

Techniques for providing water to arid regions report example

[Environment](#), [Plants](#)



1. 0 Introduction

Water is an important component of life and without it life on earth will be non-existent. About $\frac{3}{4}$ of this planet is made up of water and it is a surprise, therefore, to find out that more than a billion people do not have access to clean water. According to the United Nations, the uneven distribution of water is endangering an increasing number of people although there is enough water in the planet to supply its entire population (2014). This situation is particularly true in areas that are classified as arid regions or regions with precipitation characterized as low, unpredictable and irregular (Han and Singer 2007). In such areas, various techniques and technologies are in use to provide the communities with water. These techniques include the high technology of desalination and the simple and practical technique of rainwater harvesting.

- Different Techniques for Providing Water to Arid Regions

2. 1 Desalination

Desalination is a technique of turning water from seawater, brackish groundwater and other non-potable sources into potable water with low saline content. As a technique, desalination had been known to have been used in the 4th century B. C. as can be gleaned from the writings of Aristotle and Hippocrates. About 125 countries operate desalination plants, but while some countries with arid climate substantially rely on desalination for their water supply, the process contributes to only to 0. 2% of the water supply worldwide (National Research Council 2004, p. 12).

- Desalination Technologies

The goal of desalination is to separate solids from water to make it at least

usable. The choice of technology to be used in desalination will depend on the number of factors that exist, or do not exist, in the given locality. An important consideration, for example, is the source of water to be desalinated. Other factors include the specific use of the water, the plant size, costs, and renewability of the energy. The United States is an important contributor to the development of desalination technologies because of the efforts and money it expended for research, through the Office of Saline Water and the Office of Water Research and Technologies. Both these offices used a combined amount of \$1.4 billion to research desalination resulting in technologies as reverse osmosis.

There are several technologies now in use in the process of desalination. Some of these are membrane technologies, alternative technologies, thermal technologies, concentrate management technologies, and reuse/recycling technologies. The membrane technologies process non-potable water by filtering it through semi-permeable membranes so that contaminants can be removed. On the other hand, thermal technologies use extreme temperature, low or high, to separate and capture contaminants while water is in a frozen or boiling state. Alternate technologies use non-traditional desalination technologies, while reuse/recycling technologies either use thermal or membrane technologies, but are designed to handle bigger loads of contaminants (US Bureau of Reclamation/Sandia National Laboratories 2003, p. 29).

- Effectiveness

Desalination is a useful process of getting water supply, especially in arid regions where there is dearth of water supply. The Middle East, for example,

is dependent on the process for its water supply (However, desalination is costly and uses too much energy. Rich countries can easily adopt desalination for water supply, but in developing countries, such as those in the African continent, the overall costs, especially if fossil fuel is not locally sourced, may not be easy to overcome. Other sources of energy, such as solar or wind turbine, may be resorted to, but this will also involve capital. Between seawater and brackish water, the latter is less costly to desalinate because it contains lesser amount of salts. However, the availability and sustainability of brackish water supply can also be aggravating factors in using it as the main source of desalination (Maliva and Missimer 2012). The use of desalination in small areas in arid regions is also impractical. Thermal desalination, for example, cannot be downscaled and is thus, impracticable for use in small regions and in other regions with low infrastructure because of their electricity requirements and sustained maintenance. Although reverse osmosis of the membrane technologies can be downscaled, it also requires extensive maintenance (Rizzutti et al 2007). Nonetheless, renewable energy sources may provide hope in the provision of potable water in arid regions that have no fossil fuels or are not rich enough to build and maintain extensive desalination plants. Power from the sun, geothermal and wind turbines may be harnessed and combine with desalination systems - depending on their suitability to the locality - to provide potable water system to arid regions. The high temperature in some parts of Saudi Arabia, for example, can be used to build geothermal power plants and used them to power desalination plants (Maliva and Missimer 2012).

- Rainwater Harvesting

Rainwater harvesting had long been a practice as part of water supply system in arid and semi-arid regions in early civilizations. During those times, rainfall water was stored in cisterns or human-made reservoirs. The Romans built the Piscina Mirabilis near Naples to serve the purpose of storing freshwater from their primary source of water. Today, the term rainwater harvesting is a term used to refer to the techniques of collecting water from roofs or ground surfaces for supplementary and even primary water use. Unlike desalination, however, this technique is often used only at the community level or household use. For example, rainfall harvesting is used in Kuwait to provide 12% of the water demand for landscape agricultures in Kuwait, 27% of the water demand for industry in Muscat, Oman, and 16% of the water demand for agriculture in Alin Ain, UAE (Mays 2009).

2. 2. 1 Rainwater harvesting techniques

Rainwater harvesting excludes run-off rainwater that find its way into lakes, rivers, lakes and other bodies of water, and refers only to the immediate collection of rainwater from surfaces where it has directly fallen. Rainfall harvesting is done using roof catchments, storage tanks, and rock catchments. Roof catchments can be constructed from tiled roofs, roofs made of corrugated materials or even from thatched or palm-leafed roofs. Water from rain is collected in gutters constructed at the edge of the eaves of these roofs, which all lead to a downpipe that further leads to a storage tank, where the rainwater is finally stored. A mechanism is installed, such as a mesh strainer, to filter debris and other foreign materials, from water. Storage tanks are built taking into account rainfall patterns and volume,

length of dry periods, and demand for water. For domestic use, tanks can be made of cheap materials, such as bamboo or corrugated steel sheeting. On the other hand, industrial use of rainfall water requires bigger and more durable storage tanks, called ferrocement tanks. These tanks have concrete base, and walls and roof made of steel sheeting or ferrocement – materials which chicken wire as reinforcement. The Rock of Gibraltar is an example of a rock catchment as much of its water can be collected from its slopes that drain down to excavated rocks on the Rock's foot. Artificial collection on the Rock's surfaces have also been attached for the purpose of water collection (Water Aid 2013)

2. 2. 2 Effectiveness

Rainwater harvesting is cheap and materials that can be used for the purpose of catching it are also relatively inexpensive. In addition, if the catchment storage and other materials used to catch water is clean, the water may be used without treatment. On the other hand, there is a possibility that the water is contaminated by external elements, such a bird droppings, and the storage tanks may eventually be contaminated with algae, or infested by rodents, insects and other animals. Rainwater harvesting has been effective for water supply use in East Asian countries, such as Jordan, Yemen, Lebanon and Palestine. In some of these countries, legislations have been passed to encourage rainwater harvesting in homes. However, in arid regions that have very low rainfall rates or large populations, and other unsuitable conditions, rainwater harvesting is ineffective.

3. 0 Conclusion

In arid regions, where water is scarce, various techniques are used to supply communities with potable water. Two of these techniques are desalination and rainwater harvesting. Desalination entails the use of advanced technologies. It is effective and can supply entire communities and industries with usable water. Unfortunately, however, they are both cost-intensive and use large amounts of energy. More often, they are not available for downscaling. In short, poorer countries or smaller communities cannot afford or have practicable use for them, respectively. On the other hand, the much simpler rainwater harvesting is cheaper, but it is only practical for household and domestic application. Moreover, it is at risk for contamination from external factors.

References:

Han, F and Singer, A 2007, Biogeochemistry of trace elements in arid environments, Springer Science & Business Media

Maliva, R and Missimer, T 2012, Arid lands water evaluation and management, Springer Science & Business Media

Mays, L 2009, Integrated urban water management: arid and semi-arid regions: UNESCO-IHP, CRC Press

National Research Council 2004, Review of the desalination and water purification technology roadmap, National Academies Press.

Rizzuti, L, Ettouney, H and Cipollina, A 2007, Solar desalination for the 21st century: A review of modern technologies and researches on desalination coupled to renewable energies, Springer Science & Business Media

US Bureau of Reclamation/Sandia National Laboratories 2003, Desalination and Water Purification Technology Roadmap - A Report of the Executive

<https://assignbuster.com/techniques-for-providing-water-to-arid-regions-report-example/>

Committee, <https://www.usbr.gov/research/AWT/reportpdfs/report095.pdf>

United Nations 2014, Water Scarcity, <http://www.un.org/waterforlifedecade/scarcity.shtml>

org/waterforlifedecade/scarcity.shtml

WaterAid 2013, Rainwater harvesting, www.wateraid.org/technologies