Introducing Water Efficiency of U.S. Green Building Council's LEED Program to the Freshmen of the Technology College

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Water is the limited source that is essential for all human life. The population of US between 1950 and 2000 doubled. However at the same time public demand for water more than tripled. The average US household uses about 50 gallons per person per day. World Health Organization declares good health and cleanliness require a total daily supply of about 8 gallon per person. A recent government survey showed at least 36 states are anticipating local, regional, or statewide water shortages by 2013. This is the reason that water becomes a national priority. LEED v3 is subdivided into six groups for which there are prerequisites, subcategories, and credits in place of possible points. The six categories are: Sustainable Sites (SS), Water Efficiency (WE), Energy and Atmosphere (EA), Material and Resources (MR), Indoor Environmental Quality (EQ) and Innovation in Design Processes (ID). Water efficiency is one of the categories. Buildings are major users of our potable water supply. The goal of the Water Efficiency credit category is to encourage smarter use of water, inside and out. Water reduction is typically achieved through more efficient appliances, fixtures and fittings inside and water-wise landscaping outside. In this paper educate the freshmen student the connection between the water source to how their water use habit can affect the environment and human health. Every drop counts.

Key words: Water Efficiency, Water Reduction, Water Sustainability

Introduction:

Water is a limited resource that is essential to all life. There is a demand for expanding freshwater resources to provide drinking water for increasing population, in the mean time preventing pollution and leaving enough water for natural ecosystem functions. These combined describe the need for sustainable waster resource management. [6] The world's population, currently estimated at 6.7 billion, is growing by about 80 million people each year, which means demand for freshwater is increasing by 64 billion cubic meters a year. Global per capita water supplies by 2001 were one –third lower than they were in 1970 due to population increase and water quality was turning down in many areas. According to UN, eighty percent of all illnesses in development countries are related to water. In addition by 2050 two-third of population or as many as 5 billion people will face shortage of clean freshwater [8]. Water problem may become serious even in the wealthy countries, since some of the toxic organisms such as cryptosporidium are already resistant to chlorine which is the most widespread techniques used to purify drinking water. The average US house hold uses about 50 gallon per day per person which is seven times more than average in the rest of the world.[4] The World Health Organization declares good health and cleanliness require a total daily supply of about 8 gallon per person per day. [2] The goal of this paper is to introduce the water efficiency to the freshmen students.

LEED:

The Leadership in Energy and Environmental Design (LEED) Green Building Rating System, developed by the U.S. Green Building Council (USGBC), provides a set of standards for environmentally sustainable construction. U.S. Green Building Council has had a wide acceptance to data and it becoming more widespread. This system is referred to as LEED. There is several other green rating systems for vertical construction in the Untied States but the LEED system and the alternative Green Globes system are the most well-known. Green Globe Initiative (GBI) is based on the system developed in Europe and later also used in Canada. The reason that LEED was chosen to bring in to the freshman students are that LEED rating system is more widespread in United States in addition there is one system which makes it more restrictive and more difficult but as the same time gives more control and consistency to green building.

LEED was formed to define green building by creating a common standard of measurement, Promote integrated, whole-building design practices, and Recognize environmental leadership in the building industry, Stimulate green competition, Raise consumer awareness of green building benefits and Transform the building market. The LEED 2009 Green Building Rating System for New Construction and Major Renovations is a set of performance standards for certifying the design and construction of commercial or institutional buildings and high-rise residential buildings of all sizes, both public and private. The intent is to promote healthful, durable, affordable, and environmentally sound practices in building design and construction.

Green Building Council members, representing every division of the building industry, developed and continue to improve LEED. The rating system is subdivided to seven categories: Sustainable sites (SS), Water efficiency (WE), Energy and atmosphere (EA), Materials and resources (MR), Indoor environmental quality (EQ), Innovation in design (ID) and Regional Priority (RP). Different LEED versions have varied scoring systems based on a set of required "prerequisites" and a range of "credits" in the six major categories. Based on USGBC LEED 2009 (v3) there are 100 possible points plus an additional 6 points for Innovation in Design and 4 points for Regional Priority. Buildings can qualify for four levels of certification:

- Certified - 40-49 points
- Silver - 50-59 points
- Gold - 60-79 points
- Platinum - 80 points and above

Water Efficiency:

Water efficiency means the reducing usage of water and reducing waste. The key for efficiency is reducing not restricting. Examples of water efficient steps includes fixing leaking taps, taking showers rather than baths, installing displacements devices inside toilet, and using dishwashers and washing machines with full loads. These are things that are part of definition of water efficiency, which to obtain the desired result or level of service with the least necessary water. By using water efficiency we can help preserve water supplies from future generations, save money and protect the environment. From LEED rating system for each category there are possible points that are associated with their numbers of prerequisites and subcategories. For Sustainable Sites (SE) 26 Possible Points, Water Efficiency (WE) 10 points possible, EA 35 points, MR 14 points, EQ 15 points and ID 6 points possible. Water Efficiency possible points are including prerequisite 1, Water Use Reduction, and Credits 1, 2 and 3 are Water Use

Reduction, Innovative Wastewater Technologies and Water Use Reduction. LEED v3 doubled the point of Water Efficiency credits from 5 to 10 points of LEED v2.2.

The Water Efficiency (WE) portion deals with issues that reduce the use of potable water at the site and discharge of wastewater from the site. This will help limit the amounts of freshwater drawn from our water bodies and treated for distribution and use which damage our freshwater resources. Another purpose is to reduce the wastewater volumes discharged to these receiving bodies. The objective of water use reduction is maximizing waster efficiency within buildings to reduce the burden on municipal water supply and wastewater systems. Based on prerequisite 1 Water Use Reduction, 20% Reduction is required. Credit 1.1 Water Efficient Landscaping, Reduce by 50% ,Credit 1.2 Water Efficient Landscaping, No Potable Use or No Irrigation, Credit 2 Innovative Wastewater Technologies Credit 3 .1 Water Use Reduction, 30% ,Credit 3 .2 Water Use Reduction, 35% and Credit 3 .3 Water Use Reduction, 40% at least Credit 4 Process Water Use Reduction, 20% .There are two requirements to achieve this goal, the first one is to use 20% less water than the water use baseline calculated for the building which is not included irrigation and the other one is utilize strategies to use 30% less water than the water use baseline calculated for the building which is not included irrigation. The definition of these prerequisites are as follows: Potable Water is meets or exceeds EPA's drinking water quality standards, Process Water is used industrial processes and building systems such as cooling towers, boilers, and chillers. Blackwater is wastewater from toilets and urinals. Some state and local codes consider wastewater from kitchen sinks, showers, and bathtubs as blackwater. Composting Toilet Systems is dry plumbing fixtures and fittings that contain and treat waste via microbiological processes and Dry Urinal replaces water flush with a trap containing a layer of buoyant liquid that floats above urine blocking sewer gas and odors. In general we can obtain this aim by using high efficiency fixtures, dry fixture such as composting toilet systems and non water using urinals, and occupant sensors to reduce the potable water demand.

The average US household uses about 50 gallons per person per day a rate more than seven times the per capita average in the rest of the world [3] yet the World Health Organization declares good health and cleanliness require a total daily supply of about 8 gallon per person per day[2]. Two third of residential interior water is used for toilet flushing (4gal/flush) and bathing (15-50 gal/ shower or bath) while a dishwasher uses 8-12 gallon and a top loading clothes washer 4055 gallon[4] Consider reuse stormwater and greywater for non-potable applications such a toilets and urinal flushing as custodial uses.

Conclusion:

Water is a finite resource. More than one-sixth of the world's population doesn't have access to safe water supplies. [5] The world's total water supply of about 332.6 million cubic miles of water, over 96 percent is saline. Over 69 percent of the total freshwater is locked up in ice and glaciers. Another 30 percent of freshwater is in the ground. Fresh surface-water sources, such as rivers and lakes, only constitute about 22,300 cubic miles (93,100 cubic kilometers), which is about 0.0067 percent of total water. In total less than three-tenth of 1% of Earth's freshwater is in the lakes and rivers that have served as the major sources of water through most of human history. [1] While both population and demand on freshwater resources are increasing, supply remains constant. Water efficiency helps preserve our water supply for future generations. By introducing Water Efficiency (WE) to the freshman students of Technology College we are opening the way to more sustainable water. Since Building consumes 20 percent of the world's available water, Water Efficiency has a major role in this area. [9] Efficient practices and

products such as grey water treatment and low flow plumbing fixtures provide significant opportunities. The study shows that brand awareness is strongest for high-efficiency toilets (identified by 48 percent of respondents), water-saving sinks (30 percent), and waterless urinals (23 percent). If one of every 10 homes in the United States upgraded to water-efficient plumbing fixtures and appliances, nationwide we could save more than 300 billion gallons of water and nearly $2 billion annually. Additionally If 1 percent of American homes replaced older toilets with WaterSense labeled models, we would save enough electricity to power more than 40,000 homes for a month. [7]

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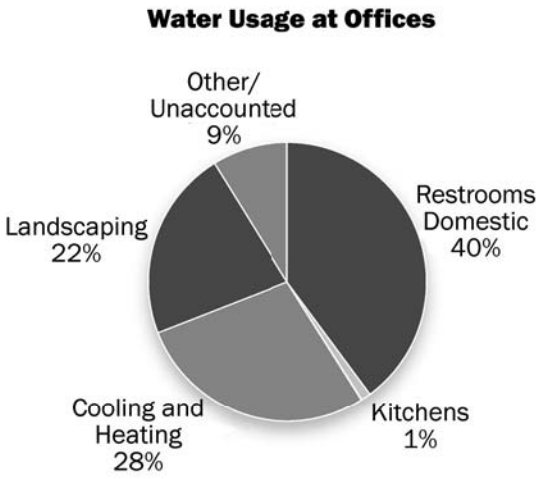

Figure 1

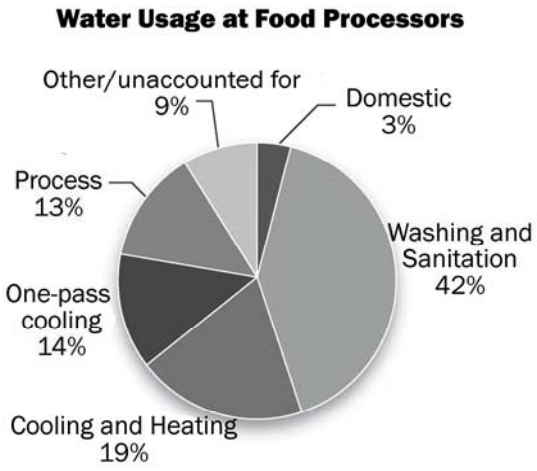

Figure 2

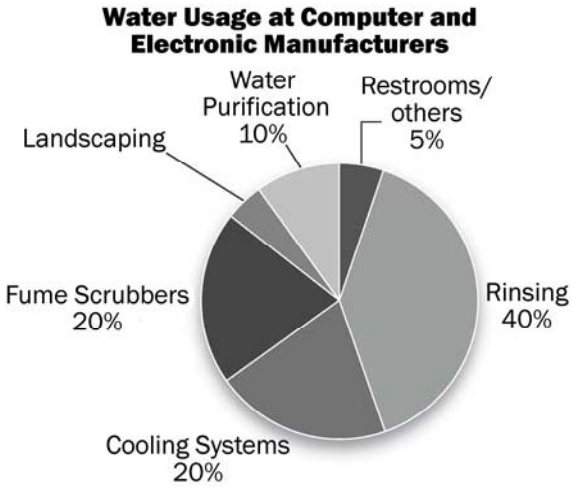

Figure 3

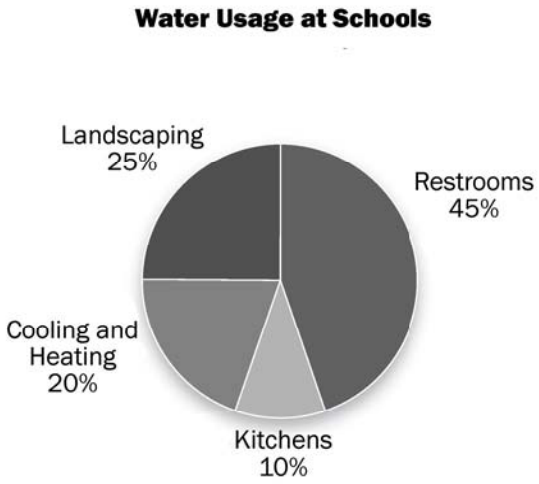

Figure 4

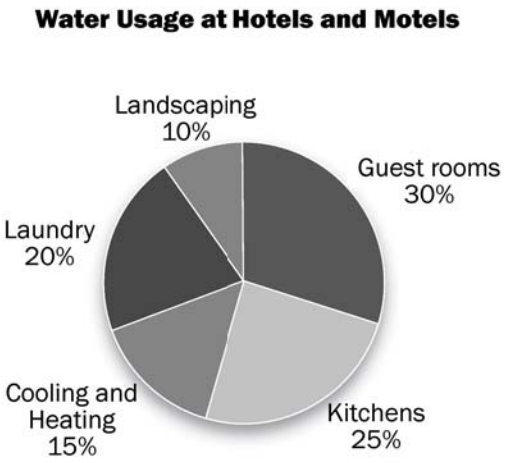

Figure 5

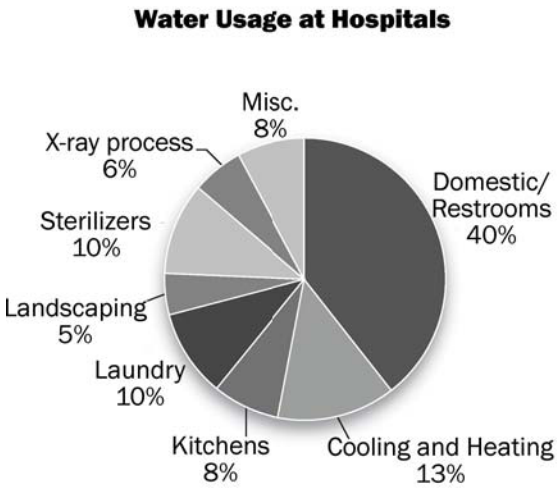

Figure 6

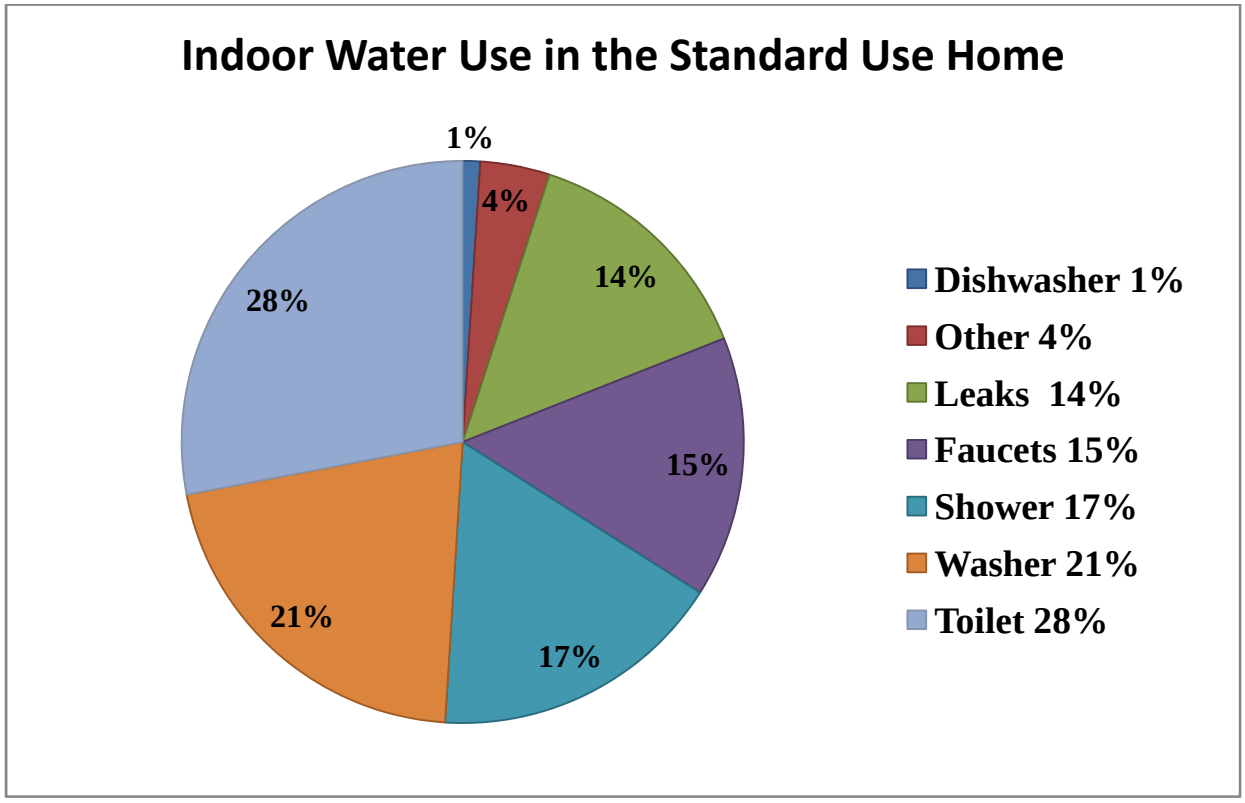

Figure 7 (www.nyc.dep.gov)

	Standard (Gallon)	Efficient (Gallon)
Toilets	20.1	5.12
Washer	15.1	10.6 or less
Shower	12.6	5-10
Faucets	11.1	7-10.8
Dishwasher	1	0.5-1
Leaks and Others	12.7	<7.7
TOTAL	**72.5**	**36-42**

Table 1. Usage of Standard Home VS. Efficient Home (www.nyc.dep.gov)