

Ecological, On-Site Wastewater Treatment: Sustainable and Good for Business

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Water limitations offer an unexpected opportunity to combine profitability and green development. Many parts of the country face water shortages creating difficulty for current businesses as well as limits to growth. These water limitations are alarming, but innovative ecological wastewater treatment and reuse systems and other onsite water technology allow creative business owners to take control of their water needs.

Alternative technologies already established in the market allow owners and developers to go beyond LEED criteria to integrate functional, natural ecosystems into their projects, gaining aesthetic amenities and water for reuse, while improving the overall financial viability of the project.

Capitalizing on these opportunities requires seeing water and wastewater as resources to be managed onsite. The conventional approach of treated water coming from upstream, being used once, and sent downstream for treatment is giving way to harvesting as much water as possible onsite from such sources as treated and reused wastewater, rainwater, and AC condensate.

This change in thinking, coupled with 21st Century water technologies, allows the creation of a sustainable, practical way to ensure the most cost effective and environmentally sound water for development. The onsite management, treatment, and reuse approach follows the same technology path that allowed cell phones to dominate the growth of telecommunications and that is boosting alternative, decentralized energy technology.

Decentralized water treatment strategies, such as those described below, allow owners to reduce first cost, protect themselves from growing municipal water costs, and create an attractive, green drawing card for potential tenants and buyers.

Today's Water System Not Sustainable

Western civilization grew based on the Roman model that provided public services by centralizing infrastructure. Water began to flow to cities via a network of pipes and similar pipes carried away wastewater. This worked well when cities were small and energy was cheap, but now increasing centralization is becoming more costly and less efficient. It's time to rethink water infrastructure from the ground up.

The centralized model is also a '*once through*' model. Turn on the tap and good water is always there, but once used, it's thrown away into the sewer and moved downstream for treatment and release back into the environment. This wastewater travels long distances to a centralized wastewater treatment plant – hidden from public view for its unsightly appearance and offensive smell. Reuse of the water is usually too expensive because of the energy and infrastructure cost of moving large quantities of water back upstream.

Further, conventional wastewater treatment uses large amounts of energy and chemicals and produces substantial quantities of greenhouse gas (GHG) emissions, odors, and hazardous waste (sludge) to be dried and disposed offsite. The scale of the resource commitments to the centralized system is indicated by the fact that California uses about 20 percent of its total electricity consumption just to move and treat water.

To ease water shortages and stave off the need for more dramatic solutions, public policy is looking seriously at integrated strategies such as decentralized ecological wastewater treatment, water reuse and other alternative sources such as air conditioner condensate and rainwater captured at the point of use to create a sustainable water system and re-couple the economy to natural cycles. There is an understandable preference for wanting to return this water to the drinking water tap, but the substantial majority of water consumed (over 70%) is not used for potable purposes.

Ecological Wastewater Treatment and Re-Use

In the 1980s, a movement began to develop wastewater treatment systems that could mimic nature more closely and do away with the chemicals and by-products of traditional, centralized treatment plants. In the last few years, newer ecological treatment technologies have come to market that treat both gray and black water. One of the most effective combines advances in wetland science and engineering along with innovative technology to mimic and accelerate the natural tidal cycles one sees in nature's most effective water cleansing system – the tidal wetland.

This is how it works: Black water from a variety of sources runs into a series of wetland cells, or basins, that are filled with a special packed gravel medium. This medium provides extensive surface area to support the formation of diverse ecosystems of microorganisms – biofilms – that are the key to cleaning the water. As water moves through the system, the cells are alternately flooded and drained to create multiple tidal cycles each day, much like we find in nature. Again like nature, the cycles promote the growth of diverse wetland vegetation and microorganisms, especially in the wetland plant root zone.

Computerized controls allow accelerating the natural cycles and shrinking the footprint of the system to integrate with architectural and landscape design. Remote monitoring capability further reduces the operations and maintenance cost. Thus, a complex and stable ecosystem generates clean water under a variety of conditions, cleansing any gray or black water at a rate that can meet current and growing demand.

The key attributes of the newest generation ecological wastewater treatments systems include:

- low operating costs
- high quality treated water suitable for reuse
- sustainability – a nearly closed loop creating no by-products that must be hauled off and disposed

- a small footprint, yet ready scalability for high volumes in the hundreds of thousands of gallons a day
- low energy consumption and minimized greenhouse gas (GHG) emissions
- aesthetic attractiveness, integrating the beauty and complexity of nature into the structure of buildings and communities
- eligible for LEED credits

Water Re-use and Commercial Development

Decentralizing wastewater treatment simply means moving away from a one-size-fits-all strategy for water capture in both urban and rural settings. Currently, in an urban setting, all wastewater from buildings, houses and factories comes into a central treatment plant while storm water is left to run off into streams and rivers, usually degrading the water quality for downstream users.

Despite the obvious flaws in this system, developers are left to high construction costs and sewer tie in fees, along with complex building specifications and the necessity of laying new/upgrading water pipes while still paying expensive hook-up fees. When looked at holistically, water re-use becomes more and more practical and cost-effective.

With a decentralized ecological re-use system, buildings, shopping centers, and neighborhoods could set up their own wastewater treatment system integrated with the architectural or landscape design. Gray and black water from all source types such as toilets, sinks, food processing, etc. would be captured and reused for irrigation, lavatory needs, car washing, chillers, and other water heavy uses. Water would not move long distances, and each owner would be in control of recapturing, reusing and saving on water costs and environmental impacts.

The following case studies demonstrate how commercial properties are benefiting from such strategies.

Commercial Buildings Benefit from On-site Water Recycling

South Florida, like many U.S. regions, is facing critical water shortages. According to the South Florida Water Management District, the 2008-2009 South Florida dry season has become the third driest on record since 1932. Latest reports show the region received less than 30 percent of normal rainfall this past winter. As a result, estuaries at the mouths of rivers are becoming too salty and bodies of water, such as the Everglades marshes, are evaporating.

John F. Romano, head of the Romano Law Group, decided to make water conservation and reuse the theme of the building design. As a centerpiece of the design, he put in an on-site wastewater treatment system in the lobby of his new building, the Eco-Centre. The on-site wastewater treatment system treats gray water from the building's sinks and showers, producing high quality, recycled water clean enough for exterior irrigation. In addition, rain water is collected in an 8000 gallon cistern on the roof and recycled for lavatory flushing, saving the building about 200,000 gallons of water a year.

On an even bigger scale, a new headquarters office facility for the Port of Portland (Oregon) being built at the Portland Airport will feature an ecological on-site wastewater treatment system designed to treat all of the facility sanitary wastewater. The system is under construction and will treat black water to a quality suitable for reuse, including toilet flushing and water for landscape irrigation. This approach will cut water consumption close to 80 percent compared to a conventional office. It is an important part of their effort to obtain LEED Gold certification for this building.

For builders looking at sustainable yet profitable projects, an on-site ecologically-based wastewater system becomes a valuable asset - aesthetically, environmentally, and economically. Such systems not only can reduce building costs and entice customers, but also create the ability for the owner to establish what amounts to an on-site, small utility and resulting profit center.

Deciding to install an on-site wastewater system might seem daunting, when it fact operationally and fiscally, it's easier than one would think. Consider:

- Discharge fees to sewer can be so high for some areas that an onsite system can save the building owner substantial money.
- The cost of installing sewer piping to connect to the municipal system can easily cost more than an onsite option for remote sites.
- An onsite system and its hydraulic components require little maintenance with operations being handled as a part time job, and monitoring and control can be done remotely using a computer or even an iPhone.
- Onsite systems aren't limited to one building. They are scalable from thousands of gallons per day to much larger sizes.
- These systems have a solid track record of obtaining environmental permits and of documented treatment performance. Successful permitting and operations in over a dozen states (including California, Florida, New York, Oregon, Pennsylvania, Texas, and Washington) provide a strong precedent for new permits.

Sustainable Water Approach Can Put Commercial Developers on Firm Footing

Commercial real estate developers can differentiate themselves with a green, sustainable water approach that can also lead to significant cost savings – and business opportunities. Ecological water treatment and re-use makes great economic sense in areas of rapid growth or failing existing treatment (e.g. septic systems), or as a stand-alone system to serve a specific need.

Decentralized water systems help support the creation and maintenance of viable local economies and communities. Commercial real estate developers and owners can expand their contribution to their communities by integrating the solution of water problems with the creation of business opportunities. In the current economic climate, this approach will also help developers and owners distinguish themselves in the marketplace.