

# Chapter 6

## Harvesting rainwater: An adaptation strategy for peace and the climate crisis

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**Keywords:** Andean Amazonia connectivity, climate crisis, deforestation, flying rivers, new skills, rainwater exchanges

### 6.1 INTRODUCTION

An independent environmental thinking platform has been growing since the early 1980s in to the 20th century in Latin America. It is relevant to understand why it has taken such a long time to position rainwater harvesting as an adaptation tool to face poverty, access to fresh water, cultural diversity and climate vulnerability. In Colombia, it can also be associated with the complexity of the peace building process, a political situation that has affected deforestation after the peace agreement between FARC and the State. This particular situation has affected the Amazonia forest 'water factory', as deforestation in the year 2019 has been increasing dramatically. Rain and all its forms of utilization in the Andean Amazonian basin is produced by a hydrological cycle determined by equatorial geography and biological conditions. Ecological functions and connectivity are central to produce rain. Protection of the cradle of rain in the tropics means

ensuring the health of ‘the flying rivers’, which guarantee life in the continent and in the world.

This editorial initiative, born in Mexico, has permitted the construction of a tropical network of a variety of rainwater harvesters. Since Arturo Gleason in Guadalajara organized the 2017 meeting to collect experiences and launched the Mexican Rainwater Association AMSCALL (in Spanish), IWA Publishing in London started the process of inviting participation in a ‘Contributors Agreement’. This idea of assembling different points of view from all continents on a voluntary basis has led to a legacy for future generations. As the world is facing a global climate crisis, our contribution in this publication concerns a variety of local experiences in three continents with adapting socio-cultural environments.

In Colombia, located at the north of the equatorial countries in Latin America, between two oceans and with half of its territory in the Amazonia and Orinoquia basins, rainwater harvesting is still an ancestral practice, barely recognized by the Nation State as an adaptation strategy to the current climate crisis. Rainfall patterns are changing rapidly due to deforestation and fires in the forest expanding to pave the way for alternative uses. As rain depends on the health and connectivity of ecosystems to ensure the water cycle, acting at national and international levels is necessary to guarantee action at local levels. Collection, storage, distribution, social sharing and final disposal of rainwater utilized for multiple purposes urge political action and civil society concern. Rainwater harvesting (RWH) values should become part of the circular economy principles of reuse, recycle and reduce waste and of the implementation of the Sustainable Development Goals, 2, 3, 6, 10, 11 and 13, where water is central for life. The aim is to scale up rainwater harvesting experiences and to strengthen more institutional support from national and local governments. In the education sector, this book should provide useful information for training schools and to generate new skills to improve access to rainwater. It was Augusto Angel Maya, who in the ‘Challenge of Life – Ecosystem and Culture, IDEA, Bogota 1996 said, ‘The human species and the culture, belong to a natural order in the same way as plants or animal species. It is the evolutionary process that conducts towards an instrumental adaptation, social organization and symbolic elaboration. With technology, these should be all included as part of nature’s evolutionary process’.

## 6.2 CONFRONTING GLOBAL CLIMATE CRISIS

Youth worldwide is clamouring for political change to stop the global climate crisis. Current awareness is increasing, but the speed of confronting the situation to prevent water and food scarcity is at a slower pace. Climate variability in both hemispheres is being evidenced by rapidly melting glaciers, rain reduction due to deforestation and extensive cattle breeding, flooding and droughts, increasing seasonal

temperatures with health impacts, extreme storm events, climate displaced population, increasing urban air pollution, and in the broader picture, social uncertainty. Media, social networks, academia and geographical information systems worldwide are communicating planetary changes.

In Andean Amazonia countries hosting the most strategic ecosystem producing fresh water in the sky and being the main CO<sub>2</sub> sink, the hydrological cycle is at risk from rapid deforestation and induced fires, changing land use and biodiversity functions. Global uncertainty has been expressed by the Intergovernmental Panel for Climate Change IPCC in many reports and civil society organizations and youth movements are influencing public opinion concerns.

The political position of the Brazilian government to promote ‘colonization’ of Indigenous Peoples territories under the argument of ‘progress and sovereignty’ is endangering the source of rainwater harvesting options in the Latin-American region. The threat of depleting the Amazon is provoking irreversible effects and risks a massive population displacement process and food scarcity. These phenomena in the basin are environmental services that affect rain production and increase air pollution in cities and towns in Latin America. Protecting the ‘flying rivers’ (Pacheco, 2018), i.e. feeding the clouds from the hot evaporation systems of the forest is at stake.

The ‘flying rivers’ provide rain to all Andean urban centers and rural areas. Weak institutional monitoring systems to control deforestation, combined with long lasting corruption, illegal drug trade and river gold mining, plus land occupation for pastures and post-conflict armed groups in key spots, endanger the cradle of forest–ocean–mountain water production. In Colombia, after the peace agreement signed by the FARC guerrilla and the Colombian State in December 2016, large amounts of capital and money laundering have been inducing forest fires, depleting biodiversity and introducing new farmers and extensive palm-oil monocultures, so changing water production patterns. Justice is backing up with thousands of demands with slow responses.

Amazonian departments of Caqueta, Amazonas, Putumayo, Guaviare, Guainia, Vaupes Vichada and south of Meta, 46% of Colombian territory, are a world cultural and natural patrimony heritage for water and peace preservation. In that context, rainwater harvesting analysis starts by protecting the sources of life.

### **6.3 RAIN IN THE ANDEAN AMAZONIA WATER CYCLE**

The rain cradle in the Andean hydrological cycle has a particular feature. In tropical geography the ‘Paramos’ ecosystem, unique in the world, make the highlands (3,200 meters above sea level) the rain sink and a river system cradle. The Paramos ecosystems are fed by the ‘flying rivers’ coming from Amazonia and Orinoquia where vast plains and forest land play a regulating climate role, intimately connected with the Pacific and Caribbean wind and steam raising currents. In the highlands, water produced at the ‘Paramos’ by endemic species,

store rain and mist like sponges and in lakes which help infiltration and runoff. Highland lakes collect and store rain, making ‘Paramos ecosystem’ essential. In the case of Bogota Capital District, Chingaza and Sumapaz National Parks at 3,400 meters above sea level (Figure 6.1) are the main providers for a city region of 11 million people and the surrounding region. This is understood to be the largest scale rainwater harvesting concept. The National Natural Park System and the Natural Civil Society Reserve Network have been contributing to protect highland water sources jointly with regional environmental authorities, as part of the National Environmental System, SINA (in Spanish).

SINA celebrated in 2019 twenty-five years of existence, created after the UN Earth Summit in Rio 1992, by Law 99 in 1993. Today, SINA is weakened by political interests controlling investments and contracts for large oil and mining extractive sector projects, dams and infrastructure, affecting forest conservation. Main rivers are under threat by cities and towns with non-existent sewage treatment plants, thus receiving domestic and industrial polluting waste. In this context, RWH and wells are healthier than using water from rivers (polluted with mercury) so fishing is endangered for human consumption.



**Figure 6.1** Sumapaz tropical highland ecosystem absorbs the “flying rivers” blown from Amazonia, where deforestation is affecting the rain patterns and increasing the climate crisis. Bogota Capital District, 2019. (Source: Author’s own).

In spite of significant international cooperation contributing to restoring peace and local economies in Amazonian indigenous communities, uncontrolled and illegal deforestation in different regions of the basin contributes to increasing the climate crisis at national and global levels. The highlands, the lowlands, Orinoquia and Amazonia forests and the two oceans of Colombian tropical geography have an intimate connectivity and interdependence to produce sky water. These are the ‘flying rivers’ conceptual framework, described by indigenous cosmology and knowledge of the functioning of their habitat.

Effects due to deforestation and fires are transforming cloud formation and rain in Andean cities. Pacific Ocean temperatures influence wind and transit of the flying rivers in every tropical floor of the Andes, and are impacting rainfall patterns. ‘El Niño’ and ‘La Niña’ weather events are becoming more intense and more frequent (Euscategui & Huetado, 2011), the worst being registered in 2010–2011.

Nation States are timidly recognizing the multi-purpose role of rain to face the global climate crisis. In Colombia, water management and forest conservation and restoration have different institutional responsible managers both at national and territorial levels. Water management separation puts rain in a shadow place, where harvesting rainwater is not a key issue in national and local policy and in urban environmental regulations. RWH is left to private voluntary initiatives with no significant relevance in environmental planning.

Water and Sewage Services at municipal level sell water but do not promote or stimulate rainwater harvesting systems as water is considered a commodity and not a public good to be implemented as an adaptation strategy. Scattered urban experiences are mainly private initiatives interested in promoting principles of circular economy, but in rural areas, RWH experiences respond mainly to family survival needs and systems are built with no sponsorships, technical assistance or subsidies.

At an international basin level, the forty-year old Amazon Cooperation Treaty Organization (OTCA in Spanish), is now superceded by critical climate changes occurring in the eight countries within the basin. The OTCA headquarters in Brasilia has been silent on the fires, rainforest destruction, cattle breeding and extensive monocultures changing indigenous communities ancestral tenure and wise biodiversity conservation. The Andean Amazonia connectivity is been transformed by political decisions at multinational level by tolerating new forms of colonization. Tropical rain forest is devastated with a risky and irresponsible idea of ‘progress’, which has no long-term vision.

### 6.3.1 Scaling rainwater harvesting

Strategic ecosystems connecting the water cycle form the complex hydrological system of a sky–sea–soil–mountain circular motion system pushed by the winds (Figure 6.2). In this period of high climate vulnerability, when a growing young citizen movement is advocating decarbonizing society, education and media play



**Figure 6.2** Scaling up RWH means understanding tropical ecosystem connectivity. Serrania La Lindosa, Guaviare, Amazonia, 2019. (Source: Author's own).

a key role in the scale up of rainwater utilization. The question is how to confront the effects during the current geological era, the Anthropocene (Kolbert, 2015). Human activity is affecting the weather and food security, public health, and behavioral changes are appearing in all living species.

Research findings are responding to resilience limits, extensive lists of scientific publications are warning the international community. Leadership from thematic networks and from concerned media is being raised. Voices from non-state actors are claiming concrete action. These are urging the strengthening of institutional arrangements to cope with the national and local energy transition process, improve adaptation and mitigation strategies, and increase technical training to scale up circular economy, in particular within the water sector.

To scale up rainwater adaptation strategies, environmental land use planning should include resilience and adaptation plans, subsidies, vocational training and dissemination. The global goal suggested by scientists from IPCC in Korea in 2018 should justify the strengthening of public education and improve multipurpose rainwater utilization in urban and rural areas in every municipality in the tropics, associated with the energy transition process.

As a public good, rain collection, storage and use, should be free of charge. In Colombia, island communities in San Andrew and Old Providence Islands are using their rain storage as part of the house structure. All schools and houses in Amazonia have their own local systems and this is also true in many rainy regions, including the Choco region, the rainiest, richest in biodiversity and poorest afro and indigenous population in Colombia. Small municipalities with weak or inexistent public water and sewage services lack regulations to encourage rainwater utilization, not recognizing the cultural traditions which adapt to local environments.

Multipurpose rainwater options with potential uses for household and productive uses, such as sanitation and hygiene, watershed management, food sovereignty and soil conservation, aquifer recharge and ecosystem conservation, runoff management, disaster prevention and reconstruction, should be incorporated in to integrated water resource management policies (IRHA, 2006). All RWH scales are valid to give an added value to rainwater utilization.

The climate change crisis should thus encourage scaling up of RWH at policy level, permitting urban and rural housing and public infrastructure to use rain as a public good in non-potable water uses: washing and cleaning options, gardening, landscaping, animal feeding and biodiversity conservation, amongst others. Legislation to scale up rainwater utilization should also cover different sectors, from housing, health, energy, education and agriculture, to larger scales in land use and environmental planning and final disposal.

Building resilience to confront extreme weather events, as storms are becoming more frequent and more intense, should mean designing institutional capacities and arrangements within sectors to facilitate citizen's adaptation to climate change.

## 6.4 KNOWLEDGE EXCHANGES

In the call that the Intergovernmental Panel for Climate Change (IPCC) made to cities in 2018 to include adaptation strategies, different territorial levels should be included. From the basin to the neighborhood and house level, integrated RWH approaches should be developed to connect experiences, promote benefits and prevent difficulties, encouraging scaling up and knowledge sharing and exchanges among cities and regions.

There is a citizen's 'de facto' knowledge on rain utilization, made up from local knowledge on weather and seasonal agricultural cycles in rural inland, highlands and coastal areas. This knowledge belongs to a precautionary principle responding to satisfy human needs. An example is the amphibian culture (Figure 6.3) in wetland regions in the Colombian Caribbean, where Senu and Chimila indigenous traditional knowledge on flooding control in the Magdalena River marshes area dealt technically with issues of flooding by building polders.



**Figure 6.3** Amphibian houses adapted to rainfall and flooding in Putumayo, Amazonia. (Source: Author's own).

This tradition has unfortunately disappeared since Spanish colonization and the introduction of cattle breeding in wetland regions.

Indigenous conservation knowledge in the Amazon basin and in the highland forest should be better disseminated, particularly to learn from it how ecosystem conservation has been implemented to protect survival; forests in the lowlands, valleys and highlands have an intimate connectivity to maintain the water cycle and the sacredness of rain, wind, air and soil, essential to spiritual beliefs connected with nature.

At the city level, new urbanizations and housing projects should learn from other cities by involving RWH systems in urban regulations. From roof and wall rain collection to lakes in green spaces and run off utilization for gardening and infiltration in parking lots, economical and ecological benefits should become urban adaptation regulations to confront the current climate crisis.

## 6.5 INTEGRATED RAINWATER MANAGEMENT APPROACH

An Integrated Rainwater Resources Management (IWRM) approach links social and economic development with the protection of vital ecosystems. The aim is to increase the multipurpose use of rain and reduce potable water consumption to strict needs. The rationality today is the payment to access water, waste and sewage services, with no intention in reducing the final volume disposed in the combined sewage system. Zero waste goals with reuse and recycling water resources need to be part of education and public awareness. IWRM promoted by national policy in Colombia requires adjustment of its goals and strategies at



sub-regional and municipal levels, aiming at reducing the polluted water thrown directly to the rivers and subsequent CO<sub>2</sub> emissions, separating rainwater waste from domestic sewage systems. Decentralized rainwater utilization should generate a new culture to protect the ‘flying rivers’ and its final disposal once has been used and reused.

The complex interaction between soils, air, sea water, underground water, winds, mountains and forests in the tropical geography of Andean Amazonian countries demands specific policies to protect biodiversity and quality of life, and to regulate climate change. It is an integrated life system where rain links all. New policies to position rainwater harvesting should include a portfolio of current private and public initiatives at urban and rural levels, and understand they are all part of an adaptation strategy to consolidate peace and reduce the effects of the current climate crisis.

## ACKNOWLEDGEMENT

Special thanks to Arturo Gleason for pushing this editorial project forward. Also to Rachel Nisbet from the International Rainwater Harvesting Alliance IRHA in Geneva, for her translation of Gilbert Sene’s text from French into English. We hope that this IWA Publishing will serve as a pedagogical tool in rural and urban English speaking communities, disseminating and sharing knowledge from Spanish and French speaking regions and communities in the tropics.

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