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Management of Water in the Rural Households of Papua New Guinea

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ABSTRACT:*Water is vital for all living things. This natural resource is scarce and susceptible to pollution mainly due to the unplanned human activities which may lead to water-borne diseases if not treated for human consumption. This paper reviews the major ways of preserving the environment to support annual rainfall, methods of utilizing water wisely in the rural households of Papua New Guinea and treatment of used water for recycling. Human activities rely on the water without which life is impossible. Thus our responsibility must be recognized to preserve this precious natural resource for continuous household utilization; sustainable eco-friendly environment; and protecting human life from water-borne diseases.*
KEY WORD*: Water, environment, natural resource, life*

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I. INTRODUCTION

Water is an essential natural resource that sustains the quality of human life and the ecosystem. Despite it is unevenly distributed in some regions of the world. About 2.1 billion people across the world do not have access to clean water and 4.5 billion people lack improved sanitation facilities [1]. Water is scarce in Papua New Guinea (PNG) which is one of the South Pacific countries receives average rainfall 1000 – 8000 mm per annum [2]where more than half of population still lack potable water [3]. Rural households of PNG live on unprotected water sources such as lakes, ponds, rivers, streams, and swamps. The quality of water supplied through these sources is already degraded due to continuous unplanned human activities and climate change.Population growth, increased demand for water, overuse of land, and waste disposal are detrimental to the environment. It deteriorates the capacity of the land to produce water.More than 90% of people in rural areas remain underprivileged in getting safe water supply [4] that causes an adverse impact on public health and economic progress. Prevalence of water-borne diseases among rural children has increased and led to poor attendance in schools and higher mortality rate at the national level [5].Water PNG is responsible for providing affordable safe water and sanitation facilities to rural households. However considerable improvements are yet to be achieved to promote water and sanitation services [6]. Individuals should also recognize their responsibility to protect the environment and water sources since water pollution reduces the quality and quantity of water available for households. The aim of this paper was to review the effective management practices of water in the rural households of Papua New Guinea. The academic literature and technical reports were critically analyzed to ascertain the methods of preserving the environment for optimum rainfall, wise consumption of water and reuse of treated wastewater.

II. CONSERVATION OF ENVIRONMENT

Papua New Guinea has a beautiful landscape in which the majority of people involved in farming, hunting, and gathering of wild species for their livelihood. Unconventional farming and land management practices disrupt the fragile ecosystem. Loss of topsoil, nutrient depletion, and water pollution further aggravate the environment. Deforestation is an on-going process that affects the living standard of the ever-growing population. The demand for natural resources especially access to the improved water source is becoming high. The rapidly increasing population impairs the quality of water on which life sustains [7].Overuse of land for farming depletes the nutrients present in the soil. Fertilizers used to enrich the soil contaminate the water sources. Deforestation also causes soil erosion, water pollution and global warming that significantly influence annual rainfall [8].Rain is the primary source of water for the land and people. Dams, reservoirs and other secondary water resources depend on rainwater. Households are getting water from these catchments through pipelines. In rural villagesofPNG, only 20% of households are connected with treated pipe water [2].Water is a

basic need for human beings. It is necessary for everyday domestic activities such as bathing, cleaning, cooking, drinking, gardening, and washing. If water is unavailable the dwellers visit public water resources for swimming and washing thereby water is being contaminated to a greater extent. They also fetch water home for other domestic purposes. It puts a lot of pressure and stress on people especially women and children. It decreases their productive time and increases health hazards if the water is not treated and stored safely for consumption. Boiling, filtering and chemical treatment of water are quite common however expensive in terms of resources [9]. Hence treatment of water is not envisaged by rural households. Further boiling requires fuel and reduces the amount of water fetched. Emerging demand for fuel gradually removes natural resources from the forest and exacerbates the environment.

The safe water supply could be obtained by all residents if the water is abundant in the country. As the first step towards getting optimal annual rainfall, the natural environment should be preserved. Prevention of human-induced land and water degradation promotes water productivity and quality. Healthy soil and clean water are the fundamentals of a balanced ecosystem. By changing agricultural practices fertility of land and availability of water can be retained. Reforestation, terraces, and mulching reduce erosion, retain moisture and enrich soil [8].Water absorbing crystals added to soils can retain water longer [10]. Fishing, swimming, washing and throwing off rubbish onto open water sources minimize the quality of water and affect its inhabitants. Open defecation, domestic animal wash and wastewater from industries worsen the ecosystem and endanger the indigenous species that are valuable for sustainable biodiversity. Rain-induced landslides cause great damage to agricultural lands and water resources. Clearing away of riverbanks for the developmental activities results in soil erosion and soil deposition in the waterways [2]. Polluted water lessens its availability to humans for physical and economic development.

III. WATER CONSUMPTION

Water scarcity can be addressed through wise water consumption at households. Rainwater stored in drums and tanks through gutter could solve water-related issues at homes. It reduces the number of walks to fetch water from the public water resources. Rainwater is used for all domestic purposes such as cleaning, washing, and irrigation. Filtered rainwater is also be used for cooking, brushing, and bathing. Boiled and filtered rainwater is stored in sterilized containers for drinking. Rural households that have pipe water facility can minimize their water utilization bypracticingthe methods as follows. The water tap in the kitchen sink, shower and washbasin should not be opened fully. Keep quarter or half-open as required for the specific task to complete. Most of the domestic tasks do not need more water supply however for fun or practice of doing that way people always perform household chores using a lot of water. Instead of washing fruits and vegetables in the running water over the kitchen sink it can be done in a bowl of water to reduce water consumption immensely in the food preparation area. It is good to cool down dishes by leaving them in the refrigerator instead of doing it over the kitchen sink by running water over it. Frozen foods should not be thawed under a running tap. Instead, it must be defrosted in the refrigerator [11].The water flow rate in the kitchen tap can be controlled by installing a regulator that reduces the flow. A water-saving showerhead attached to the tap in the kitchen sink could thoroughly wash and rinse the cooking pots and dishes with less amount of water[12]. Dishwashing can also be made in the kitchen sink filled with water and few drops of liquid soap. Here the dishes are inserted first in soapy water for brushing and then sink is drained to fill in the water again for rinsing the dishes. Water consumption is comparatively minimum in this two-way process of dishwashing. If a dishwasher is used run to the machine when it is loaded full since it uses 15 gallons per load [11].The kitchen counter, bench and stovetops must be cleaned and wiped off with the damp cloth every day to remove dirt, oil and food stains. If the unattended accumulation of all these, later on, require more water for cleaning. The dining room that has a sink for handwashing must be installed with a push-button or electronic sensor tap [10].The bathroom sink should have a low-volume faucet aerator [11].The tap must be closed tightly when water is not needed while brushing or shaving. Allowing running water partially for lathering in the shower must be avoided. A bucket of water to have bath consumes less water than turn on the shower. Water-efficient showerheads can be the right solution for saving water in the shower room. The inefficient older toilets can be replaced with efficient models that use 3-4 liters per flush. The washing machine must be operated only if fully loaded to conserve water. Front-loading AAA-rated washing machines are water-efficient than standard top loaders. The drips and leaks both indoors and outdoors must be fixed immediately. It is always better to consider installing water sense labelled products to save water at the households. For watering flower, gardens use sprinkler nozzle containers instead of bucket water for maximum water efficiency [10].

IV. REUSE OF WATER

Recycled wastewater is an alternative source of water where demand for water accentuated. Wastewater referred to water that has already been used and remained unwanted. Water used in the kitchen sink and other indoor areas can be reused for gardening and other non-potable requirements. Kitchen, laundry and

shower wastewater is known as greywater. The toilet water is called as blackwater. The greywater is widely reused especially for outdoor purposes. Whereas blackwater requires special treatment before it is accepted for reuse since it contains fecesand pathogens [13]. Hence it is not recommended for the rural households where water treatment system is unavailable. Water used in the sink for washing cereals, fruits, lentils, seafood, and vegetables is a boon for the garden. A pipe can be installed from the kitchen sink to an outdoor garden for the effective reuse of water. The dishwasher and washing machine can also release water to the garden. Detergents used in these machines are not harmful to garden plants, fruits, and vegetables despite proper filtration and treatment can be beneficial [12].Greywater can also be used for washing vehicles and patio. Water from the shower is good for gardening if effectively used with technical advice from experts. Pools at the households tremendously reduce the water consumption where filter backwash schedule is practiced.Water from the pools can either be diverted into the lawns or reused for agricultural lands [10].

V. CONCLUSION

Water is an essential natural resource for a sustainable environment. Water scarcity in PNG is challenging health and economic issues. The health of the human population is fundamental for alleviating poverty and national development. Water PNG implements policies and strategies to combat the water crisis in rural villages. Governmental procedures delay the process of monitoring and controlling pollution of water sources to ensure safe water supply to households. Soared mortality and morbidity rate of water-borne disease can be controlled immensely by individual household through behavior change. Socially accepted irresponsible human activities that spoil water resources need not be practiced.Realizing the importance of wise utilization of water and reuse of wastewater from the kitchen, laundry and shower are paramount. Establishing a basic water treatment plant in the areas that experience water shortage throughout the year flourishes the land and people. Technological advances provide affordable solutions to safe water supply systems. Efficient waste and water management strategies would certainly improve the health and economic status of the rural population.

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