Ventures of Cleveland is the following:
To improve or maintain biodiversity, quality of life, environmental and public health by impacting fresh water quality issues throughout the world.

The Mission is to:
Connect with key stakeholders and end users to identify, create and apply sustainable fresh water quality solutions via Intelligence, Incubation and Implementation.

The most immediate goal is to increase the pace of impact by shifting the investment curve. Considering the amount of time it takes to attract interest (and investment) in causes where the social benefit is perceived to outweigh the financial benefit, significant mainstream investment typically occurs only after years of small-scale investment by a handful of visionaries. And example is investment in advanced energy, which while recently in vogue, has limped along at a dismal level for decades.

Our belief is that, left to market forces and human nature, the same will happen with fresh water technologies. Global Water Ventures of Cleveland will shift the inflection point for fresh water investment to an earlier date by greasing the skids with information, connecting good ideas with funding and support and demonstrating the potential benefits via Implementation. This will enable the world to achieve strides in fresh water quality technologies sooner than would otherwise happen.
In order to achieve this objective, Global Water Ventures will focus on the following initiatives in the near term:

- Validate water industry size and scope to attract increased investment
- Connect experts with user needs to maximize effectiveness of solutions
- Connect experts with business acumen to ensure business viability and optimal reach
- Remediate water quality and instill sustainability culture

Over time, operational focus will shift to implementing sustainable solutions and converting the mainstream to more innovative approaches. Eventually, it is likely that the organization will also evolve to impact fresh water quality in new ways or expand its scope to issues related to quantity and governance.

Throughout its evolution, Global Water Ventures of Cleveland will remain focused on the following fundamentals:

- Creating new knowledge — synthesize information in new ways to increase investment and connect key stakeholders to change the paradigm for fresh water quality solutions
- Propelling the pace of impact — by connecting the dots of key stakeholders and engaging new stakeholders in the dialogue
- Creating economic value for Cleveland — by incubating and spinning off new companies, attracting new businesses, employing staff, hosting events and leveraging the strengths of the region

Define Key Operational Details

The most important operational details relate to the following areas:

- Leadership
- Structure and culture
- Social network mapping

Leadership

The organization’s leadership — both professional staff and the board — are of primary importance to its success. It has been determined that the ideal profile for Global Water Ventures is one that possesses:

- Enlight analysis and research.

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140 *enlight* analysis and research.
Ventures of Cleveland’s first CEO is that of a Social Entrepreneur. A Social Entrepreneur will combine the inherent strengths of an entrepreneur with those of an individual committed to a social good. In the case of Global Water Ventures, the social good may be fresh water quality or sustainability, but could just as easily be conservation, environmental health, sustainability in general or even public health.

“Rather than leaving societal needs to the government or business sectors, social entrepreneurs find what is not working and solve the problem by changing the system, spreading the solutions and persuading entire societies to take new leaps... Social entrepreneurs often seem to be possessed by their ideas, committing their lives to changing the direction of their field. They are both visionaries and ultimate realists, concerned with the practical implementation of their vision above all else.”

Regardless of the legal structure, the Advisory Board structure and expectations are of fundamental importance. It is critical that the Advisory Board embody the culture and approach of the organization.

**Structure and Culture**
The structure of the organization refers to both the formal operating structure and the less formal support structure. Formally, each operating division (Intelligence, Incubation and Implementation) will have its own staff of appropriately qualified individuals. Additionally, there will be a small marketing and development group and a small group of executive overhead (CEO, COO and assistant).

In order to maintain a relatively small staff of core employees, it will be critical to maintain a less formal network of support. This will include relationships with experts, users, NGOs, governments and investors, as well as direct connections to existing incubators and sources of native knowledge. Management of these relationships is key, and will be described in greater detail in the Social Network Mapping section below.

As important as a well qualified and orchestrated staff is the overall culture of the organization. The components that will drive the culture have been divided into the following categories:

- **Primary Objective:** Converting the mainstream to maximize impact
  - Apply existing approaches in new settings
  - Commercialize new and existing technologies
  - Identify and share best practices
  - Focus support of innovation and new product/solution development
  - Establish a compelling business case for changing the behavior of the mainstream

- **Fresh Water Philosophy:** Water is the substance of life and is required for growth
  - Build the business case for biodiversity as important to economic development
  - Protect the quality of life for people
  - Safeguard the environment for all aspect of the ecosystem
  - Ensure basic human needs are met
  - Promote responsible use of water to support economic development

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Global Water Ventures
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- **Sustainability Focus:** Strive for sustainability through education and evolution
  - Identify the sustainable ideal, while implementing short term improvements
  - Understand the holistic sense of sustainability in the context of smaller progress
  - Educate about the tradeoffs and impact of shortchanging sustainability
  - Recognize the ongoing iterative quest for sustainability

- **Approach:** Employ Integrated Water Resources Management\(^{142}\) to understand stakeholders and align action
  - Include social, economic, environmental and technical perspectives
  - Recognize the independent nature of water uses
  - Analyze problems from the watershed point of view
  - Give all stakeholders a voice

The staff and the Advisory Board will be responsible for ensuring that the organization lives up to the spirit of these guiding principles.

**Social Network Mapping**

Due to the complexity and sheer number of relationships that will need to be maintained globally, social network mapping is a key component to ensuring the success of Global Water Ventures of Cleveland. The social network mapping project, planned to begin during the Bridge phase, will map the global fresh water stakeholder network to:

- Identify potential Advisory Board members and future advisors
- Identify potential Social Entrepreneurs (CEOs) and future employees
- Prioritize global stakeholder network to simplify ongoing relationship management and collaboration
- Inform Intelligence’s knowledge management structure
- Significantly increase ability to manage relationships and achieve impact via collaboration
- Begin as soon as possible, in parallel with Social Entrepreneur (CEO) search process

Network Maps provide a revealing snapshot of a business ecosystem at a particular point in time. These maps can help answer many key questions in the community building process:\(^{143}\)

- Are the right connections in place? Are any key connections missing?
- Who are playing leadership roles? Who is not, but should be?
- Who are the experts in process, planning and practice?
- Who are the mentors that others seek out for advice?
- Who are the innovators? Are ideas shared and acted upon?
- Are collaborative alliances forming between businesses?
- Which businesses will provide a better return on investment?

Starting with a disconnected community, network builders weave together the necessary skills and resources to build simple single hub networks, a more robust multi-hub network and eventually a resilient core/periphery structure – maximized for learning and implementation.\(^{144}\) The diagram below is an example of a social network map.

\(^{142}\) Integrated Water Resources Management - ensures that social, economic, environmental and technical dimensions are taken into account in the management and development of water resources

\(^{143}\) Building Smart Communities through Network Weaving © 2002-2006 Valdis Krebs and June Holley.

\(^{144}\) Ibid.
Operational Example
The following example demonstrates how Global Water Ventures of Cleveland will work. The organization will leverage its strategic relationships to identify opportunities. One such opportunity may be the need for a mid-sized filtration system to address in-home water quality issues in developing countries. Bhavika Vyas, the Water Portfolio Manager of the Acumen Fund, a global microlender, shared this real example in an interview.

145 Ibid.
Water filtration is a key area of focus for many researchers, and most current efforts are focused on individual filtration systems for treatment at the point of use or city-wide systems for treatment at the source of the water. The Acumen Fund sees the need for a mid-sized filtration system that would be appropriate for 12-15 households, which represents a micro-lending unit (i.e. micro-lenders lend money to individuals in groups of 12-15).

Accommodating 12-15 households would most likely be more cost effective than individual homes and less cumbersome than city-wide systems. Today, the Acumen Fund does not have a logical place to report this need or identify the opportunity.

Once the Intelligence division of Global Water Ventures learns of this opportunity from its network, it assigns a project manager and begins validation. After connecting with the Acumen Fund to understand and define the need, the Intelligence team consults with other microlenders, appropriate governments, NGOs and other organizations to validate the need. Next, the team identifies and evaluates potential target audiences, defines the target user groups and scopes the size of the market opportunity. The team also connects with appropriate regulatory agencies to better understand and incorporate that perspective in to their output.

The Intelligence team reviews existing technologies for relevance and conducts patent research to evaluate current activity. Finally, the team communicates the need, opportunity and knowledge to the Incubator and other partners including experts and venture capital firms.

Once the Incubator learns of the opportunity, it begins business development. As concepts are submitted by experts and entrepreneurs, the Incubator evaluates the submissions to determine whether to invest individually or jointly, to refer to another investor or outright reject the idea. As the portfolio companies hone their designs and develop the business models, the Incubator provides the appropriate functional expertise and native knowledge. The Incubator also assists with prototyping and field testing, including procuring appropriate field test sites.

Over time, the Incubator will focus its investment on the small number of technologies that it deems most viable, and will continue to provide relevant functional expertise and native knowledge. Ultimately, the Incubator will launch the most promising products, services or businesses and communicate their knowledge to the Intelligence and Implementation teams.

The Implementation team will then work with the newly launched business and local engineers to develop an installation process that is appropriate for the local context. The Implementation team then collaborates with key stakeholders — governments, NGOs, etc. — to maximize the project’s success. Upon completion of the implementation process, the team reports its knowledge to the Intelligence and Incubator teams.

Installing 5,000 systems could impact 375,000 lives and create 80 new jobs in Cleveland.

Understand Non-Financial Implications

Global Water Ventures of Cleveland will establish Cleveland as the global epicenter of freshwater quality by creating new knowledge (related to user needs and the fresh water market opportunity) and propel the pace of global impact. Additionally, the organization will create economic value for Cleveland. These non-financial implications increase the overall attractiveness of the effort.
Financial projections for Global Water Ventures of Cleveland are based on a phased approach:

1. **New Knowledge**
   - Attracts increased fresh water investment
   - Establishes business case for sustainability and biodiversity
   - Converts the mainstream to leverage sustainable solutions
   - Speeds pace of action by connecting key stakeholders
   - Represents US on global freshwater stage

2. **Global Impact**
   - Saves more lives faster
   - Reduces illness and improves quality of human life
   - Safeguards biodiversity
   - Influences global freshwater policy and investment
   - Facilitates UN Millennium Development Goal progress

3. **Economic Value for Cleveland**
   - Establishes Cleveland as epicenter of freshwater innovation
   - Leverages NEO strengths to drive global impact
   - Establishes academic center(s) of excellence
   - Attracts new businesses – ~15/yr
   - Economic impact of events – $5M/year by year 5

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**Estimate Financial Performance And Needs**

Financial projections for Global Water Ventures of Cleveland are based on a phased approach:

- Bridge - 18 months
- Start Up - 18 months
- Operations - 10 years and beyond

The organizational structure of Global Water Ventures is yet to be determined, although it is expected to be an independent 501c(3) organization.

The purpose of the Bridge phase is to refine the financial and operation plan for Global Water Ventures of Cleveland. The primary activities include hiring the Social Entrepreneur (CEO) who will develop the business plan and start up the organization, seat an Advisory Board with a global sphere of influence, and develop a social network map of the fresh water space.

The Bridge phase is expected to require a $1.1 million investment, to be spent in the following ways:

- $282K - Social Entrepreneur (CEO) salary ($200K/yr), benefits (50%) and bonus (20%)
- $40K - Social Entrepreneur (CEO) travel - $2,000/trip, 2 trips/month
- $113K - Advisory Board compensation - $5,000/year, 15 members
- $174K - Advisory Board travel - $2,500/meeting, 4 meetings/year, 15 members
- $100K - Project management support

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147 Economic impact of events based on spending per event estimates provided by the Cleveland Convention and Visitors Bureau - ExPact 2005.
The Project Manager will be responsible for driving progress with the process, including providing support for the Social Entrepreneur search, the Social Network Mapping project and setting up the legal structure of the organization. The Project Manager will be expected to interface with key Global Water Ventures of Cleveland stakeholders including the Advisory Board and the sponsors. The Project Manager will not be responsible for content development or strategic planning.

The Social Entrepreneur (CEO) will develop the strategic plan and secure Start Up funding.

The Social Networking project will map the relationships and communications related to fresh water to simplify relationship management for ongoing operations, inform the knowledge management component of the Intelligence team and support recruitment efforts.

The Advisory Board is expected to consist of 15 members from throughout the globe with relevant experience in a variety of disciplines. There will be four meetings per year and a high expectation for contribution of time and talent.

The Search Firm will be responsible for the Social Entrepreneur (CEO) search, and the Legal support is expected to cover organization setup and related counsel.

The Bridge phase is expected to require $1.1M, and include the following checkpoints:
- Establishing the Advisory Board
- Hiring the Social Entrepreneur (CEO)
- Creating the social network map of global fresh water activities
- Refinement of the high level financials and operating model
- Development of the business plan and detailed start up plan

The graph below summarizes the expected costs for the Bridge and Start Up phases.
The Start Up phase will include hiring the heads of the Intelligence and Implementation teams and the Marketing VP. These 18 months will be spent building the operating model for the two divisions, solidifying key global relationships, developing the marketing and development strategy and laying the groundwork so that Year One of Operations starts with impact. Start Up also includes hiring an executive assistant to support the growing organization.

The Social Network Mapping consultant will continue to refine the framework developed in the Bridge phase. The Search Firm will assist with placement for the additional employees, and the Legal support will provide appropriate organizational counsel.

The Start Up phase is expected to require $2.7M, which will be invested in the following ways:

- $510K - Social Entrepreneur (CEO) salary ($200K/yr), benefits (50%), bonus (20%)
- $170K - Intelligence Dir salary ($100K/yr), benefits (50%), bonus (20%) - 12 mos
- $255K - Implementation Dir salary ($150K/yr), benefits (50%), bonus (20%) - 12 mos
- $170K - Marketing Dir salary ($100K/yr), benefits (50%), bonus (20%) - 12 mos
- $216K - Employee travel - $2,000/trip, 2 trips/month/employee (excluding Exec Asst)
- $75K - Marketing expenses
- $128K - Executive Assistant salary ($50K/yr), benefits (50%), bonus (20%)
- $162K - Operations - $3,000/month/employee (excluding Exec Assistant)
- $112K - Advisory Board compensation - $5,000/year, 15 members
- $225K - Advisory Board travel - $2,500/meeting, 4 meetings/year, 15 members
- $100K - Social Network Mapping - additional work
- $100K - Legal support
- $50K - Search firm - additional employees
- $36K - Office - $2,000/month - 18 months
- $386K - Misc - 25% of other costs - excluding personnel and consulting

Based on current projections, Global Water Ventures of Cleveland will break even in Year Five of Operations and steadily improve its performance over time. Initially, investments in personnel and marketing will outweigh income, resulting in nearly $14M in required investment. However, by Year Five of Operations, Intelligence, the Incubator and Marketing and Development should be financially self sufficient. If the Incubator — slated for launch in Year Three of Operations — generates the expected returns, they will offset the expected losses generated by the Implementation and Executive leadership teams. More analysis and evaluation should be conducted to validate and refine all of the estimates, especially the Incubator and Implementation teams, which are expected to generate the most significant revenues and costs.

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148 Based on enlight estimates. Refer to the Financial Estimate Details section in the Appendix for more information.
Operating Revenues & Costs By Division
($M)

FTEs
10 11
17 17
26 27
28 30
32 34

PTEs

Based on enlight estimates. Refer to the Financial Estimate Details section in the Appendix for more information.
Cleveland is well positioned — literally and figuratively — to impact global fresh water quality, thanks to its location on the Great Lakes and its legacy of remediation.

The Great Lakes are an important factor in the world’s fresh water supply.

- The Great Lakes, at more than 90,000 square miles, are the largest group of fresh water lakes in the world.\textsuperscript{150}
- The Great Lakes contain nearly 20\% of the entire world’s fresh surface water supply.\textsuperscript{151}
- The United States draws more than 40 billion gallons of water from the Great Lakes every day.\textsuperscript{152}
- Lake Erie is one of the shallowest large lakes in the world, making it an ideal spot for field testing new technologies.\textsuperscript{153}


Cleveland was a leader in this key legislation, and few people know of the progress in the quality of the rivers, lakes and streams since then. This is an opportunity to leverage Cleveland’s remediation expertise to impact water quality globally.

Beyond access to 20\% of the world’s fresh surface water in the Great Lakes and a legacy of remediation, Northeast Ohio has a vast array of attributes that make it an ideal place for this effort.

The various industry clusters that exist or are emerging will complement this effort:

- Bioscience & Healthcare
- Information Technology
- Polymers & Advanced Technology
- Instrumentation & Controls
- Power & Propulsion

Additionally, the region houses key functional expertise

- Advanced Manufacturing
- Green Buildings
- Industrial Design
- Business Incubation

According to Team NEO, the region’s primary economic development organization, the region boasts the following additional attributes:\textsuperscript{154}

- Northeast Ohio is the 15th largest metro market in the U.S.
- The region’s GDP ranks 12th in the U.S.
- Northeast Ohio’s workforce includes:
  - 29,000 engineers, scientists and IT professionals

Global Water Ventures of Cleveland

- 28,000 bioscience professionals
- 95,000 management professionals
- Northeast Ohio is home to 24 colleges and universities including:
  - 160,000 students
  - 28,000 faculty and staff
- Over 110,000 firms make up Northeast Ohio’s diverse industrial base
- Northeast Ohio ranks 7th in number of Fortune 500 companies
- Northeast Ohio is home to over 120 ethnic/cultural communities
- Logistics Today ranks the region 4th in the U.S. in logistics infrastructure
- Northeast Ohio has the largest number of consumers within a 250 mile radius of any metro market in the U.S.

The region’s excellence in higher education will be both a benefactor and beneficiary of this effort. The institutions have the potential to be primary partners and suppliers of talent to the organization. Also, our research has revealed that there is no single institution in the world that is renowned for fresh water quality technology. There is an opportunity for a local institution to stake this claim, which would benefit both Global Water Ventures of Cleveland and the region.

The combination of the benefits presented by the regional community will enable Global Water Ventures of Cleveland to accomplish its objectives of creating new knowledge, achieving global impact and creating economic value for Cleveland.

Finally, this effort capitalizes on the convergence of regional economic development efforts. And, it can serve as a means of focusing the talent, energy and passion on a cause of global importance which greater Cleveland is uniquely positioned to impact.
Five to 20 percent of fresh water use exceeds the long term sustainable supply. Businesses will need to grapple with this issue in a variety of ways, including the following:

- Recycling the water supply
- Selecting sites based on water availability
- Mitigating increased input costs as water prices increase
- Innovating operations to reduce water consumption or improve water quality

Economic development and growth will only exacerbate the challenges related to fresh water Quality, Quantity and Governance. The chart below demonstrates the increased water consumption that comes with increased wealth. This concept is called the water ladder. As wealth increases, water consumption evolves from simply Survival to Lifestyle Choices.

Water Needs and Service range from Drinking, Cooking, Washing and Shelter - at the Survival end of the spectrum – to Lifestyle Choices such as Leisure, Recreation and Tourism. Additionally, the sources of water range from reliance on manual energy at low levels of wealth to increasing needs for modern fuels and power sources at high income levels.

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As economic development progresses, the issues of fresh water Quality, Quantity and Governance are compounded. Not only does economic development imply population growth — and with it increased water needs — but as wealth increases individual consumption increases as well. One primary example is the evolution of diets. As economies develop, individual diets shift from grain-based to meat-based. It takes about 25 gallons of water to grow a single serving of rice while it takes more than 2,600 gallons to produce a single serving of steak.\(^\text{156,157}\)

In addition to affluence, other trends that will affect fresh water use are expansion of business activity, rapid urbanization and climate change.\(^\text{159}\) Due to these pressures, there is a sense of urgency to determining how to better manage fresh water challenges of Quality, Quantity and Governance.


Launching Global Water Ventures of Cleveland is not without risk. However, identifying the risk enables the leadership team to develop mitigation plans. Equipped with an understanding of the risk and mitigation plans, Global Water Ventures of Cleveland is better poised for success.

**Risks**
- Taking on too much, too fast
- Being viewed as duplicative to existing efforts
- Insufficient relationship building and maintenance
- Tarnished by Cleveland’s image
- Insufficient resources – funding and talent
- Inadequate native knowledge
- Poor execution
- New competition

**Mitigations**
- Phased Implementation
- Focus on gaps, building appropriate relationships
- Leverage social network mapping to manage relationships
- Capture re-branding opportunity
- Build a compelling vision and garner broad-based support
- Establish relationships in key areas
- Appropriate leadership, metrics
- Excellence in execution and mission impact

Fundamentally, the success of Global Water Ventures depends on acquiring the right resources and empowering them to execute. The key success factors in the near term include:
- Securing Funding - Bridge, Start Up, ongoing Operations, Corporate Sponsorships
- Recruiting the Social Entrepreneur (CEO) and heads of Intelligence, Incubation & Implementation
- Refining the operating model for each of the divisions – Intelligence, Incubation & Implementation
- Executing the business plan and daily operations
- Social Network Map of fresh water activity and stakeholders
- Seating the Advisory Board
The next 18 months are critical to the long-term success of Global Water Ventures of Cleveland. This phase is called the Bridge phase. The primary actions of the Bridge phase are detailed below, with the check points highlighted. These check points will allow the Advisory Board, funders and Social Entrepreneur to evaluate ongoing investment decisions.

### Hire Project Manager
- Establish project scope, deliverables
- Hire consultant

### Secure 'Bridge' Funding
- Review recommendations with current donor
- Identify and approach additional potential donors

### Establish Organization
- Determine appropriate fiscal agent for Bridge Funds
- Establish new entity or partnership with existing entity

### Establish Advisory Board
- Define governance model, expectations, skills
- Identify and select candidates
- Educate about vision, progress, needs

### Hire Social Entrepreneur (CEO)
- Develop job description, responsibilities
- Identify and select candidate
- Educate about vision, progress, needs

### Initiate Social Network Mapping
- Establish project scope, deliverables
- Hire consultant, manage project

### Develop Business Plan
- Refine financials and operating model
- Develop detailed Start Up Plan

### Secure Start Up Funding

The founders (and Advisory Board chairs) will secure Bridge funding. The Project Manager will be responsible for driving progress in the next nine months. Primary responsibilities will include the following:

- Interface between the Advisory Board chairs and key stakeholders
  - Social Network Mapping Consultant
  - Advisory Board
  - Advisory Board Search collaborators
  - Social Entrepreneur (CEO) search firm
  - Legal support
- Establish the legal organization
- Manage Social Network Mapping Consulting
- Manage search and on-boarding for Advisory Board and Social Entrepreneur
- Plan Advisory Board meetings, prepare agendas and materials
- Develop and implement a detailed work plan for Bridge phase
- Communicate with key stakeholders to ensure ongoing progress
The Advisory Board will be responsible for governance, and will be expected to contribute — individually and collectively — to maximize the organization’s success. Specific responsibilities will include:

- Provide access to potential donors
- Provide access to local, national and global stakeholders
- Identify and evaluate candidates, select Social Entrepreneur (CEO)
- Provide strategic and mission-based direction and input
- Evaluate, refine and approve bridge work plan, business plan
- Ensure continuity of mission, vision, strategy
- Participate in regular meetings and conference calls

The Advisory Board should be seated with individuals that possess significant influence and expertise — including a global scope — in the following areas: water experts, NGOs, government representatives, policy experts, finance professionals (venture capital, private equity, corporate), research and development professionals and social entrepreneurs.

The Social Entrepreneur (CEO) will be responsible for developing (and subsequently implementing) the business plan, securing funding for start up and ongoing operations, hiring and managing key employees and executing to maximize mission impact and financial performance.