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# ORIGINAL ARTICLE

## Urban Water Management Design Forvertical And Horizontal Landscape

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Soleyman Kohi: Urban Water Management Design Forvertical And Horizontal Landscape

**ABSTRACT**

This article focuses on design the water management systemsector fromsustainable perspective. The purpose is to determine the water consumption for urban landscape and reduce their water consumption.Mostly due to high population growth, Water is a vital resource for urban green space so necessary to design the irrigation system expansion of urban green spaces is urgency.Water efficiency and adversely impact food production, Irrigation has helped boost urban agricultural yields and stabilized food production and prices. so design the water management system is significant for this purpose, This system considers a section for injecting liquid fertilizers to the water. Main line is divided to three sections, one goes to the roof and two others will feed the green façades. The plants will be irrigated by drip irrigation system. Each one of three water lines is connected to solenoid valve that is controlled by wireless sensor switch and get functions from control system. The results indicate a lack of water management in the urban green space sector. The article proposes the application of design methods to improve water management for urban landscape and, in general, within any system where the irrigation sector is the main activity.

***Key word:*** *water management, urbanlandscape, vertical, horizontal,*

### Introduction

Human systems require a large value of material resources for their action (Rueda, S., *et al.,* 1998. Due to the climate change, the importance of green space is more obvious in the urban area. Green roof and green facade are thebest solution for theurban area environmental pollutions including air pollution, noise pollution and etc.

Green roofs or vegetated roof covers (also referred to as living roofs, nature roofs and eco-roofs) are a thin layer of living plants growing on top of a roof. A green roof is not a collection of potted plants to decorate a roof space but rather an extension of a conventional roof which involves instillation of a layered system of membranes, substrate and plants (http://www.lakesuperiorstreams.org/stormwater/toolkit/greenroofs.html). Green façades differ from green walls in that their vegetative layer is rooted in the ground and grows up. The plants use a vertical surface, such as a wall, for structural support but do not receive any moisture or nutrients from it. (http://www.greenovergrey.com/living-walls/our-green-wall-system-vs-modular-boxes.php) The value of green spaces to people living and working in towns and cities has increasingly been recognized by Government. The work of the Urban Green Spaces Taskforce (Green Spaces, Better Places, 2002) demonstrated the various benefits that green space provide, such as ecological function, visually softening the built environment, supporting biodiversity, aiding people's mental and physical health, and providing a communal focus and sense of place. (http://www.efb-greenroof.eu/verband/fachbei/fa01_englisch.html) Water is a vital resource for urban green areas so necessary to design the irrigation system expansion of urban green spaces is urgency.Because water is critical and intimately linked with socio-economic development, it is necessary to move away from sectoral development and management of water resources and to adopt an integrated approach to water management (http://unstats.un.org/unsd/envaccounting/seeaw.asp).

*Climate And Water Resource:*

the climate is described by uniform temperature, high humidity and copious rainfall mostly due to maritime influence (Ir. A.J. Shaban et al. 2011) The United Nations Framework Convention on Climate Change (United Nations, 1992) defines climate change as, “a change of climate which is attributed straight or indirectly to human activity that alters the composition of the globe atmosphere and which is in addition to natural climate variability observed over similar time periods”

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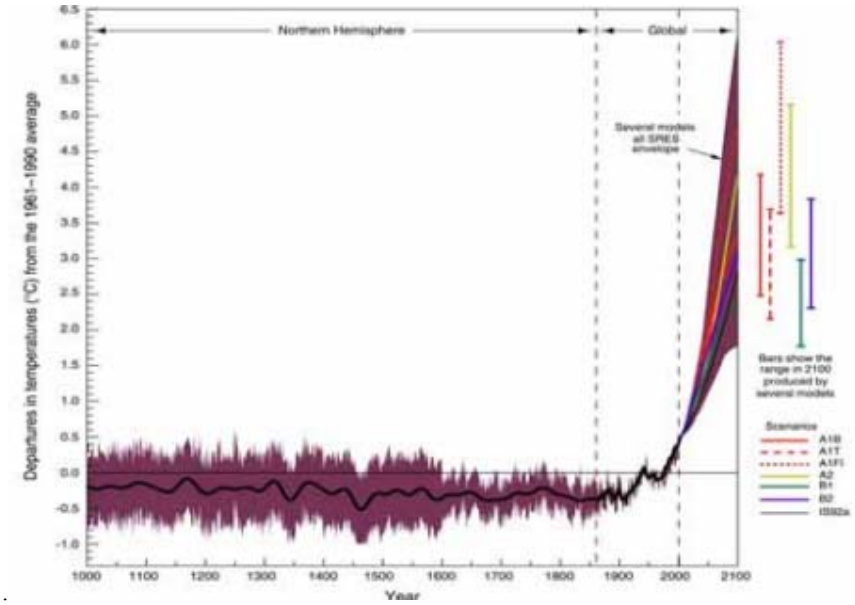


**Fig. 1:** measures temperature variation over the last 1,000 years, source:wateraid.org

The impact of climate change on temperature and water,rising global temperatures will lead to an intensification of the hydrological cycle, resulting in dryer arid seasons and wetter rainy seasons, and then heightened risks of more extreme and frequent floods and drought. Shifting climate will also have important impacts on the availability of water, as well as the quality and quantity of water that is available and accessible. Melting glaciers will increase flood risk during the rainy season, and strongly reduce dry-season water supplies to one-sixth of the World's population (ERM, 2007).

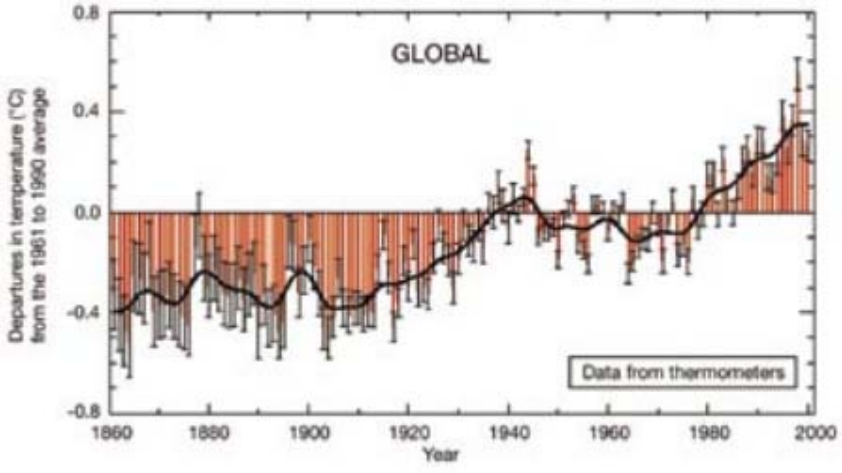


**Fig. 2:** Varian's of the earth surface for the past 140 years( 1860to 2000).Source: IPCC WGI 2001,p.25.

Air temperature is anticipated to have the following water-related effects
- Rises in water temperature
- Changes in the location, timing, form and quantity of precipitation
- Growths in tropical storm intensity
- Increasing sea levels
- Changes in oceans and seaside regions—chemical and physical

Increase water shortages due to changes in precipitation patterns and power,increase water demand for agriculture, primarily for irrigation.Several research estimates an over 40 percent increase in land demanding

irrigation by 2080. (Gunther Fischer *et al*., 2007) Bad water management, lacking investments in structure or maintenance, and changes in the organization of water management can cause disruptions in water availability or access which, in turn, can lead to conflicts, specifically if inadequate service is combined with rising water prices (Balanyá, B., B. Brennan, O. Hoedeman, *et al*., 2005).

*Method:*

Gathered information about these projects from published literature, websites, and visited each project. Documented the designs with journal notes, drawings, and sketches, did not collect construction documents or measured drawings, the collected data were organized, reviewed, and analyzed to determine detailedwater management system designs. Initial classification was guided by this question: What aspects of water management design increase a project's attractiveness?

Project goals:
1. Ease: location, simplicity, or calm
2. Safety: freedom from disclosure to hazard or risk
3. Visual richness: beauty or enjoyment as a result of design work

*Water management:*

Although applying fertilizer is not necessary in every day and it is applied on regular monthly or yearly basis, this system considers a section for injecting liquid fertilizers to the water. Main line is divided to three sections, one goes to the roof and two others will feed the green façades. The plants will be irrigated by drip irrigation system. Each of water lineis connected to solenoid valve that is controlled by wireless sensor switch and get functions from control system.

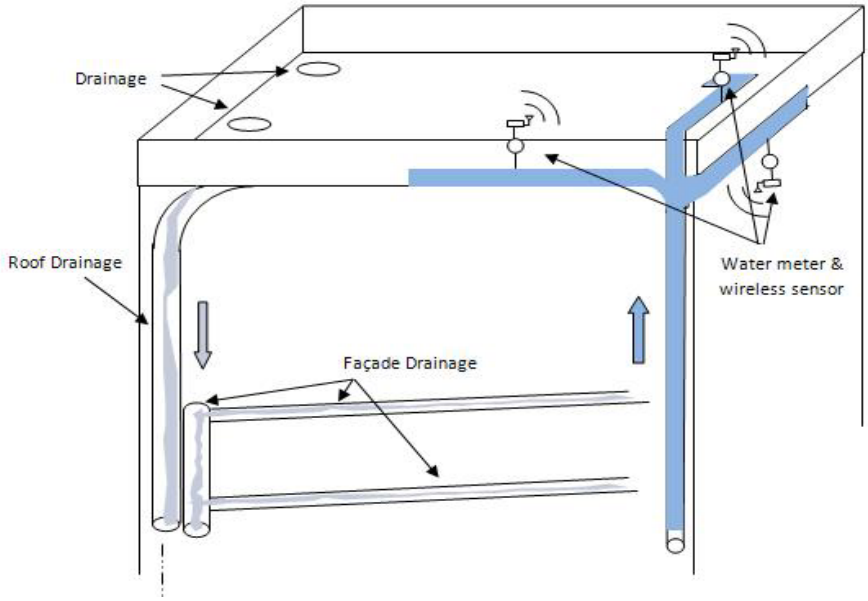


**Fig. 3:** Schematic of Pipes

Figure.3 shows the 3D view of the building; the excess water is coming down through the drainage pipe of roof and façade. In the other side filtered water is pumping for irrigation process.

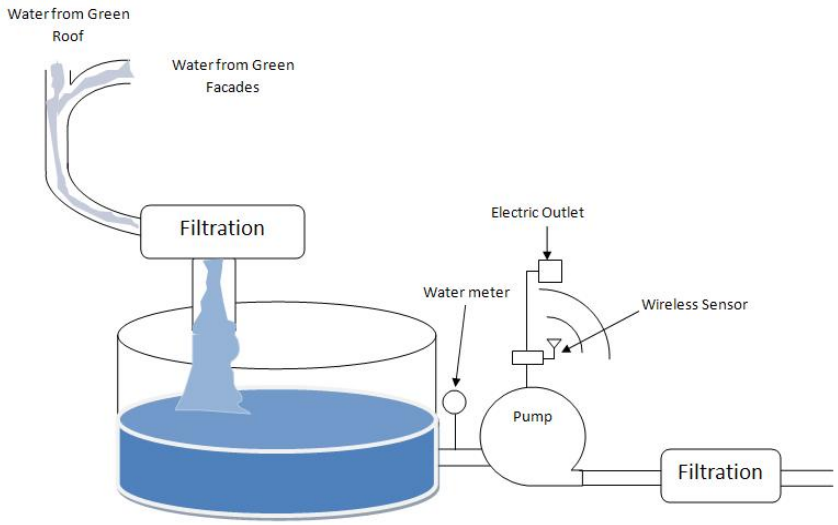


**Fig. 4:** Filtering, Storage and Pumping Process

Figure.4 shows the entire storage and pumping mechanisms including first step filtration, storage in the tank and pump. The pump is connected to the electrical outlet because usually pumps need more power and batteries cannot supply required power.

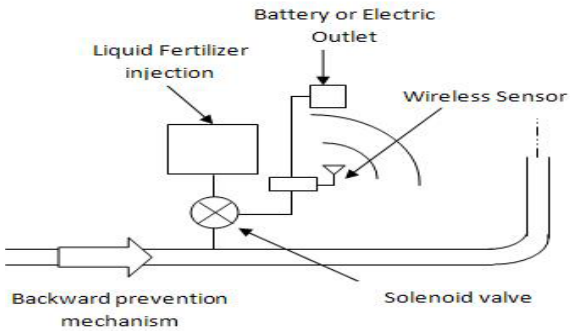


**Fig. 5:** Liquid Fertilizer Injection Process

In figure 5 shows the liquid fertilizer injection system and water are moved upward to reach top of the building. Backward prevention is necessary for the system since the dirty materials can affect the filtration equipments and water. Contaminated water can harm the plants and destroy the green roof and green façade.

Top view of the green roof structure with drip irrigation system is plotted in figure 4.

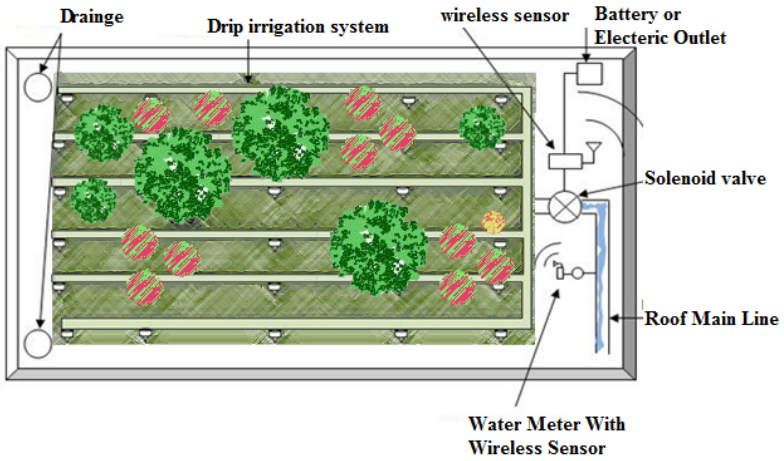


**Fig. 6:** Top View of Green Roof

For efficiency and managing of water resources drip irrigation system is chosen to irrigate the plants. Drip irrigation systems usually work under lower water pressure and this can reduces the numbers of switching pump on and off ad totally reduce cost of energy.

Cross section view of the building and one side of green façade are shown in figures 5 and 6 respectively.

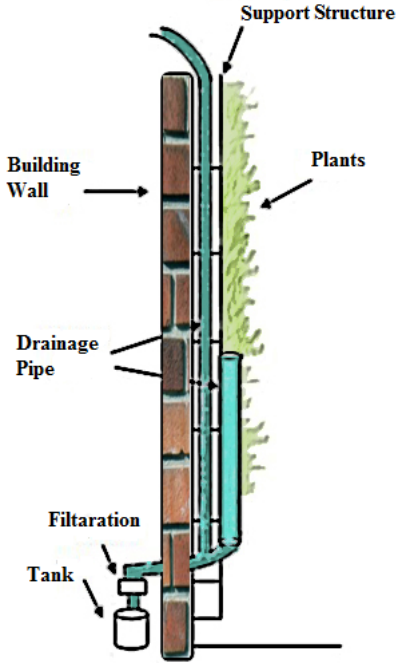


**Fig. 7:** Cross section view of Green Façade

As it is shown in figures.7 the roof drainage pipe is behind the support structure and green facade drainage pipes are in front of façade but after collecting water these two pipes contact with each other behind the structure. They will fall to the filtration equipments in the building.

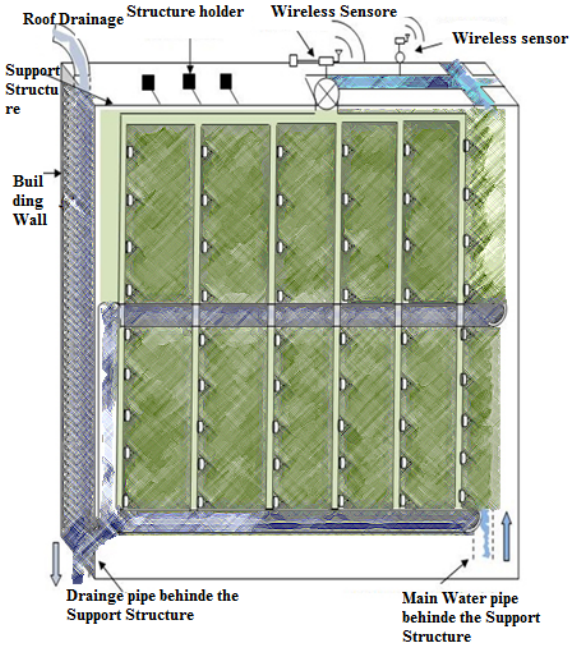


**Fig. 8:** Green façade

As it is shown in

As it is shown in figure.8 the main water line is behind the support structure. Water meter shows the pressure of water and report it to control system. If the pressure is under the threshold level control system send command to the pump and turn it to fill the lines with water.

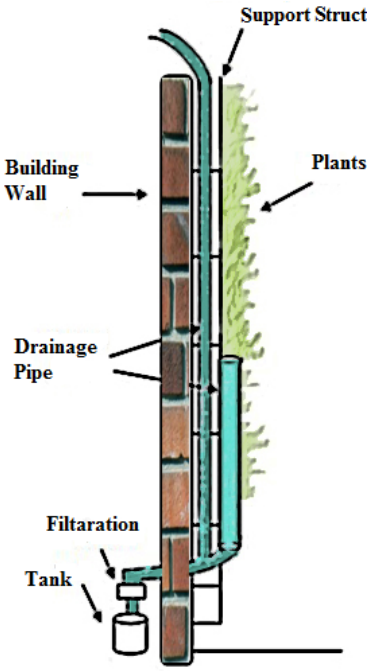


**Fig. 9:** Cross section view of Green Façade

As it is shown in figures 9, the roof drainage pipe is behind the support structure and green facade drainage pipes are in front of façade but after collecting water these two pipes contact with each other behind the structure. They will fall to the filtration equipments in the building.

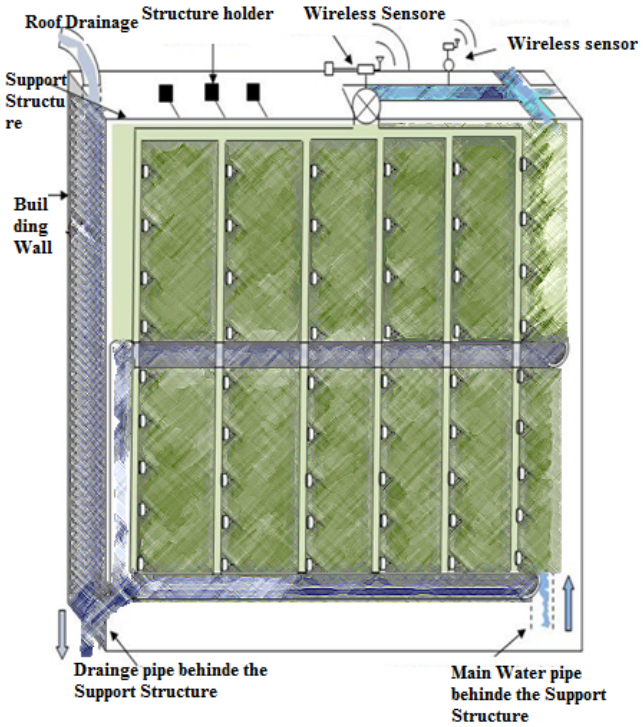


**Fig. 10:** Green façade

As it is shown in figure 10,the main water line is behind the support structure. Water meter shows the pressure of water and report it to control system. If the pressure is under the threshold level control system send command to the pump and turn it to fill the lines with water.

*Discussion:*

The benefits of this project have been wide ranging and this can be seen in varioussections. For efficiency and managing of water resources this system is chosen, the environment impacts havealso decrease.Physical contact with green roof and façade have chance of breathing easily and enjoy the clean air, mental benefits, such as stress reduction they can cause heart rate and blood pressure reduction.

*Conclusion:*

Climate change is previously giving impact on water supplies and it will be worsen in the future Implementingof the ideas introduced in this document can bring us closer to a truly sustainable way of living.Human activities have a negative effect and damaging on the environment and destroying biodiversity. As the urban habitats are often too disturbing and degraded, the Green roofs and Green facades might be the two important and critical solutions for increasing biodiversity, birds and microorganisms, butterflies, honey bees and other advantageous insects which can improve urban environment.Today more than ever, it is imperative that we begin to be conscious about our water use. Water tables around the world are being drained at an ever increasing rate and water shortages are heightening with global warming.The target of urban water management design is to guarantee the balance of water supply and water demand in quality and quantity.

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