The Urban Gazette

Transforming cities in Punjab

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RAIN WATER MANAGEMENT IN URBAN AREAS

A SUSTAINABLE APPROACH

Green infrastructure is a new technique to manage rainwater in urban areas. It is cheap, sustainable and natural technique. By the implementation of this technique we can save a large sum of money that is used to build rainwater drainage system.

Green Infrastructure

Green infrastructure as a component of comprehensive rain water management plan aimed at reducing rain water runoff. Green infrastructure can be applied in many forms. In practice, installing green infrastructure means preserving, creating, or restoring vegetated areas and natural corridors such as greenways, parks. When linked together through an urban environment, these lands provide rainwater management benefits similar to natural undeveloped systems, thereby reducing the volume of rain water.

Green Infrastructure to absorb Rainwater that comes from road after rain (Source www.rainwatercollecting.com)

Green infrastructure can be used to restore vegetation and green space in highly paved city areas. Planting street trees and other urban forestry initiatives can reduce rainwater because urban trees canopies intercept rainfall before it hits the pavement and is converted to rainwater. Trees can absorb the first half-inch of rainfall.

Trees in a street to absorb rainwater
(Source: www.nrdc.org)

Green management techniques are used to minimize, capture, rainwater at the location at which it is created and before it has the opportunity to reach the collection system. Most green rainwater management techniques actually consist of green growth, including vegetated systems like rain gardens.

Rainwater collects & absorb into ground;
(source : www.sbprojeccleanwater.org)

Green infrastructure offers numerous benefits when used to manage rainwater. Many green techniques reduce rain water volume. The use of green infrastructure protects natural resources and lessens the environmental impacts of development by not only reducing rain water, but also by improving air quality and community beauty. This reduces the amount of rain water discharged from rainwater sewer systems by decreasing the overall volume of water entering the system, thus reducing the number and size of overflows. Another large benefit of green infrastructure is that nearly every green technique results in the removal of rainwater pollutants. The natural processes employed by green infrastructure allow pollutants to be filtered or biologically or chemically degraded, which is especially advantageous for separate rainwater sewer systems that do not provide additional treatment before discharging rainwater. The combination of runoff reduction and pollutant removal is an effective means of reducing the total mass of pollution released to the environment.

Extra Benefits

Green infrastructure is also attractive because it can be used to achieve multiple environmental goals. Funds spent on conventional rainwater management are used only for water infrastructure. In addition to rainwater management benefits, green infrastructure improves air quality by filtering air pollution and helps to minimize urban heat effect by lowering surface temperature. Green infrastructure also improves urban beauty, increase property values, and provides recreational space for urban residents.

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Rainwater

Rain is the ultimate source of fresh water. With the ground area around houses and buildings being cemented, particularly in cities and towns, rainwater, which runs off from terraces and roofs, is draining into low-lying areas and not absorbing into the soil. Thereby, precious rainwater is wasted, as it is drained into the sea eventually. Rain water management is a system by which, the rainwater that collects on the roofs and the area around the buildings is directed into the ground to improve ground water storage.

Rainwater Management Methods

The most suitable methods to manage rainwater in urban areas are rain garden and soil storage and seepage system. These methods are natural and inexpensive.

Rain Gardens

A rain garden is an artificial depression in the land that collects and stores rainwater until it absorbs into the soil. The soil stores the water for use by vegetation. The water may also move

Rain Gardens (a) *(source www.dblrealty.com)*

through the soil, recharging groundwater. Rain gardens are not ponds. When correctly designed, water should not stand for more than a few hours even after fast rain. They are usually planted with native vegetation that is hardy and attractive.

Rain Gardens (b) *(source www.dblrealty.com)*

Soil Storage and Seepage Systems

As rain occurs "soil storage and seepage system" collects rain water from the roofs of buildings. It then goes into the soil.

A soil storage and rainwater seepage system
(Source: www.rainwatercollecting .com)

A New Approach to Manage Rainwater in Urban Areas

Low Impact Development (LID) is simple and effective method. Instead of large investments in complex and costly engineering structures for rainwater management, LID strategies integrate green space, native landscaping, natural water functions, and various other techniques to generate less rainwater runoff from developed land. LID is different from conventional engineering. While most engineering plans pipe water to low spots as quickly as possible, LID uses micro-scale techniques to manage rainwater as close to where it hits the ground as possible. LID is economical. It costs less than conventional rainwater management systems to install and maintain, in part, because of fewer pipe and below-ground infrastructure requirements. But the benefits do not stop here. The associated vegetation also offers human "quality of life".

Cost effective cheap natural drainage system *(source www.swiftpage2.com)*

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Rainwater Management Program

The cost of rainwater control is a major factor in the successful implementation of rainwater management programs. Usually rainwater drains are constructed in urban areas to control rainwater. For this purpose large investment is required. While natural rainwater system is cheap, cost effective and sustainable. For example, researchers at the University of California at Davis have estimated that for every 1,000 deciduous trees in California's Central Valley, rainwater is reduced nearly 1 million gallons—a value of almost $7,000 (Rs.588000).

Benefits of Rainwater Management

The rainwater management in urban areas provides several beneficial functions:

- Flood control - by greatly reducing urban rainwater which chokes storm water drains.
- Rainwater drainage - by reducing the size and scale of infrastructure requirements.
- The ground water level will rise as rainwater is absorbed into ground.
- Saving of energy per well for lifting of ground water – one meter of rise in water level saves about 0.40 KWH of electricity.
- Flooding of roads is reduced.
- Quality of water improves.
- Soil erosion will be reduced.
- Best solution to remove arsenic from aquifers by dilution. As rainwater absorbs into the ground, it adds into groundwater.

The overall quantity of groundwater will increase and arsenic will decrease.

A Strategy for Rainwater Management

Awareness

There is a need to educate the local governments, agencies, authorities, public representatives and planners regarding this concept and approach towards sustainable rainwater management.

A Systematic Approach

Rainwater utilization, together with green infrastructure, should be incorporated into municipal laws, rules & Bye laws. Some standardization of materials, at least at regional level, may be desirable from a maintenance and replacement point of view.

Implementation Policy

Various implementation policies should be established to make rainwater utilization and other measures a part of the social system. Leadership is very important and local governments must take the initiative to promote the concept of green infrastructure to control rainwater in urban areas.

Technology Development & Training

Encouraging technology and human resources development to support green infrastructure techniques is very important. It is also important to promote the development of efficient and affordable devices to conserve water, facilities to use rainwater and devices to enhance the underground seepage of rainwater. Together with this, there is a need to train specialists of these technologies and devices.

Networking

To promote green infrastructure techniques as an environmentally sound approach for sustainable urban water management, a network should be established involving government officials, citizens, architects, planners, plumbers and public representatives.

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Guest Editorial

CLEAN GROUNDWATER UNDERPINS THE DEVELOPING WORLD

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It is often said that water is life. However, as the global extent of groundwater contamination becomes clear, it may be more apt to say clean water is life. This message is stark, both in the positive and the negative, and nowhere more so than in developing nations where the majority of humanity lives. In such nations, the burgeoning population, especially in urban centers, relies upon fluctuating water resources with potable quality ranging from good to calamitous. As rivers and lakes are polluted or overutilized, groundwater reservoirs come under increasing pressure from abstraction and contamination. In developing nations, the need is clear for groundwater expertise to support public water supply.

Some examples are pertinent. In developing nations in Africa, Asia, and the Pacific, central supplies are intermittent, if available at all, and are often supplemented by unregulated markets of private bore (well) operators and water carriers who supply untreated water. The lack of regulation often leads to over abstraction and to poor wellhead protection practices, so that wells become contaminated and resources are used beyond sustainable limits. Water scarcity in Central Africa has recently prompted rationing or cessation of central water supply and private bore owners are being asked to supply neighbors where possible. The 2008 cholera outbreak in Zimbabwe shows how rapidly poor water management situations can worsen. In Asia, where urban centers commonly rely on both surface water and groundwater resources for watersupplies, surface water is heavily contaminated by discharge of raw sewage and groundwater levels are dropping due to overabstraction. In the face of this, domestic production and storage of water is almost mandatory because of inadequate service from central water utilities.

Of course, in many cases of groundwater pollution, cause and effect is relatively well understood and it is tempting to leap to solutions well proven in developed nations where legislative, regulatory, and societal structures are relatively stable and where the relevant scientific, engineering, and technical expertise is available. Access to capital in developed nations also tends to bias technical interventions and strategies in directions impractical for other nations. Imposing external technical solutions on communities has contributed to the demise of many well-intentioned international infrastructure initiatives in developing nations.

Ready access to technical expertise alone is no guarantee of success. There is ample evidence that governmental and societal factors are important to the acceptance and execution of technical strategies. Governmental structures can have blurred jurisdictional boundaries and overlapping responsibilities, making monitoring and regulation of water supply inefficient. Legal infrastructure may also be insufficient, resulting in water allocation, water rights rulings, and water infringement prosecutions being delayed, sometimes indefinitely. Societal instability may hamper investment programs and can lead to serious staff turnover in water agencies and utilities, with consequent loss of corporate memory, resources, and momentum. Finally, capital is often scarce, so many otherwise routine methods for improving groundwater and potable supply quality may be out of reach for some communities. In this kind of environment, development of optimal technical strategies must take social, governmental, and economic factors into account so that local needs and priorities are respected.

Situational complexity in itself may be important. For example, declining water tables in Chennai, India are likely to be ***most efficiently addressed not by regulating abstractions from the few centrally operated bores or by pricing interventions, but rather by encouraging domiciles to harvest rain water and recharge to groundwater, bypassing the sewerage stream.*** Experience from around the world shows that the efficient management of water resources in times of stress demands multiobjective approaches involving surface water, groundwater, and climatic and social drivers acting through both public water utilities and often in compatible private markets. Stakeholder involvement is crucial.

This century will see unprecedented growth in global urban population and water demand, but are our current groundwater skills up to the challenge? Centralized water management paradigms that work so well in developed nations may not be useful when addressing the complex water problems of the developing world. It is likely that the next generation of groundwater specialists will have to balance technical expertise with a new understanding of social and governmental context in order to maintain and improve the quality of life in our developing world. This is a great opportunity both to do new science and to save lives.

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