



MINISTRY OF ECONOMIC GROWTH
AND JOB CREATION

World Water Day 2017

Why Waste Water?



What's Inside:

■ The Value of Wastewater

■ From Forests to Faucets:
The Role of Forests in
Safeguarding our Water Supply

■ Kiddies Corner

■ Young NCU innovators use
Hydroponics for Increased
Agricultural Production



MINISTRY OF ECONOMIC GROWTH & JOB CREATION



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*"Achieving Prosperity through Partnership,
Economic Growth and Sustainable Development".*

"I encourage every Jamaican to do their part in protecting our water resources"



Water permeates all aspect of life and is essential to social development, environmental protection and economic growth. Considered to be a source of life, the essential services water provides are among the key drivers to achieving poverty alleviation and increased prosperity.

The sustainable development of water resources involves policies, plans, and activities that improve equality of access and quality of life for all. It challenges us to look to the future and to fully assess and understand the implications of the decisions made today on the lives and livelihoods of future generations and the natural ecosystems upon which they will rely.

The Government, through the Ministry of Economic Growth and Job Creation, recognises the importance of water as a vital resource. As such, increased access to safe water supply and sanitation services continue to be a major focal point. To this end, the Government has over the past year, accelerated activities to revise and update the 2004 Water Sector Policy, Strategies and Action Plan with the objective to provide universal access to potable water to all Jamaicans by 2030. The Policy seeks to:

- a) Provide the framework for the effective management of water supply across the island by ensuring equitable sharing of the water resources;
- b) Protect watershed areas, ecosystems, catchments and networks and promote effective programmes for water conservation and protection;
- c) Improve institutional arrangements for Integrated Water Resources Management;
- d) Provide a participatory approach to water resources management;
- e) Put in place policy, programmes and physical structures for climate adaptation and energy efficiency in the water sector;
- f) Encourage private sector participation in the water and wastewater sectors;
- g) Ensure economic efficiency by considering pricing and other economic incentives;
- h) Ensure effective management of wastewater and water quality; and

- i) Provide sufficient water for achieving food security by improving irrigation services.

The Water Supply Development Strategy for Non-Utility Service Areas (NUSA) is the companion document to the Water Sector Policy 2017 and will set out how the Water Sector Policy will be implemented to bring service to NUSAs through projects, other than through a Utility Service Provider. For each parish, a plan is prepared and projects are proposed for implementation. A multiplicity of modalities to expand coverage will be employed, for example, rainwater harvesting systems, entombed springs, catchment tanks and community based projects.

The Government, through its agencies, embarked on a number of plans and programmes over 2016/2017 Financial Year, which have created jobs and opportunities for people to build more stable futures. Through the National Water Commission's, NWC, Capital Programme approximately 132 projects have been undertaken. The Rural Water Supply Limited, under the Rural Water Upgrade Programme, undertook several projects providing employment for nearly 800 persons and benefiting over 7,000 citizens. Three (3) schools benefitted from the Rainwater Harvesting Project in Schools initiative Warminster Primary School (St. Elizabeth); Clarendon College (Clarendon); and Long Look Primary, Clarendon. Impacting approximately 2000 students and staff as well as providing indirect and direct job creation for over 500 persons through the engagement of community hardware stores, local contractors and labourers.

As a developing country we must take a holistic approach to the management and protection of our water resources in order to secure a bright future for all. As we commemorate World Water Day, I encourage every Jamaican to do their part in protecting our water resources, so that we can realise the vision of a Jamaica where we can live in a healthy environment with adequate supply of clean water for all.

**THE MOST HON. ANDREW HOLNESS,
ON, MP
PRIME MINISTER**

"Replenish and protect our watersheds"



Each year, the celebration of World Water Day places focus on the critical importance of this most precious resource to every human being on earth. This year, the United Nations theme is "Wastewater" with a supporting campaign slogan from the World Health Organisation (WHO) - "Why Waste Water?" - focussing on both water and wastewater. This highlights one of the Sustainable Development Goals (SDG) on improving water quality and reducing, treating and reusing wastewater. Indeed, the provision of both services is a critical part of the thrust towards sustainable development.

It is reported that over 663 million persons throughout the world have to travel far distances to access potable water even though approximately 1.5 billion work in water related sectors.

According to the United Nations, the use of water has grown by more than twice the rate of population increase in the last century. In addition, it is estimated that by 2025, approximately 1.8 billion people worldwide will live in areas where water is scarce, with an additional two thirds of the world's population occupying what is termed "water stressed" regions.

Pollution and the impacts of climate change are likely to place additional stress on the world's water resources as the worldwide demand for water continues to increase.

Here in Jamaica, we too are threatened by the impacts of climate change, population growth and the improper disposal of wastes. However, we are blessed with good quality water resources and our water is rigorously treated before distribution.

The Government's primary objective is to ensure that our consumers are drought resilient

and not subjected to water lock offs. Therefore, through the National Water Commission (NWC) and the Rural Water Supply Limited we will extend our water supply services to more areas. Additionally, we intend to reduce non-revenue water from 70% to 55% by 2021. While this administration seeks to extend water supply services to more areas, we are also giving due attention to expanding and improving wastewater services and facilities, to protect water sources, guard public health, preserve our fragile eco-systems and protect economic investments.

We are therefore in the process of correcting our sewage treatment systems throughout the island through partnerships with multi-lateral agencies and the private sector, - utilizing innovative financing approaches to expand our existing sewer network, by constructing new plants and rehabilitating many others.

The Soapberry Treatment Plant will be expanded and the sewage treated to a satisfactory level and reused as wastewater suitable for irrigation. The NWC is now spending J\$1.5 B to undertake wastewater improvement projects in Boscobel, Elletson Flats, Bay Farm Villas and several other locations islandwide. Still more will be spent on wastewater improvements in the new financial year. As we commemorate World Water Day this year, I urge you all to reduce your water use by conserving whenever you can.

Replenish and protect our watersheds by replanting our trees and forests and recycle wastewater around the home.

As we work to make Jamaica the place of choice to live, work, raise families and do business, we ask that you partner with us to address the challenges that may arise in the provision of water and wastewater services and in ensuring the sustainability of our water resources which will produce tangible benefits for all of us.

**HON. DR. HORACE CHANG, MP
MINISTER WITHOUT PORTFOLIO
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Wastewater and our Future

Under the theme "Wastewater" the National Water Commission (NWC) is pleased to commemorate World Water Day on March 22, 2017.

Wastewater is essentially a combination of liquid or water carried waste removed from residences, institutions, as well as commercial and industrial entities. All living things generate some amount of waste and as human beings come together, living in urban communities, the waste that is generated becomes a real threat to our health and well-being.

Wastewater treatment is a process that converts wastewater from its unusable state into an effluent that can be either returned to the water cycle with minimal environmental issues or reused for another purpose. The three main reasons for the treatment of wastewater therefore are:

1. The protection of persons from waterborne diseases such as cholera, typhoid, dysentery, and others which may develop from contact with untreated wastewater;
2. The protection of the natural environment, including the rivers, seas and coral reefs, from the damaging effects of untreated wastewater;
3. The support of important life systems, eco-systems and developmental initiatives.

The National Water Commission (NWC), being the primary provider of wastewater (grey water) and sewage (black water) services in Jamaica, operates more than seventy (70) wastewater treatment plants in twelve of the fourteen parishes and treats approximately 113,000 cubic metres of sewage each day.

This theme is of utmost importance to the NWC, and steps are continuously being taken to improve wastewater treatment processes despite the many challenges encountered over the years.

In the last two years alone, the NWC has undertaken major sewage rehabilitation of the Harbour View Wastewater Treatment Plant; diverted flows from aged, malfunctioning plants to the Soapberry Treatment Wastewater Plant via the Portmore Sewerage Reconfiguration Project and upgraded sewerage facilities in Majesty Gardens, Seaview Gardens and

Riverton Meadows under the Sector F Sewage Rehabilitation Project.

Along with these works the NWC has recently completed the upgrading of the Boscobel and Elletson Flats Wastewater Treatment Plants as well as an extension under the Papine/Mona Sewerage Project.

At the recently rehabilitated Harbour View Wastewater Treatment Plant, NWC has installed state-of-the-art technology powered by wind energy to reduce the cost associated with the treatment process and improve the quality of the effluent being discharged. The Portmore Sewerage Project applied the use of Supervisory Control and Data Acquisition (SCADA) systems as a measure to significantly reduce operating costs while improving system performance and reliability.

It is the intention of the NWC to continue to embark on improving its wastewater infrastructure and utilizing these advanced technologies to do so. In fact, during the current 2016/17 financial year it is estimated that as much as 35% of the NWC's capital expenditure has been utilized on wastewater projects.

Historically, providing good wastewater services is a costly but rewarding investment which is often taken for granted. The NWC wishes to remind its customers that they too should take part in improving wastewater management as many of the sewer blockages, overflows and other challenges occur due to customers' failure to comply with the standards of disposal of waste. Solids, household garbage and storm water do not belong in the central sanitary sewer systems and manhole covers should not be removed or stolen. The improper use of the sewerage systems not only causes malfunction but results in unsightly overflows that are costly both to customers and the NWC and poses a threat to our health and environment. Proper wastewater management is critical to our future. The NWC is using the resources at its disposal to invest in new practices and new technologies to make our future brighter.



Soapberry Wastewater Treatment Plant



The Harbour View Sewage Treatment plant

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Water and Wastewater

In addition to the water challenges that we now face in Jamaica, it is anticipated that by the year 2030, half the world's population will experience water scarcity. There will be an increase in the demand for potable water, which will result in a greater need for the treatment and recycling of wastewater. Countries like Singapore, Australia and Namibia, and some states in the USA such as California, Virginia and New Mexico, along with several countries in Europe, are already ahead of the game, in some instances, going as far as using recycled water for drinking purposes. While many of us Jamaicans may find the thought of drinking recycled water repulsive, we must admit, that these countries have proven that purified wastewater can help to ease water shortages.

Wastewater is the flow of used water discharged from homes, businesses, industries, commercial activities and institutions. Its treatment involves several processes to achieve the desired water quality objective through physical, mechanical, biological and chemical methods. In addition to drinking recycled water, treated wastewater can be used for a number of other purposes. Hotels and business establishments in Jamaica are already using recycled water to irrigate golf courses, lawns and even vegetable gardens. However, treated wastewater can also be used as processing water in manufacturing establishments, to recharge groundwater aquifers, to cool power plants and towers, and to mix concrete.

Rural Water Supply Limited, formerly known as Carib Engineering Corporation Limited, understands the great role water plays in society and the importance of reusing water to solve the scarcity of this commodity. Over the past 30 years the company has undertaken numerous projects that are geared to providing sustainable solutions to the water and wastewater challenges that Jamaica faces.

These projects include, but are not limited to, the development of Rainwater Harvesting Systems and Potable Water Supply Systems. We are dedicated to improving the basic sanitary/ health conditions by increasing access to potable water and sanitation services across the island.

In addition to developing water supply projects, Rural Water Supply Limited also provides services in designing, rehabilitating and managing the construction of wastewater treatment plants for housing developments. We have brought these new and existing systems to the standards insisted on by the National Environment and Planning Agency (NEPA), the National Water Commission (NWC) and the Ministry of Health (MOH).

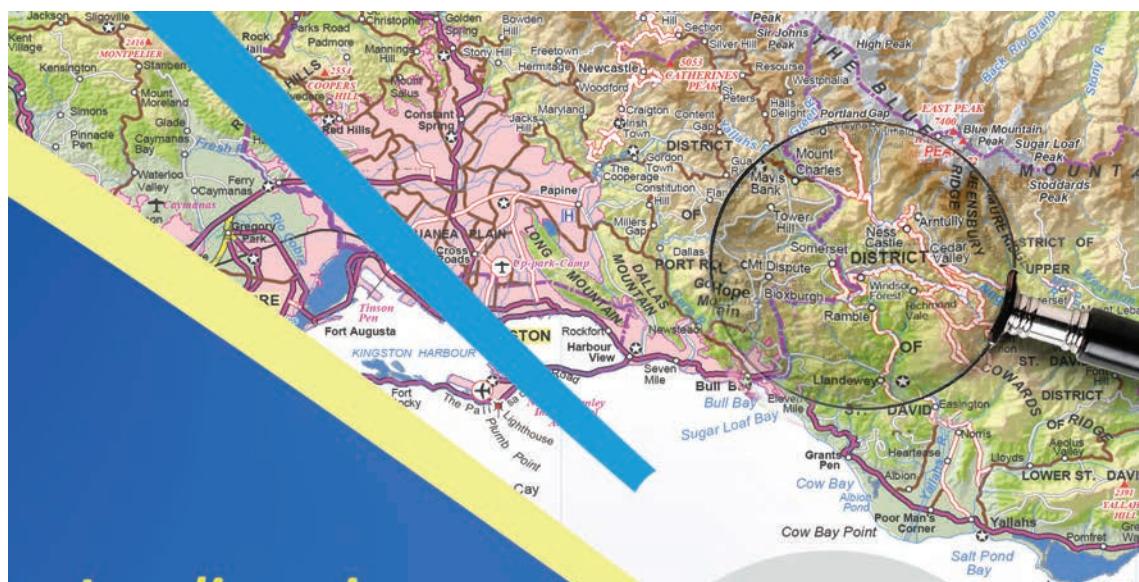
In an effort to meet the water needs of Jamaica, Rural Water Supply Limited, through its Rainwater Harvesting Programme, has implemented numerous systems across the island. In addition, the company has assisted several schools in implementing small rainwater harvesting systems which provide water for their sanitary facilities after being treated. In some cases, small wastewater systems inclusive of septic tanks and reed beds have been implemented in these very schools.

Rural Water Supply Limited stands in support of innovations that address the imbalance between water demand and supply and will continue to make strides in meeting the water and wastewater needs of Jamaica.

Chantelle Coley
Project Engineer
RURAL WATER SUPPLY LIMITED



Beacon/ Little Park Irrigation Pumping Station, St. Elizabeth



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Making Water Available



Courtesy of JIS

The climatic and hydrological systems are tightly related and any induced changes result in chained interactions. After our independence in 1962, the management of Jamaica's water resources entered an important phase and, the recognition of the need to control the use and extraction of water, particularly from wells along our Southern Plains was pivotal.

Jamaica being the land of wood and water is not devoid of available water resources; it is the distribution that is primarily problematic. Notwithstanding this, in considering the impact of climate change on water resources, issues such as availability and quality are high on the list.

Impacts such as saline intrusion, reductions in aquifer levels due to reduced inflows, greater variability in rainfall, longer dry periods, and more intense rainfall events are not new. Our freshwater resources are primarily based on surface flows from rivers and streams, and underground flows from wells and springs. The bulk of our water resources are contained in our groundwater systems that now supplies approximately 80% of all our water demands.

The availability of freshwater is a major limiting factor to economic and social development in island states such as Jamaica. When one considers the priorities of the Government – Economic Growth and Job Creation – addressing the impact of climate change takes on greater significance for this life sustaining sector.

Without adequate, reliable and suitable water resources, our tourism, mining, industrial and commercial sectors will fold. Our food security will become threatened since our agricultural sector is primarily rainfall fed. The health sector will experience even greater strains.

For example the Kinston Metropolitan Area has two major raw water storage facilities, both are located in St. Andrew and both are extremely sensitive to climatic conditions. The Mona Reservoir, with intakes at the Hope and Yallahs/Negro Rivers, has a storage capacity of 3.67 million cubic metres (MCM). The Hermitage Dam, with intakes at Ginger River and Wagwater/Morsham Rivers, has a storage capacity 1.78 MCM. The inflows to both reservoirs are highly sensitive to changes in rainfall and precipitation patterns. Human activities within the upper watersheds also impact the reservoir's supply capacity.

CONTINUED ON PAGE 8>>>

WORLD WATER DAY 2017



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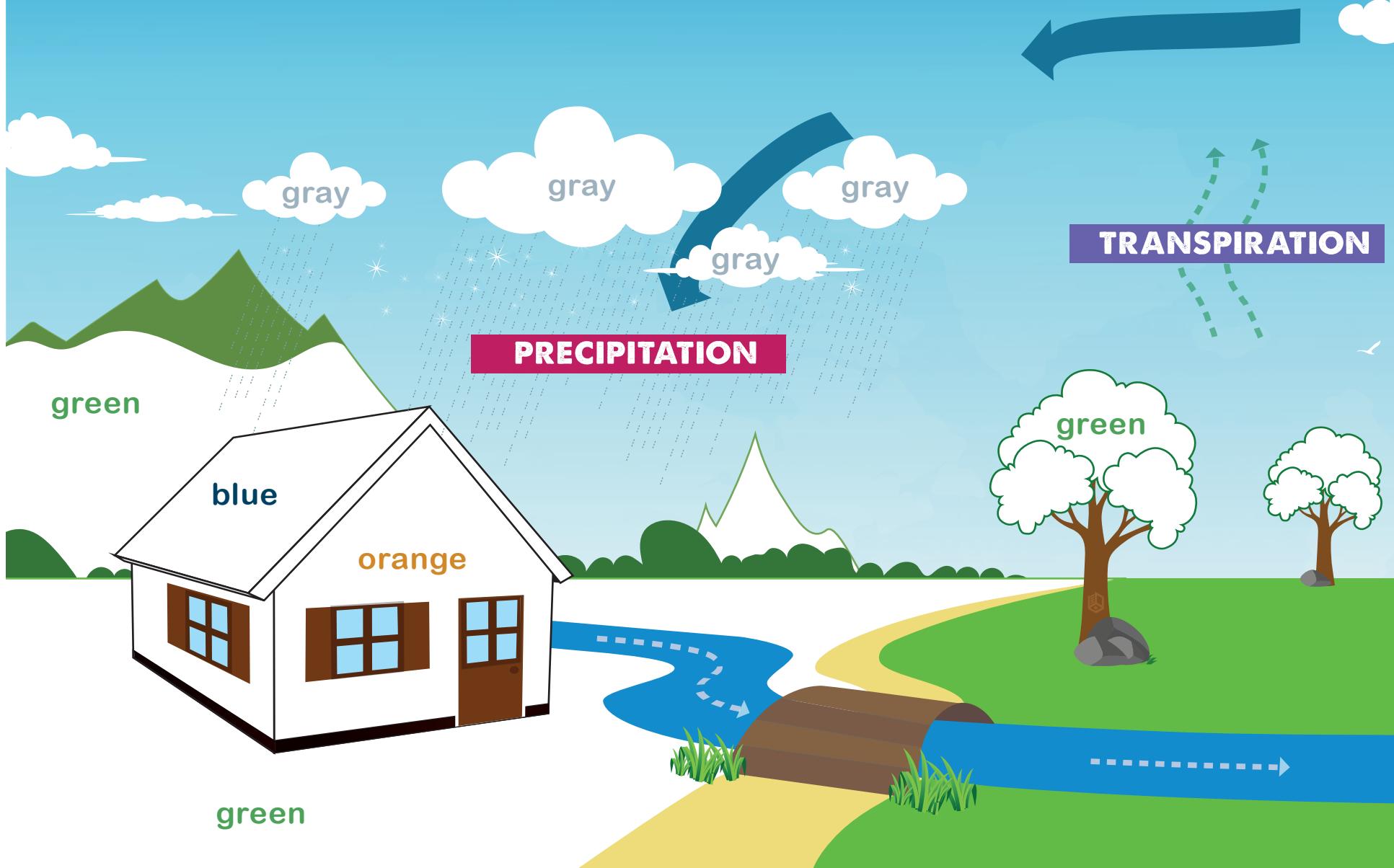
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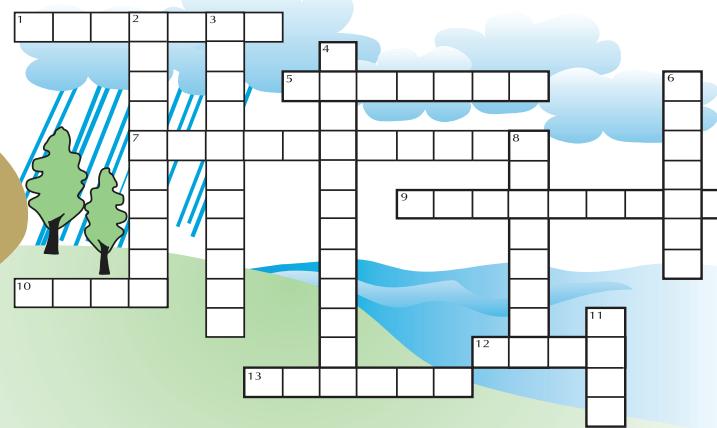
WORLD WATER DAY 2017

THEME: WATER AND WASTEWATER

How much do you know about the water cycle?



WATER CYCLE CROSSWORD



Across

1. Layers of soil, sand, and rocks that store groundwater.
5. To contaminate, to become unclean.
7. Water that is found underground in the cracks and spaces in the soil, sand, and rocks.
9. Groundwater leaves the ground and enters a lake or stream in a _____ area.
10. An example of precipitation.
12. A pipe in the ground that is used to remove water from an aquifer.
13. Water on the earth's surface which moves into a lake or stream without absorbing into the soil.

Down

2. The largest use for groundwater is _____.
3. The stage of the water cycle when water changes from a liquid to a vapor.
4. Clouds are an example of this.
6. A long period of dry weather could cause a _____.
8. In the water cycle, when water soaks into the soil.
11. The movement of water underground is called groundwater _____.

CROSS: 1. AQUIFER; 2. IRREGULATION; 3. EVAPORATION; 4. CONDENSATION; 6. DROUGHT; 8. RECHARGE; 11. FLOW
DOWN: 2. POLLUTE; 3. GROUNDWATER; 4. CONDENSATION; 6. DROUGHT; 8. RECHARGE; 11. FLOW
ANSWERS: 1. AQUIFER; 2. POLLUTE; 3. GROUNDWATER; 4. CONDENSATION; 6. DROUGHT; 8. RECHARGE; 11. FLOW

KID'S ACTIVITY CORNER

For this activity
you'll need:

- x Crayons
 - x Pencils
 - x thinking caps

Funstructions:

1. Use your crayons to colour all the sections of the water cycle with the colour that matches their labels.
 2. Complete the activities below.

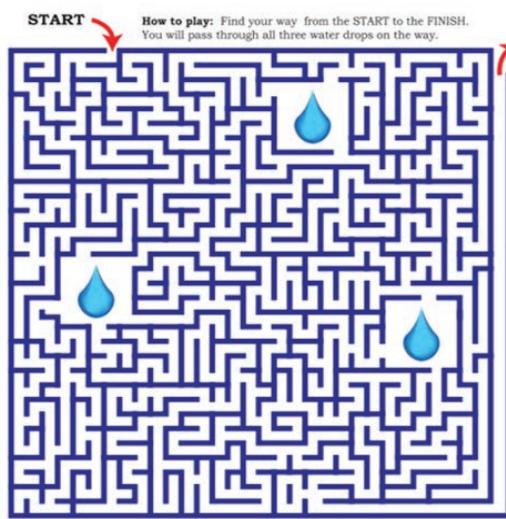


CONDENSATION



sky blue

WATER MAZE



UNSCRAMBLE ME!

vOri Cebor
ewN ahvSanna
irversD
Roi euoVN
CPearn
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Winners in the Water Resources 2017 Essay Competition

HOW DOES IMPROPER/POOR WASTEWATER TREATMENT IMPACT OUR HEALTH?

Water is one of the most important substances needed for the existence and good health of humans and all living things on earth. With water covering over 70% of the earth's surface, and making up over 60% of the human body, water is clearly needed for life on earth. Human, plants and animals must have water to survive, but apart from human drinking water to survive, they use water for many other purposes.

Wastewater is water that has been contaminated by human activities, such as bathing, dishwashing, doing laundry, fertilizing crops, and flushing the toilet. The contaminants include soaps and detergents, cooking oils, pesticides, paint, gasoline, pharmaceuticals, solid waste and, of course, human waste (faeces and urine along with used toilet paper and wipes). In its strictest sense, the term SEWAGE refers to the subset of wastewater that includes faeces and urine. It can, however, be used to mean wastewater in the broad sense. Wastewater can be produced from domestic, commercial, agricultural and industrial activities. This usually carries harmful contaminants, such as, pathogens (bacteria, virus and parasites), organic pollutants, suspended solids, nitrogen compounds, phosphorous compounds and heavy metals, and when discharged into the environment, without treatment, it becomes a health hazard. For example, the wastewater can pollute surface and groundwater sources, causing unpleasant odour for humans, and can damage plant life.

The effects of wastewater on life depend on which harmful materials are contained in the wastewater. Wastewater can cause death of aquatic animals, disrupt

the food chain, cause diseases, and destroy the ecosystem.

When harmful particles get into the sea, it can lead to numerous infectious diseases. These diseases can be contracted and spread through swimming and the consumption of seafood. Pollutants are eaten by tiny fishes, and when killed, they are eaten by larger fishes. These larger fishes are then consumed by humans. Humans can get diseases, such as, hepatitis, tuberculosis and cholera from eating poisoned seafood and drinking contaminated water. The water that humans drink comes from sources, such as a river, and must be properly purified to protect against water-borne diseases.

The interaction of plants can be affected by the pollutants in wastewater. When wastewater, sometimes containing heavy metals (lead, arsenic, chromium, zinc, cadmium, copper, mercury and nickel), gets into the soil accidentally from overflowing sewage, improper disposal of pesticides, fertilizer, agricultural run-off, and industrial chemicals, or the use of wastewater to irrigate food crops, the effects can be severe and widespread. Both humans and animals feed on these crops, and will consume the toxic minerals absorbed from the soil, resulting in poisoning and/or reproductive problems.

Written by: Jade Green
El Instituto de Mandevilla Preparatory School

- Wastewater treatment is important as it one of the ways in which we can conserve water and utilize it for other useful purposes. Wastewater is water that is polluted or really used water. The water is polluted by soaps and detergents, cooking oils, pesticides, paint, gasoline, seawater, pharmaceuticals, solid waste and human waste (feces and urine). Wastewater comes not only from our homes but from business places and industries. Treated wastewater is wastewater that was treated in a wastewater treatment plant to reduce pollutants including the odor, so that it can be usable. Treated wastewater is used for agricultural irrigation purposes and it helps people by supplying water for purposes that does not need fresh water, freeing up the fresh water for important purposes such as for drinking water. Most important is that wastewater treatment and its use protect health as poor treatment can spread diseases and pollute drinking water sources. If wastewater is not properly treated, then the environment and human health can be negatively affected. This essay will focus on the impact of improper wastewater treatment on our health.

- When poorly treated wastewater affects water that is used as a source of drinking water, there can be serious health risks. We can catch diseases from treated wastewater either directly such as swimming in polluted water or indirectly, contact with animals or insect carriers. Wastewater contains pathogens that are dangerous to humans. These pathogens include bacteria, viruses, parasites and fungi which can cause respiratory infections and other symptoms which can be life threatening. Some diseases which can be due to wastewater include typhoid, dysentery, gastroenteritis and cholera. Viruses such as Hepatitis A, polio and viral gastroenteritis can also be contracted from viruses in wastewater. Some of these diseases spread quickly and in communities where there are many people living closely together, outbreaks can occur especially in developing countries like Jamaica.

- Written by: Nickolai Newman,
St Peter and Paul Preparatory School

Water is too precious to waste

Wastewater can be recycled/reused as a source of water for a multiple of water-demanding activities such as:

- ↳ Agriculture
- ↳ Aquifer Recharge
- ↳ Aquaculture
- ↳ Flushing of Toilets
- ↳ Industrial Cooling

Making Water Available

<<<<CONTINUED
FROM PAGE 5

Climatic extremes will severely affect availability of water resources. Extreme weather events such as temperature changes, hurricanes and droughts, will decrease water availability for mining, household and agriculture activities and affect the current and future food and economic security of the parishes of the island.

To support the GOJ approach to nation building, Jamaica has embarked on a number of initiatives aimed at building resilience in the water sector. These include the development and implementation of

- an integrated water distribution system capable of moving water from areas of surplus to areas of deficit;
- integrated watershed management systems to improve the quality and quantity of available water resources through integrated sectoral action involving agriculture, tourism, water, and environment, along with the support of local government;
- Scaled up efforts to harness the potential of rainwater harvesting to increase the capture and storage of a very precious resource.

Working together we can achieve a dynamic, integrated and protected water resource system that supports economic growth and the provision of jobs. Failure to do so will have serious consequences, especially for the poor and vulnerable, and will ultimately undermine any economic growth and human development prospects for future generations.

If the Clouds can use Wastewater... so can you.

On this World Water Day when the campaign focuses on reducing and reusing wastewater, we take the opportunity to learn from nature how to exploit wastewater for a global benefit.

Wastewater recharges oceans, lakes and rivers via surface runoff and groundwater. Most of the water vapour in the atmosphere comes directly through evaporation from the surface of these waterbodies. Clouds are formed when water vapour in warm air rises and condenses as water droplets to form cotton ball-resembling structures in the sky. Rain falls when water droplets in a cloud become heavy enough to overcome gravity and deposits fresh water to the earth.

So, from evaporation to rainfall, wastewater is a great foundation resource in the ultimate global distribution of fresh water. On a daily basis the hydrological cycle is making use of wastewater so why are we not exploiting wastewater more in our daily living? There are valuable nutrients and recoverable material being lost every day in wastewater. Globally, over 80% of the wastewater generated in our homes, cities and industry flows back to nature without being treated or reused

The Value of Wastewater

Wastewater is the collective term used to refer to all types of used-water and water-borne wastes that are generated in a human community although it is sometimes used almost interchangeably with the term sewage. Sewage or black water consists of faeces, urine and associated water from toilets. Industrial and institutional wastewater and storm water flows are not sewage but are wastewater.

Historically, wastewater management has always been seen mainly as a public health imperative critical to protecting public health from diseases such as cholera, typhoid, dysentery, etc.; protecting the natural environment and aquatic eco-systems including rivers, lakes, seas and coral reefs.

Wastewater systems were seen as necessary and costly, but a nuisance nonetheless that most people would rather not talk about. That view however is changing. More and more, wastewater management is being seen as the management of a very valuable resource from which significant value can be extracted.

According to UN Water, "the costs of wastewater management are greatly outweighed by the benefits to human health, economic development and environmental sustainability – providing new business opportunities and creating more 'green' jobs."

The new paradigm sees wastewater as a resource, and its use or recycling after suitable treatment, can provide significant economic and financial benefits.

The wide range of beneficial uses include irrigation and fertilization for agriculture, household or green areas, aquifer recharge for eco-system maintenance and climate change resilience in addition to water and energy sources to meet growing demands. In fact, scientists are now working at how to effectively calculate a specific monetary value to each unit of flow of wastewater.

As Jamaica's primary provider of central wastewater or sewerage services, the NWC is relied upon by more than 500,000 Jamaicans to collect wastewater from their homes every day and to transport it to one of about 70 NWC wastewater treatment facilities across the island.

The NWC recognizes the significant importance and increasing value of treated wastewater effluent and is actively exploring ways in which greater value can be extracted from our wastewater operations. The NWC is therefore investing more in wastewater management and in fact, they spent J\$1.9 B in 2015-2016 expanding coverage and improving wastewater treatment plants. Additionally, they are encouraging the reduction of wastewater generation through water conservation and the re-use of treated effluent and other by-products of the wastewater treatment process.

As studies around the world show, safely managed wastewater is an affordable and readily available source of water with nutrients and other recoverable constituents. The NWC is itself now spending J\$1.5 B to undertake wastewater improvements projects in Boscobel, Ellerton Flats, Bay Farm Villas and several other locations islandwide.

The NWC is moving with the developing global trend that, instead of wasting wastewater, one can actively reduce wastewater and find creative ways of re-using and extracting value from it. For example, in Montego Bay, the NWC is supplying approximately 4544 cubic metres per day [one million imperial gallons per day (1migd)] of treated wastewater effluent to the nearby JPSCo power generation plant at Bogue. NWC provides nutrient-rich sludge from many of its wastewater facilities for use as fertilizer for horticultural and agricultural uses. In fact during the 80's and up to 2000's NWC was supplying sludge to the Blue Mountain Coffee Farmers. The NWC is actively pursuing the expansion of the 75,000m³ per day state-of-the-art Soapberry Sewage Treatment Plant. It is intended to handle all the wastewater generated in the KSA, but more importantly the opportunity for reusing the approximately 150,000m³ of effluent to support agriculture in the South-East St. Catherine plains, and also allows for a valuable resource for industrial purposes being made available for the planned Caymanas Special Economic Zone (CSEZ).

With the continued advances in technology, more and more value can be extracted safely and successfully from wastewater. As climate change and water scarcity becomes more pressing, exploiting this valuable resource to make the water cycle work better for every living thing on the planet becomes even more essential.

(World Water Day Factsheet, 2017).

In our homes, we can reuse wastewater from baths, sinks and washing machines on our lawns and gardens; rainwater collected from our rooftops can be used to wash our vehicles. In our cities, treated wastewater can be used to irrigate green spaces. In industry and agriculture, wastewater can be treated for usage in cooling systems and large-scale irrigation.

Today on World Water Day we acknowledge how clouds use wastewater in the ultimate return of fresh water to the environment and tomorrow on World Meteorological Day using the theme Understanding Clouds, we will celebrate the other roles of clouds, their beauty in the various forms and their inspiration to artists and artistes throughout history.



Financing Climate Smart Measures to Build Resilience to Climate Change

The Financing Mechanisms of the Adaptation Programme and Financing Mechanism (AP&FM) Project Pilot Programme for Climate Resilience (PPCR), Jamaica

The Adaptation Programme and Financing Mechanism (AP&FM) Project is a five-year initiative which is working to help Jamaica build its resilience and adapt to climate change. Component Two of the AP&FM Project has developed two innovative financing mechanisms to provide funds to help small businesses and communities adapt to climate change.

What are the two Financing Mechanisms Available under the AP&FM Project?

A *Climate Change Adaptation Line Of Credit (CCALoC)* is providing low interest loans for climate change adaptation work undertaken by Micro, Small and Medium-sized Enterprises (MSMEs) involved in tourism and agriculture and related businesses. The Line of Credit offers loans from J\$200,000 to J\$5Million to help these businesses adapt to the impacts of climate change. It is administered at a 4% interest rate. The AP&FM project has allocated USD3.5 Million to support this line of credit.

A *Special Climate Change Adaptation Fund (SCCAF)* is providing grants for climate change adaptation, resilience building and disaster risk reduction work by Non-Governmental Organizations (NGO), Community Based Organizations (CBO) and government agencies working at the community level, across Jamaica. These grants range from J\$500,000 to J\$5 Million. Grants are provided through the Environmental Foundation of Jamaica (EFJ). The EFJ issues periodic calls for proposals under the Fund and provides support in proposal writing to help grant applicants develop their climate change adaptation project ideas.

The AP&FM project has allocated USD5.02 Million to support this grant mechanism. The Memoranda of Understanding and a Fund Administrator Agreement governing the operations of the CCALoC and the SCCAF were signed in July 2016.

Why does Jamaica need Financing Mechanisms for Climate Change Adaptation?

Climate change impacts pose a serious threat to economic growth and development and to a number of key sectors in Jamaica including agriculture, tourism, health and water. Longer dry seasons, drought and bush fires associated with climate change are a threat to farmers. Warmer seas, stronger storms and sea level rise threaten the livelihoods of fishermen. Sea level rise and stronger hurricanes put coastal resources and infrastructure including hotels and beaches at risk.

Small businesses – including small farmers and fisher folk- as well as communities grapple with these challenges which exist at the national and the local levels. They also struggle to gain access to resources to build their capacity to withstand the impacts of climate change and recover from associated natural disasters. They need funding to help them be better able to adapt. The financing mechanisms are assisting small business owners and local level community groups to secure the funds needed to finance adaptation measures.

What other support does the AP&FM Project provide?

The AP&FM Project is a part of the Pilot Programme for Climate Resilience (PPCR) in Jamaica. It is being implemented by the Ministry of Economic Growth and Job Creation with USD19,869,963 in funding, provided by the Inter-American Development Bank (IDB).

Through Component 1, the project is helping the Government of Jamaica mainstream Climate Change adaptation measures in development planning and processes at the local, national and sectoral levels. Activities include training for climate change focal points in government Ministries, Departments and Agencies and the development of climate change adaptation strategies and plans for key sectors including water, health, tourism, human settlements and coastal resources.

The project is also working to implement adaptation measures in target communities in the vulnerable Upper Rio Minho Watershed Area in Clarendon. These measures include establishing check dams, shade/green houses and rainwater harvesting systems and the introduction of climate resilient agricultural techniques.

How can I get more information about the Financing Mechanisms and other activities of the AP&FM Project?

The Project Management Unit
AP&FM PPCR Project
Ministry of Economic Growth and Job Creation
16a Half Way Tree Road
Kingston 5
Tel: (876) 633-7500

Artificial Groundwater Recharge

As a baseline let us consider that the exploitable surface water runoff (reliable yield) is 666 million cubic metres per year (MCM/yr) while the exploitable ground water (safe yield) is 3419 MCM/yr. Jamaica's water production in 2011 was estimated to be 917 MCM/yr or 22.4% of the island's total exploitable water resources. Of this amount, surface water contributes 8% of production and groundwater contributes 92% of production, which is approximately 840 MCM/yr. (1MCM = 264 million US Gallons). This aptly demonstrates our reliance on groundwater. Despite these heartening figures, that clearly indicates that we are not tapping into the full potential of the exploitable water resources. Care regarding allocation, abstraction and quality control must be constantly exercised. Among the contaminants that can compromise groundwater is saline intrusion, caused by the replacement of fresh groundwater with ever increasing amounts of seawater. Since even groundwater flows towards, and interfaces with the sea water, localized over-pumping of wells can pull saltwater into an aquifer, resulting in loss of use of a well. Wells located on the south coast of the island, where water demand and groundwater pumping is highest, are highly susceptible to depletion if withdrawal rates exceed replenishment rates, and to saline intrusion.

The purpose of managed artificial recharge (MAR) of groundwater is to reduce, stop and even reverse the declining levels of groundwater; to protect against saline intrusion; and to store surface water for later use. Note that advantages to storing water underground include: reduced evaporation, reduced algal bloom, reduced loss of land area and reduced need for pipelines since the aquifer can naturally transmit water over the great distances of its expanse to points that may be closer to areas of greatest need. While there are several sources of water available for groundwater recharge, such as floodwater, surplus river-flows and reclaimed municipal wastewater, the attendant costs involved in pre-treating floodwater and wastewater oftentimes militate against those sources being first-choice.

The vulnerability of the aquifer in the southeastern area of St Catherine, and the importance of that aquifer to water production for the burgeoning satellite communities within the Kingston/ Spanish Town dual metropolis has been recognized. Thus, major players in the water/construction industry have pooled resources to construct, at Innswood, St. Catherine, a Managed Artificial Recharge system

(MAR). These entities include; The Water Resources Authority - WRA (Regulators), The National Water Commission - NWC (Utility company), The Rural Water Supply Ltd - RWSL (Design & Project Management), The National Irrigation Commission - NIC (Source water providers), M&M Jamaica Ltd - M&M (Contractors) and the Inter-American Development Bank - IDB (Funding Agency).

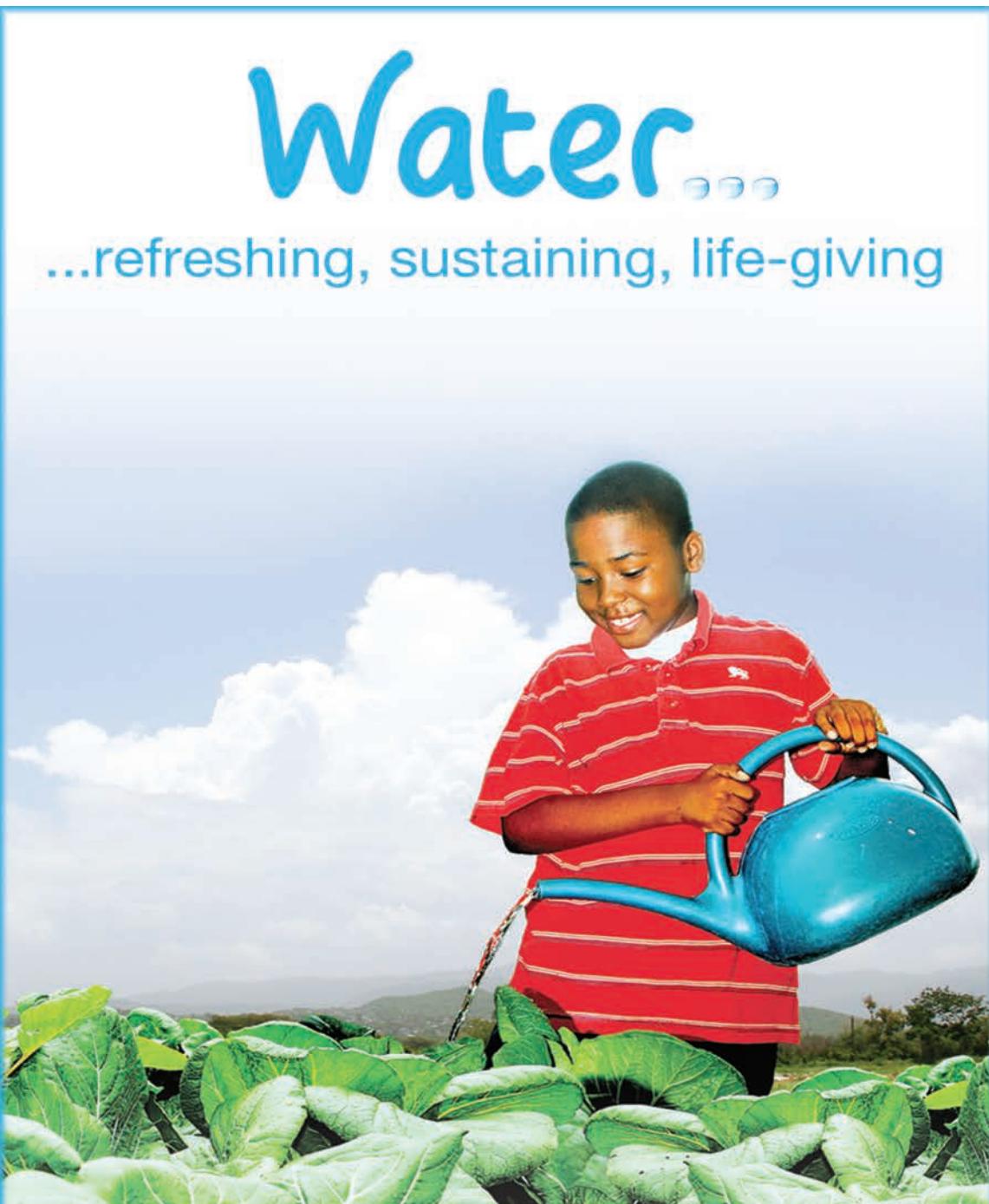
The Innswood MAR is the only system of its kind in the Caribbean. Constructed in 2016, it is designed to take off surplus water from the Rio Cobre Irrigation Canal System. This surplus water is diverted via 1km of 800mm diameter steel pipeline into a treatment facility that can treat up to 36,352 cubic metres of water per day (8 million imperial gallons per day). Treatment consists of: screening at the take-off point where large debris are trapped; 4 large Sedimentation Beds where smaller particles are allowed to settle to the bottom of the ponds; and 8 Wetland Beds where cultivated reeds and marsh plants remove nutrients (nitrogen, phosphate & potassium). Another 1km of 800mm diameter steel pipeline then conveys the treated water to the injection points, that are comprised of 3 sinkholes and 2 abandoned wells. Between the wells, (which clearly enter the aquifer, since they previously drew water from the aquifer), and the sinkholes, (located in fractured limestone), the recharge process is Direct-Injection.

The end result is that the Innswood MAR will fulfill the 3 main purposes of an artificial recharge system as it will reduce the declining levels of groundwater, protect against saline intrusion, and provide a bank of fresh water that is readily available to the attendant wells that it serves. Additionally, it provides an ideal study tool for the WRA who will monitor and log the aquifer's response to the enhanced recharge.

Future consideration must now be given to: replicating this system in other areas where similar topographical/geological conditions prevail that can store a ready supply of surplus surface water; alternative designs for riverbank/sand-dune filtration of polluted river water; wastewater reuse of high-quality treated effluent.

Of course, while using wastewater for aquifer recharge raises issues of water rights and possible compromise of groundwater quality, a time may come when very serious consideration will need to be given to that option. This year's theme for World Water Day – Wastewater, provides food for thought that sharply directs our attention towards accelerating further measures for wastewater reuse.

Peter Clarke
Deputy Managing Director
Water Resources Authority
(Project Engineer for the construction of the Innswood MAR)



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From Forests to Faucets: The Role of Forests in Safeguarding our Water Supply

The adage says, 'water is life', and it is the right of every individual to have access to clean and safe water for domestic use and other purposes. Our forests play a very important role in this by protecting and sustaining water quality, water flows, and by ensuring the health of our watersheds.

Watersheds are areas of land that catches rainfall and other precipitation that runs off into streams, rivers, lakes or underground. Forested watersheds offer a wide array of benefits including slowing storm water runoff, recharging our aquifers, and helping to filter pollutants. When it rains, the leaves of trees help to break the fall of water to the ground reducing the impact on the soil and preventing it from washing away. The roots also aid in this process and allow the water to percolate into the soil to recharge groundwater supply which is later released into our rivers and streams. This also helps to reduce sediments and pollutants in the water and makes it easier and less expensive to provide potable water to the public.

Unfortunately, the future of these natural sources of high quality water that we enjoy and depend on is threatened by some human activities that deforest and degrade the forests and negatively impact the watershed and its resources. One such activity is the use of the 'slash and burn' method to clear land for farming. Fires started as part of this activity often spread to the forest and cause significant damage to its resources. These activities result in deforestation and forest degradation, and has a negative impact on the quantity and quality of water that the watershed supplies.

As the Forestry Department joins in celebrating World Water Day, we encourage you to learn more about the role of forests in ensuring a high quantity and quality of water supply from our watersheds and also what you can do to ensure that Jamaica remains the 'Land of Wood and Water'.

Young NCU Innovators use Hydroponics for Increased Agricultural Production

Northern Caribbean University, NCU, students Orlando Hamilton, Roshane Dryden, Yanque Yip and Moses Miller are in the business of creating new technologies in agriculture.

"SOTARE Agricultural Innovators is a team of aspiring scientists who are interested in providing an alternative method of cultivating yam, sweet potato and other root tubers. Our system is called the 'Rootube'", says Chief Executive Officer Yanque Yip.

Rootube consists of fully customised tubes that will enhance the growth rate, quality and quantity of yam production by incorporating hydroponics as a substitute for soil. It provides maximum efficiency on all the resources needed to grow the yam (water, light, nutrients and air).

This innovation will minimise land use, reduce pest pressures, provide consistent yam shape, size, and guarantees quality produce that is suitable for the export market.

Unlike the traditional method of yam production, this technological method is very easy to monitor and does not rely on the environment for production. "We have gotten a great interest from younger farmers (22yrs to 39), female farmers, greenhouse farmers and aspiring agriculturalists who would love to transition to this mode of yam production given that traditional yam production is often extremely labour intensive and can be costly", stated Yip.

While the Rootube has not been utilized in production the students are currently conducting experiments at NCU.

"We have supporting evidence that it will work based on several experiments that were done particularly in Nigeria, where yam growers use the Aeroponics system in agricultural production" declares Yip.

SOTARE Agricultural Innovators will enter the National Business Model Competition, March 23- 24, 2017.



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WASTEWATER AND AGRICULTURE | Basil Fernandez

Introduction

In many regions of the world in water scarce urban and peri-urban areas and where the composition for water is high wastewater is used for agricultural purposes. There are key drivers for the use of wastewater in agriculture both in developed and developing countries. Rapid population growth and high urbanization rates, particularly in cities of developing countries, increased water scarcity and stress, agricultural water demand for food production and as a strategy to mitigate the impacts of climate change are some of the drivers. These key drivers influence current and future volumes of wastewater production, treatment and use. In many places the main driver for reclaimed wastewater use is water scarcity. The main objective when using reclaimed water as opposed to untreated wastewater is health and environment protection. This is a common and standard procedure in some countries such as Australia and Israel, where highly effective sanitation and treatment technology can be found. This is costly but reduces risk to a minimum.

Poverty is also another key driver that significantly influences the use of wastewater. In dense and rapidly growing areas where an ever-increasing volume of wastewater is being produced and financial and infrastructural capacities constrain the establishment of comprehensive wastewater management system for collection, treatment and use of wastewater, the untreated wastewater is used.

Types of Wastewater

The wastewater used for agricultural purposes has many different sources and qualities.

The types are:

1. Urban wastewater consisting of :

- domestic effluent with black water (excreta, urine and sludge) and grey water (kitchen and bathroom) wastewater
- Effluent from commercial establishments and institutions including hospitals
- Industrial effluent
- Stormwater and other urban runoff

2. Treated wastewater that has been processed through a wastewater treatment plant to reduce its contamination by hazardous substances

3. Reclaimed or recycled water is wastewater that can be used under controlled conditions for beneficial use such as irrigation.

4. Grey water is generated from households and is particularly suited for reuse by treatment for irrigation. Grey water is an important component of water conservation. It offers great potential as an economic and resource conservation component of Integrated Water Resources Management (IWRM).

Categories of Wastewater Use.

As there are different types of wastewater there are different ways to use wastewater. They include:

1. Direct use of untreated wastewater from a sewage outlet onto lands used for cultivation
2. Direct use of treated wastewater for irrigation and aquaculture after treatment

3. Indirect use of treated and untreated wastewater occurs when water from a river receiving treated or untreated wastewater is abstracted by farmers for agricultural uses.

4. Planned use of wastewater which is the conscious and controlled use of wastewater either treated or untreated.

Benefits and Risks of Wastewater Use

While there are benefits to using wastewater, there are also several risks. This depends on the composition and the treatment it has undergone. Potential risk impacts are:

1. Public Health: Wastewater has the potential to cause diseases as it contains bacteria, viruses and parasites.

2. Crops: While wastewater is economically viable due to its nutrient load, too high a chemical composition can be toxic to plants.

3. Soil resources: Accumulation of phosphorus, nitrogen, dissolved solids and other constituents (from the wastewater) in soil affects its productivity

4. Ecological impacts: Drainage from irrigation systems into water bodies such as ponds or rivers can impact aquatic life.

5. Social impacts: The use of wastewater in agriculture has different social impacts on food safety, health and welfare, quality of life and sustainability of land use.

Jamaica's Experience

In Jamaica experiments with the use of treated wastewater have been done in the South St Catherine Area. Wastewater from the Independence City sewage plant was used to irrigate sugar cane at Caymanas while wastewater from the Portmore pond system was used to irrigate Sorghum at Salt Pond. In both cases plant growth and crop yield was very high and the experiments were deemed to be successful. However, farmers continue to object to the use of wastewater even when highly treated. The biggest obstacle to the use of wastewater in Jamaica is the "culture" of irrigators. However, as the impacts of climate change gets more severe with increased temperature and reduced rainfall we will have no choice but to use wastewater in agriculture while restricting the use of high quality ground and surface waters to meeting the residential water demand.

The Central Wastewater and Treatment Company (CWTC)/NWC's Soapberry Treatment system alone has the capacity to supply over 100,000 cubic metres per day (25 million imperial gallons per day) of treated wastewater for irrigation of the south St Catherine Plains. The quality of the wastewater however has to be improved and the CWTC/NWC are moving to expand and upgrade the Soapberry system.

Wastewater is a valuable water resource that Jamaica is not now using. The economic potential of this wastewater, if properly treated, on economic growth and job creation is far too high for this resource to remain unused.

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