

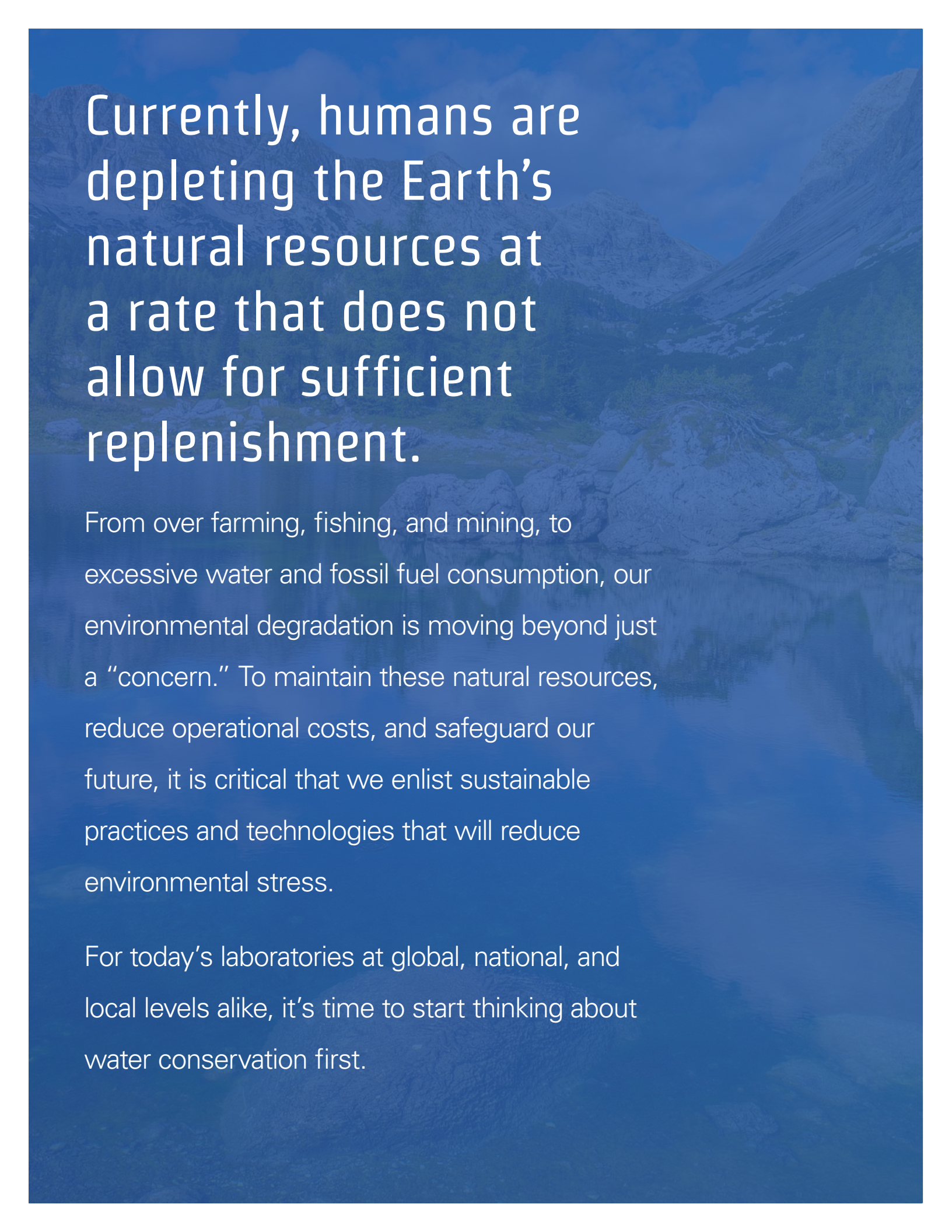


**CONSOLIDATED  
STERILIZER SYSTEMS**

# GOING GREEN

The Real Reasons for Labs to Invest in  
Water Conservation Technologies

By Amit Gupta

A scenic landscape featuring mountains and a river, overlaid with a blue gradient. The text is white and positioned in the upper left quadrant.

Currently, humans are depleting the Earth's natural resources at a rate that does not allow for sufficient replenishment.

From over farming, fishing, and mining, to excessive water and fossil fuel consumption, our environmental degradation is moving beyond just a "concern." To maintain these natural resources, reduce operational costs, and safeguard our future, it is critical that we enlist sustainable practices and technologies that will reduce environmental stress.

For today's laboratories at global, national, and local levels alike, it's time to start thinking about water conservation first.

# Sustainability in the Lab.

Just about every new laboratory construction and renovation project incorporates some kind of green initiative. However, why is it so important to “go green,” and what is really driving this trend?

Energy and resource conservation initiatives are not just a fleeting fad for a multitude of reasons:

- The demand for water exceeds the natural supply rate.
- Federal laws have been enacted to reduce energy/ water consumption.
- Compelling incentives and tax credits for eco-friendly initiatives are available.
- The growing adherence of U.S. Green Building Council’s (USGBC) LEED rating system.<sup>1</sup>

For these reasons, many building projects are prioritizing sustainability over initial cost, and many laboratory equipment manufacturers are ready to support these efforts with products that reduce utility consumption.

Laboratory conservation projects generally focus on three topics: Materials, Energy and Water. In this whitepaper, we will be focusing on water.

# WHY WATER?

## RISING COSTS

A good question to ask is “why is ‘going green’ so important all of a sudden? And why is water such an important part of it? The short answer is that this hasn’t occurred suddenly, but rather gradually over the past 20+ years. Global population has been steadily increasing while fresh water sources, water treatment plants, and other related infrastructures have been under greater stress. Recent studies by the Environmental Protection Agency have estimated \$500 billion worth of improvements are needed over the next 20 years to drinking and wastewater infrastructure. The American Water Works Association estimates it will cost more than double that—1 trillion dollars over the next twenty years.<sup>2</sup> These expected investments are already manifesting themselves nationwide as residents and businesses see rapid increases in water and sewage rates.

A recent study analyzed the water and sewage rates from 2001–2009 within the 50 largest U.S. cities and found that on average the rates went up 5.4% annually, yielding a net increase of 59% over nine years.<sup>3</sup> During the same time period, the consumer price index (CPI) increased by an average of 2.3% per year, yielding a net increase of just 23%.<sup>4</sup> Another survey found that over the last 12 years, water and sewage rates have doubled in at least 25% of U.S. localities.<sup>5</sup>

Unfortunately, these increases are not expected to disappear anytime soon. Some estimates put regional future rate increases at up to 15% per year.

According to data from the Bureau of Labor Statistics, the amount that Americans pay for water is rising faster than U.S. inflation and faster than the amount paid to any other utility service including gas and electricity.

## REDUCED SUPPLY

The increases in water and sewage costs haven’t been driven by an aging infrastructure alone, but also by supply and demand. Over the past 20 years there have been numerous studies outlining the growing scarcity of natural water resources coupled with the increase in water consumption. One very recent study found that nearly 10% of watersheds in the U.S. are “stressed”—meaning the demand for water exceeds the natural supply.<sup>6</sup> This research also showed that water sources in the western half of the U.S., especially in the southwest, are of particular concern. Aside from resupply rates, some existing water sources are no longer available to the general public because of increased pollution or reallocation of water rights to industries involved with ethanol production or fracking.

As demand continues to outpace supply, more watersheds will become stressed and perpetuate the inflation of water costs.

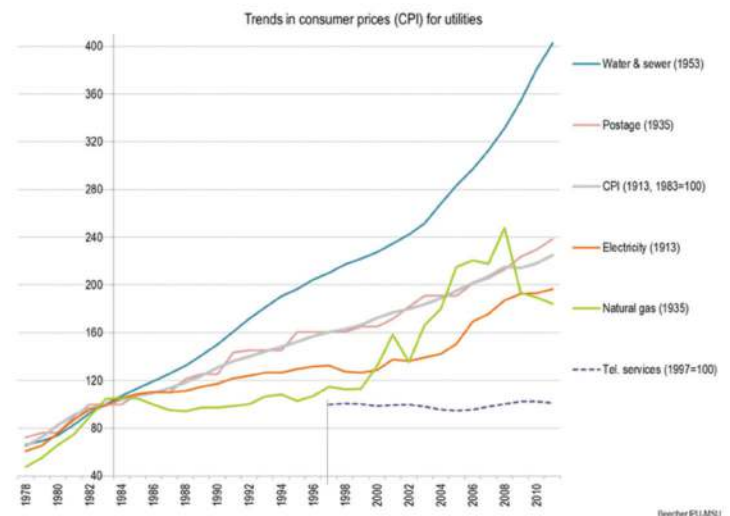


Exhibit 2. Trends in the Consumer Price Index for utilities (general, 1979-2011). The index is set to 100 for 1982-1984 except for telephone services, where the index is set to 100 for 1997.

Source: Bureau of Labor Statistics

## REGULATORY MANDATES

In addition to the compelling financial reasons to conserve water, there are also regulatory reasons. Executive Orders 13423 and 13514 together mandate that federal buildings reduce their water intensity (gallons used per square foot) by 2% each year, for a total of 26% by 2020.<sup>7</sup>

Some states have followed suit as well. Over the course of 2012 alone, at least 20 states have passed laws that either require or reference LEED certification on new government building projects.<sup>8</sup> If local governments and agencies are included, there are over 200 jurisdictions that require LEED certifications for new public buildings. It is conceivable that federal or state lawmakers may enact similar types of requirements on private and non-profit organizations. Some cities and municipalities are already experimenting with regulations on the private sector.

According to a survey performed by USA Today: “Los Angeles, Miami, Boston, San Francisco, Baltimore, Washington, and roughly 85 other cities go an extra step and require some private commercial buildings to follow LEED.”<sup>9</sup> From this, it is clear that aside from any financial and moral arguments regarding water conservation, there are strong legal reasons to do so as well.

## LABORATORY CONSERVATION EFFORTS

As a rule of thumb, labs consume 5–10 times more energy per square foot than an average office building.<sup>10</sup> This higher usage can greatly complicate construction projects, especially if the current municipal infrastructure is unable to handle the increased water supply and sewage load.

Fortunately for laboratories, there are many opportunities to reduce water consumption. Aside from the usual targets of bathroom fixtures, HVAC systems, and other building-related equipment, laboratories can also target a multitude of scientific equipment and instruments that consume tremendous amounts of water.

Equipment that uses steam or water such as autoclaves, glassware or cage washers, water purification systems, steam generators, or vacuum pumps should be examined for any potential savings opportunities. Older equipment that uses water for cooling can be especially wasteful as traditional cooling methods use “once through water.” In this arrangement, fresh cold potable water is used to absorb a heat load and then the warm water is discharged to a drain. Attention to such details is



becoming increasingly more important as some building codes, such as ASHRAE 187.1-2009, have started prohibiting the use of once through cooling water in certain applications.

To help identify and compare the efficiency of various types of laboratory equipment, the EPA and DOE have formed a joint venture called Labs for the 21st Century. Labs21 publishes a reference wiki (located at <http://labs21.lbl.gov/wiki/equipment/index.php/Categories>) that lists common types of laboratory equipment along with energy consumption data for various makes and models.

## INSTITUTIONAL CONSERVATION EFFORTS

In efforts to create a persistent force pushing forward the goals of conservation, many universities and organizations are establishing sustainability groups. In addition to reviewing specifications for new construction projects, these groups are being charged with spearheading their own conservation initiatives.

Sustainability groups at universities such as Stanford, Duke, UPenn, and Notre Dame have established so-called "Green Funds" in order to financially support conservation efforts. One of the projects paid for by Notre Dame's Green Fund installed water conservation equipment on two steam sterilizers, which saved 350,000 gallons of potable water per year.<sup>11</sup> Stanford University performed a similar retrofit on 63 autoclaves. The project only cost \$113,000 and saves nearly 34 million gallons of water per year.<sup>12</sup> Data available from the University of Arizona shows that in 2013 their Green Fund contributed more than \$400,000 to various sustainability efforts.<sup>13</sup> A quick internet search of the term "Green Fund" returns thousands of results from many different sources across the country. Clearly, many institutions are seeing the importance of conservation and there is a growing trend to prioritize long-term sustainability over short-term cost.

Retrofitting existing equipment to save water or specifying more efficient new equipment typically carries a higher initial cost. For this reason, it's vital to investigate whether a proposal only theoretically saves resources or if the results translate into realistic applications. The process by which the savings occurs should be clear and not black boxed. To support their claims, manufacturers should be able to provide documentation as well as references of successful installations.

## LEED CONSIDERATIONS

The USGBC and its LEED rating system has had a tremendous impact on the green movement. It has raised awareness to the cause of resource conservation and has sparked a dialog between a building's occupants, owners, and designers regarding conservation efforts. Additionally, local governments have taken notice; nearly 200 jurisdictions across the country now give some form of tax breaks or other incentives for buildings or projects that achieve LEED certification or can otherwise show that the design is environmentally conscious.

The LEED rating system, however, has received criticism from professionals within various industries because LEED awards credits based solely on simulated or calculated data without any requirement for real world testing. Critics of LEED argue that buildings constructed to achieve LEED certification are not necessarily more efficient than their non-LEED-certified counterparts. Regardless of the validity of these criticisms, the author believes the USGBC's efforts are an important piece to educating professionals and drawing attention to the need for reducing natural resource consumption.

# CONCLUSION

There are many factors driving the requirements for increased water conservation efforts. With the demand for water increasing, supply diminishing, and issues with the support infrastructure, water costs will continue to increase for the foreseeable future. As the stress on water supplies affects more municipalities, it is conceivable that legislators may pass more regulations on both public and private entities requiring them to reduce their water consumption. Aside from regulatory motivations, building owners or sustainability groups may also specify restrictions on water use.

For these reasons, it is important for everyone involved with lab buildings and lab equipment to

remain educated on options and strategies for water conservation. Fortunately, many manufacturers are being proactive by offering equipment that helps reduce a laboratory's water footprint. Although implementing water savings strategies into a building can have a higher initial cost, lab managers and building owners should investigate whether this may be offset by reduced utility costs, contributions from Green Funds or even local tax incentives. Regardless of potential costs, the need for water conservation is likely a permanent requirement and it's up to everyone—manufacturers, lab planners, building owners, etc.—to adapt.

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Consolidated Sterilizer Systems manufactures steam sterilizers for laboratory research and life science applications. We are dedicated to providing eco-friendly equipment and helping architects, building designers, and lab planners construct the greenest buildings possible. Contact us for more information about contributions to LEED credits and cutting utility usage in the laboratory.

