International Rainwater Harvesting Alliance
Alianza Internacional para la Gestión del Agua de Lluvia *(IRHA)*
Alliance Internationale pour la Gestion de l'Eau de Pluie *(IRHA)*

bRAINstorming

NEWSLETTER N° 36 – FEBRUARY 2011

Our newsletter focuses on all activities concerning rainwater harvesting, the International Rainwater Harvesting Alliance (IRHA) and its partners.

Topic of this issue: Urban Rainwater Harvesting

Editorial

Dear Rainwater Harvesters, Readers, IRHA Members and Friends,

One of the biggest problems in today's cities is the rapid growth of urban populations in developing countries. The world's urban population increased from around 200 million (15% of world population) in 1900 to 2.9 billion (50%) in 2000 (König, 2009). It is estimated that by 2030, nearly 5 billion people will be living in urban areas, with 75% of them located in Asia, Africa and Latin America (Gould, 1999).

Urban development is already straining water resources and they are struggling to keep up with this rising demand. As a result, existing water sources are over-exploited and often polluted, and as the populations increase, this will only intensify.

Added to this are the effects of climate change on cities; an increase in rainfall, often over a short period of time, causing floods or a reduction causing droughts.

This newsletter will look how rainwater harvesting can be used within cities to help face the duel problem of rapid population increase and climate change.

Hannah Price 

How can urban rainwater harvesting help?

Water supply

Though rainwater harvesting is predominantly seen in a rural context, millions of urban residents in the cities of developing nations still have no access to a safe and sustainable water supply. Whether through lack of infrastructure due to rapid population growth or the lowering of the water table by over-extraction, water shortages in the world's cities is a major problem.

Rainwater harvesting can play an important role in supplying urban dwellers with water. The impermeable roof surfaces that are widespread within a city, lend themselves perfectly to the collection of rainwater. By harvesting and storing the rain that falls on their roof, residents can reduce their reliance on the often unreliable centralised water system. The rainwater can be used either for drinking once treated, or for cleaning and flushing toilets.

Potential water availability from rainwater harvesting in India
The potential of rooftop RWH for a 250m^2 plot, with average annual rainfall of 1000mm (with 50% of plot area roof) would be 125,000 litres. Assuming that only 60% of this potential could be stored, the quantity of water available in a year would be 75,000 litres. This equals 250 litres of water per plot a day. For a family of 5, the availability of water would 50 litres for a person in a day (UN-HABITAT, 2006).

Aquifer recharge

Rainwater can also be used indirectly to increase the water supply to the city. By letting rainwater drain into the ground, rather than down storm drains, the level of groundwater can be raised. The urban environment provides numerous surfaces from which rainwater can be collected; roads, runways, public buildings and factories, to name just a few.

Aquifer recharge is a more holistic use of rainwater, compared to the individual use of rooftop harvesting. This perhaps is more beneficial to poorer residents who don't have the money or adequate roof space to install their own rainwater harvesting system. However, it requires the coordination and cooperation of city officials, planners, etc. and there is still the inherent risk of those who are not connected to centralised water systems not receiving the benefits.

Prevent flooding

If rainwater is caught where it falls, then either stored in tanks or directed directly into the aquifer, it should lower the quantity that enters stormwater drains. This will also provide a clean and safe drinking supply after the flooding, especially if the flood waters take time to recede or have polluted the main water supplies.

Other

There are other advantages of rainwater harvesting in cities, including firefighting and disaster relief, reduced subsidence and financial savings.

A common problem in cities after earthquakes is the outbreak of fires. Putting them out is often hampered as pipes from the mains water system crack or break, causing water shortages. If households have their own rainwater tanks, there is more water available to tackle the fires. They can also supply a source of water in the aftermath of a disaster while centralised systems are repaired.

The over-extraction of groundwater can often cause subsidence, which can have significant effects on buildings. By reducing the amount of groundwater extracted or through the recharging of the aquifer, subsidence should be countered.

Climate Change and the Urban Environment

Drought

Many large cities throughout the world already suffer from periodic water shortages, forcing their residents to ration water and buy it at considerable expense from vendors.

Water Delivery in Mexico City
Source: National Geographic (2010a)

The onset of climate change is likely to enhance this situation; increased evaporation of reservoirs and a reduction in river flows will decrease the surface water supplies available to the city.

Flooding

Climate change may also bring higher levels and intensities of rainfall to cities, increasing the likelihood of floods.

Flooded Street in Bangladesh
Source: National Geographic (2010b)

Urban drainage systems can be easily overwhelmed by large quantities of rainwater which reach the drains quickly due to the impervious nature of the urban environment.

What must be considered?

The quality of rainwater varies for several reasons, and this quality must be taken into account when deciding how to use the collected water. It was once believed that rainwater could be consumed without any treatment; though this may be true in some areas, rainwater collected in many locations contains impurities. Measures must be taken to reduce the contamination of rainwater in the first instance and then treatment used to remove any further impurities.

Air pollution

Though in theory rainwater is safer than surface water, as it has not come into contact with as many pollutants, it can become contaminated through air pollution. The physical-chemical make up of collected rainwater is usually in line with the World Health Organisation (WHO) guidelines for drinking water. However, industrial emissions such as sulphur dioxide and nitrous oxide can lower the pH of rainwater, making it unsuitable for drinking. In the last three decades, this 'acid rain' has affected the quality of rainwater in urban areas, making its pre-treatment a necessity (GDRC, 2010). It is therefore important that air quality standards are reviewed and enforced. However, these considerations do not mean that collected rainwater cannot be used for non-drinking purposes, which represent the biggest part of the needs of water.

Collection surface

The biggest problem facing the quality of rainwater is when it reaches the collection surface, such as a roof. Here there are several ways the water quality can be impaired.

The choice of roofing material is very important; painting or coating of roofs should be avoided, if a roof is painted then the paint should not be lead, chromium or zinc-based, as these are toxic if consumed. Similarly, asbestos roofs should not be used as water catchments. The materials commonly used for roof catchments are corrugated aluminium and galvanized iron, concrete, fibreglass shingles, tiles and slates.

Samples of rainwater sometimes exceed WHO levels of total coliform and faecal coliform, a result of bird and rodent droppings on the catchment area contaminating the water. A collection surface should not be located under over-hanging trees for this reason. As it is impossible to prevent some animals defecating on the roof, the surface should be cleaned regularly and a first flush system installed. This means the water from the first rainfall of the season, which picks up most of the dirt and droppings on the surface area, is directed away from the storage tank (GDRC, 2010).

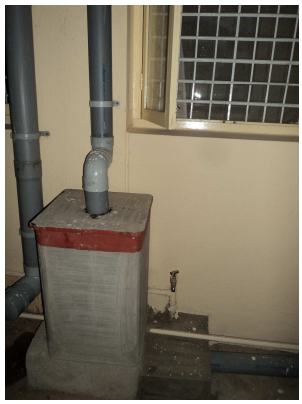
Water treatment

Once the water has been collected, it must be treated before consumption. This can be done is several ways depending on costs and access to technology. The cheapest and easiest option is to boil the water before use. Household filters also are very effective and some simply designed filters are particularly suitable for poorer residents who cannot afford the more expensive methods. Other methods include chlorine, usually in the form of household bleach (in very small quantities) and UV disinfection systems (more energy consuming), though these are often prohibitively expensive. Research is being done into the use of photo-oxidation based on available sunlight to remove coliform and streptococci bacteria (GDRC, 2010).

Learn More:
Rainwater quality is currently featured on the **Topic of Today** section of our website. Dr Dennis Lye provided us with a paper concerning rooftop runoff as a source of contamination, which can be found here.

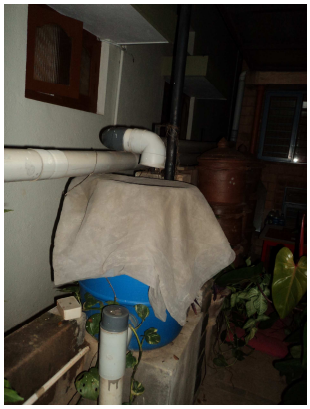
Examples of Urban Rainwater Harvesting in India

In October 2010, our Executive Director, Ms Vessela Monta, visited India and saw several examples of urban rainwater harvesting. The following pictures show the different tanks used for domestic water supply.


Above ground rainwater tank


The rain flows down the chains into an underground tank


Trapdoor to underground storage tank


You can clearly see the material used to filter the rainwater

Examples from around the world

Germany is one of the leading countries returning to rainwater harvesting and has developed new and more sophisticated systems and techniques. There is renewed interest in the promotion of household rainwater harvesting, especially at the local government level, with grants, subsidies and incentives available.

In **Japan** there is growing interest in the use of household rainwater harvesting to provide water for fire fighting purposes, particularly in the wake of earthquakes when mains water supplies may not be available. In Tokyo there have been serious investigations into the use of rainwater harvesting in water supply, flood prevention and disaster mitigation strategies.

Read more

In the last few years, **France** has been introducing laws to encourage rainwater harvesting in the practices of French citizens and companies. Already a law voted in 2009 defined the incentives for construction of systems collecting rainwater. For reducing the risk of urban floods, a project for a new decree is prepared, aiming to incite land owners to lessen the quantity of run-off water conducted to public networks by reducing their taxes.

Read more

IRHA Activities and News

Raindrops Geneva Award 2011

Best Photographs on the Advantages of the use of Rainwater Harvesting

We are still looking for photographs that show the practical uses and benefits of rainwater harvesting for our Raindrops Geneva Award 2011, in collaboration with Photojournale and their "Rainwater/Eau de pluie/Agua de Lluvia project".

The date for the final submission of photographs is the 30th April 2011 at 12 midnight GMT, with the top three photographs awarded CHF 1000, 600 and 400. Additionally, every tenth photograph entered will have the chance to be published on the IRHA and Photojournale websites.

If you wish to enter the competition, please visit our **website** to read the Rules of the Competition and send your photograph/s to raindropsaward@irha-h2o.org. We ask competitors to please focus on the topic of this competition, and **only enter photographs that show the uses and benefits of rainwater harvesting**; entries straying from this theme are unlikely to win.

The Topic of Today is a platform for sharing new scientific and research studies related to RWH. Always centred on a specific subject area, experts in the field of RWH will be invited to share their knowledge on the Topic of Today!

We invite the public to distribute these papers to better spread the word of rainwater harvesting and to send in comments or ideas for future topics.

The current subject is **Rainwater Quality**, and we have two papers on the problems of chemical and microbiological contamination of rooftop runoff by Dr Dennis Lye.

If you have any ideas for future topics or want to give feedback on our current topic, please send an email to secretariat@irha-h2o.org

Join us online and get involved!

If you have any ideas, examples or questions about rainwater harvesting, please feel free to share them with us on our **Facebook** and **Twitter** pages.

We want these to be interactive, so the more contributions the better! In return we will keep you up-to-date on all the activities going on at the IRHA.

Upcoming Newsletter

The next edition of bRAINstorming will look at our Private Sector Members. If you have any ideas, articles or pictures that you would like to contribute, please send them to us at:

newsletter-en@irha-h2o.org

Subscribe to the Newsletter

To subscribe or unsubscribe, please email us at:

newsletter-en@irha-h2o.org

Become a Member

The IRHA Members benefit from our extensive network and contribute to increasing the global use of rainwater harvesting.

Visit our website at:

http://irha-h2o.org/?page=Members

References

This Newsletter was written with the help of several articles in the area of urban RWH. A list of those used can be found here.

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