



# **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<sup>o</sup> 33 – OCTOBER 2010

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

### **Topic of this issue: Climate Change and Rainwater Harvesting**

#### *Editorial*

**Dear Rainwater Harvesters, Readers, IRHA Members and Friends,**



The effects of climate change are extremely far reaching and will impact on numerous areas of life. This Newsletter will look at: how water resources will be affected; where these changes will be greatest; and how rainwater harvesting will have an important role to play.

Dry spells are likely to become more frequent in several regions due to increased variability in the distribution of rain. While some areas may experience droughts from climate change, others will receive increases in flooding; rainwater harvesting can be used as a bridge during dry spells, and also make a difference in areas of heavy rainfall.

It is clear that rainwater harvesting can help mitigate against the effects of climate change, but what may be less obvious is the preventative role it can play in reducing the causes of climate change. Studies have shown that greenhouse gas emissions released from the supply of mains water are far greater than if the water was derived from rainwater harvesting.

The Newsletter will conclude by looking at a case study in Seoul, South Korea, where urban rainwater harvesting has been implemented to counter the effects of climate change.

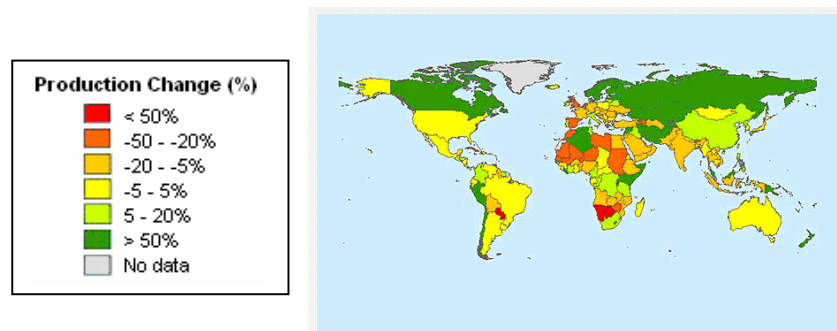
Hannah Price





## Where are the impacts felt?

The impacts of climate change on water availability and the problems associated with this vary widely depending on the location. Many regions will suffer from changes in the climate while others may benefit. The biggest impacts will be on rainfed agriculture (see map below), with some scenarios predicting that rainfed cereal productivity potentials will decline in over 40 countries worldwide by 2080, with mean losses of about 15% (Shah et al., 2008). This will disproportionately affect poorer countries that depend on rainfed agricultural as their main food source.



Projected impacts of climate change on rainfed cereal production potential, Change in 2050 from the 1961 - 1990 baseline (FAO, 2008)

### Sub-Saharan Africa

Sub-Saharan Africa (SSA) is likely to bear the brunt of negative impacts of climate change. With repeated bouts of floods and droughts, combined with the reliance of food security and national economic growth on rainfed crops and the degradation of the agricultural resource base, many parts of SSA are already extremely vulnerable to climate variability. This will only be exasperated by the onset of climate change (Padgham, 2009).

Climate change projections indicate that SSA will have an average loss of up to 12% in their cereal production potential. However, due to large variations, up to 40% of Sub-Saharan countries could lose significant shares of their rainfed cereal production potential, leaving them at risk to significant declines in food crops and pasture production due to climate change (Shah et al., 2008).

### Middle East and North Africa

The effects of climate change will also be felt heavily here as this region already suffers from severe constraints on its agriculture due to high temperatures, low and erratic precipitation, droughts and land degradation. As with SSA, these will only get worse as the climate warms (Padgham, 2009).

### Central Asia

As temperatures increase, the region is likely to suffer from reduced precipitation during the spring and summer seasons, consequently leading to a reduction in crop yields.

However, the biggest problem may arise from how climate change will affect water resources in the Tien Shan mountain range, an area that supplies a significant portion of water to Central Asia's arid plains through the melting of snow and ice. In a warmer climate there will be an increased risk of floods in the spring as large amounts of ice and snow melt quickly in the higher temperatures. This will then be followed with a drought in the hot summer months, as glacial ice that previously melted gradually throughout this period, is no longer available.

## Historical uses of Rainwater Harvesting

There is evidence from the past that people have turned to rainwater harvesting, as an alternative to migration, when faced with changes in the climate. There is a possible correlation between heightened efforts for construction of rainwater harvesting structures across cultural landscapes throughout the human history in response to aridity and drought conditions.

### The Mayans

The Mayan civilization, which developed around 3000 years ago in Mesoamerica, faced recurrent droughts due to solar forcing. Ancient reservoir technology developed by the Mayan people reveals that rainwater storage was a major source of water supply during the dry season. At least three types of reservoirs were constructed to cope with seasonal scarcity of water: centrally located reservoirs, residential reservoirs and margin reservoirs. Similar water collection and storage have been documented in other areas of South America as well (Pandey et al., 2003).

### India

There is a long tradition of using rainwater harvesting in India and folk sayings such as "capture rain where it rains" may have originated in response to increased aridity in the Indian region over the last few millennia.

Archaeological and historical evidence suggests that as aridity increased in the region, people intensified rainwater harvesting (Pandey et al., 2003).



## How can Rainwater Harvesting help?

*“As we look into what Africa can do to adapt to climate change... rainwater harvesting is one of those steps that does not require billions of dollars, that does not require international conventions first – it is a technology, a management approach, to provide water resources at the community level.”*

Achim Steiner, UNEP Executive Director

### Counter droughts

Moisture limitations resulting in chronically low crop productivity in rainfed cropping systems are generally attributed to poor seasonal distribution of rainfall during sensitive crop growth stages and to low use of incident rainfall by the crop, rather than to absolute water shortages. Increased seasonal rainfall variability (including longer dry spells between rains) and higher temperatures that increase evaporative losses from the system are very likely to occur under future climate change, thus magnifying current risks in rainfed crop production. These kinds of risks could even occur in areas where mean annual precipitation increases (Padgham, 2009).

As crop failure is more likely to be caused by poor distribution of rainfall, rather than absolute drought, rainwater harvesting can be used to bridge the gaps between rainfall events. This can be done through capturing and storing rainwater in tanks and then using it as supplemental irrigation during the dry periods. Alternatively, using in-situ methods (such as those in Newsletter N30) to increase soil moisture content can reduce crop moisture stress at critical plant growth stages.



**Australia**

Source: National Geographic (2010a)

Captured rainwater can be used as a drinking source as well as for crop irrigation, giving both people and livestock a water supply during dry periods and droughts.

### Prevent flooding

As climate change alters the distribution of rain, both temporally and spatially, many areas may experience short periods of heavy precipitation during long periods of very low rainfall. This will result in a higher incidence of floods, as the hard soil will have limited infiltration capacity leading to increased runoff.

Rainwater harvesting can mitigate this in two principle ways; through the collection of rain before it reaches the ground (as well as from runoff) and by improving the soil's infiltration capacity. Methods of capturing rainfall, from building roofs or sloping land, and storing it in tanks reduces the overall volume of water that would contribute to flooding and has a further benefit of having water available in the ensuing dry period. In-situ methods such as conservation tillage, work at storing water in the soil, improving its moisture content and stopping it from forming a hard surface layer that inhibits infiltration.



**Bangladesh: Case Study**

Source: National Geographic (2010b)

Capturing rainwater in towns and cities can also contribute to reducing urban flooding. The rainwater can be used to recharge the local aquifers and reservoirs to supply drinking water to the population or directly to flush toilets or water gardens. This can be seen in the Star City case study (right).

## A Case Study

### Rainwater Harvesting in Star City, Seoul

The Star City Rainwater Harvesting System was built in a newly developed housing complex to demonstrate that the safety and sustainability of centralized water systems can be increased by the addition of Decentralized Rainwater Management (DRM). The new development includes 1,300 apartment units with a catchment area of 6,200m<sup>2</sup> of rooftop and 45,000m<sup>2</sup> of terrace. The aim was to collect up to the first 100 mm of rainwater that falls on the complex and to use the collected rainwater for gardening and public toilets (Han *et al.*, 2008).

During one year of operation in 2007, about 41,000m<sup>3</sup> of rainwater was supplied and about 44 MWh of energy was saved. If 20% of tap water supplied in Seoul was replaced by on-site rainwater harvesting, 270 GWh of energy could be saved a year (Han *et al.*, 2008).

This is a promising solution for climate change adaptation; it can mitigate urban flooding, especially in the monsoon season, and, in the long run, reduce the energy required for water treatment and transportation (Han *et al.*, 2008).

### 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:

[www.irha-h2o.org/en/become\\_a\\_member.html](http://www.irha-h2o.org/en/become_a_member.html)

## Reduce carbon emissions

While the previous two examples show how rainwater harvesting can help mitigate the effects of climate change, it can also be used as a preventative measure, contributing to a reduction in greenhouse gas emissions. The Fourth Assessment Report of the IPCC indicated that the expanded use of rainwater harvesting and other “bottom-up” technologies have the potential of reducing emissions by around 6 Gt CO<sub>2</sub> equivalent/year in 2030 (Salas, 2009).

A study has suggested that public mains water systems contribute to climate change through direct emissions of greenhouse gases due to water storage reservoirs, water treatment processes and through significant energy and material uses in the system (Salas, 2009). In California, water related energy use, including conveyance, storage, treatment, distribution, wastewater collection and discharge, consumes about 19% of the state’s electricity, 30% of its natural gas, and 88 billion gallons of diesel fuel every year (Krebs, 2007).

As rainwater harvesting uses simple processes and infrastructure, and has low energy inputs, it reduces greenhouse gas emissions related to water supplies when compared to the mains water supply (Salas, 2009). [Click here](#) for more case studies.



**California Aqueduct**

Source: National Geographic (2010c)

## Subscribe to the Newsletter

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[newsletter-en@irha-h2o.org](mailto:newsletter-en@irha-h2o.org)

## Upcoming Newsletter

The next edition of bRAINstorming will look at the importance of training and awareness raising to increase the knowledge and global use of rainwater harvesting. 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](mailto:newsletter-en@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 currently going on at the IRHA.

## References

This Newsletter was written with the help of several articles in the area of climate change. A list of those used can be found [here](#).



## IRHA Activities and News

### News from our Executive Director: The ARCSA National Conference

The American Rainwater Catchment Systems Association (ARCSA) is the biggest and one of the most knowledgeable RWH organizations worldwide. In the beginning of October, I had the privilege to be invited to its annual conference and, furthermore, to hold the keynote speech on the last day of its programme. [Read more.](#)

### IRHA Seminar: Rainwater Harvesting, a Tool for Development and Adaptation to Climate Change

The IRHA is organising a seminar on the uses of rainwater harvesting in development and climate change adaptation, taking place on the 19<sup>th</sup> November (please see the [Seminar Agenda](#)).

High level professionals are invited to present case studies witnessing the role of RWH in these fields. Specialists and consultants in the areas of hydrology, climatology and public health, representatives of the Geneva authorities, NGO officers and leaders will compose the audience. By organising this seminar, the IRHA contributes to the understanding of the need to improve rainwater management worldwide.

If you wish to attend the seminar, 09.00 to 12.30, 19<sup>th</sup> November, Geneva, please email [secretariat@irha-h2o.org](mailto:secretariat@irha-h2o.org). We hope to see you there!

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