

## **The Carbon Footprint of Water (River Network, 2009)**

### ***Executive Summary***

*The decisions being made today regarding the management of water and energy resources will profoundly affect our economic and environmental future. Climate change and other stresses are limiting the availability of clean water and cheap energy. A large amount of energy is expended to supply, treat and use water, meaning that water-oriented strategies can result in significant reductions in energy use and greenhouse gas emissions. This report explores the energy and carbon emissions embedded in the nation's water supplies. We have developed a baseline estimate of water-related energy use in the United States, as well as a comparative overview of the energy embedded in different water supplies and end-uses. We include numerous examples of how water management strategies can protect our freshwater resources while reducing energy and carbon emissions. This information is intended to help river and watershed groups, policy makers and water managers understand the magnitude of water related energy use and evaluate the potential to reduce carbon emissions through water conservation, efficiency, reuse and low impact development strategies.*

*Through our analysis of primary and secondary research, we estimate that U.S. water-related energy use is at least 521 million MWh a year—equivalent to 13% of the nation's electricity consumption. While this appears to be a conservative estimate of water-related energy use, our findings suggest that the carbon footprint currently associated with moving, treating and heating water in the U.S. is at least 290 million metric tons a year. The CO<sub>2</sub> embedded in the nation's water represents 5% of all U.S. carbon emissions and is equivalent to the emissions of over 62 coal fired power plants.*

*Water conservation, efficiency, reuse and Low Impact Development (LID) strategies should be targeted to achieve energy and greenhouse gas emissions reductions. Research from the California Energy Commission suggests that programs focusing on these kinds of water management strategies can achieve energy savings comparable to traditional energy conservation measures at almost half the cost. Water management policies that promote water conservation, efficiency, reuse and low impact development can reduce energy demand and substantially decrease carbon emissions. The total energy savings potential of these strategies has yet to be assessed. However, numerous case studies illustrate the effectiveness of saving energy with water-based approaches. A few examples of these savings include:*

- *Retrofitting water using fixtures and appliances reduces hot water use by approximately 20%. If every household in the United States installed efficient fixtures and appliances, residential hot water use could be reduced by approximately 4.4 billion gallons per year. Resultant direct energy savings are estimated to be 41 million MWh electricity and 240 billion cubic feet of natural gas, with associated CO2 reductions of about 38.3 million metric tons. Based on national averages, indirect energy savings from reduced water supply and treatment energy needs would be about 9.1 million MWh per year, with carbon emissions reductions of 5.6 million metric tons.*
- *Outdoor water use often drives peak water demands and requires the utilization of marginal water sources with greater energy intensities. Reducing outdoor irrigation—especially during summer months—can result in substantial “upstream” energy savings by reducing water consumption from the most energy-intensive supplies and by avoiding the need to develop additional supplies.*
- *A 5% reduction in water distribution system leakage would save 270 MGD of water and 313 million kWh of electricity annually, equal to the electricity use of over 31,000 homes. In addition, approximately 225,000 metric tons of CO2 emissions could be avoided.*
- *If groundwater levels across the United States were to drop an average of 10 feet due to unsustainable water withdrawals, energy demands for agricultural groundwater pumping would increase by approximately 1.1 million MWh per year. Assuming pumping energy is derived from the U.S. electrical grid, associated carbon dioxide emissions would be approximately 680,000 metric tons per year.*
- *An average sized 1,000 MWh power plant that installs a water reuse system for cooling tower blow-down recovery would reduce the energy demand to produce, distribute and treat water by a net 15%, or enough to power over 350 homes for a year.*
- *If LID techniques were applied in southern California and the San Francisco Bay area, between 40,400 MG and 72,700 MG per year in additional water supplies would become available by 2020. The creation of these local water supplies would result in electricity savings of up to 637 million kWh per year and annual carbon emissions reductions would amount to approximately 202,000 metric tons by offsetting the need for inter-basin transfers and desalinated seawater.*

*The link between water and energy presents the climate change community with a valuable opportunity to better manage two of our most valuable resources. As the U.S. struggles to reduce its carbon emissions in response to global warming, investments in water conservation, efficiency, reuse and LID are among the largest and most cost-effective energy and carbon reduction strategies available. Furthermore, water is perhaps the most vital ecosystem service that our natural environment provides. As the inevitable impacts of climate change become evident, our freshwater resources and the ecosystems they support will become respectively less reliable and resilient. Smart water policies allow us to mitigate the worst aspects of global warming today, while the consequent improvements in water quantity and river health will provide a critical buffer as humanity and nature adapt to the climate of tomorrow.*

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