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Municipal Water Resources Management: Evaluation of Water Consumption by Car Wash Facilities in Bauchi Town, Nigeria

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ABSTRACT: Car wash can be defined as a facility used to clean the exterior and in some cases, the interior of motor vehicles. These facilities are common in Bauchi and other cities in Nigeria. They use water as a major input thereby causing serious challenges to water resources management. Car wash facilities in Bauchi depend on municipal water supply by water board. The study aimed at determining the rate of municipal water consumption by car wash facilities in Bauchi. It was carried out by measuring the volume of water used in washing cars by some selected car wash facilities in the town using both bucket and hose methods. The data collected were analysed using statistical method such as random sampling techniques and simple descriptive method like Tables, Figures and mean. The result shows that 1,710,091.2L is withdrawn daily from the municipal water supply by car wash facilities. This is more than the quantity of water serving zone 'L' of the 16-zones of Bauchi Water Demand Zones. It also shows that the use of hose consume 441.2L/day and the use of bucket consume 115.5L/day which indicate that more water is wasted using hose method. Therefore, car wash facilities consume significant amount of water supplied by the Water Board. If the current trend continues and with the proliferation of car wash in Bauchi, there will be water shortage to the populace who are the primary beneficiaries.© JASEM

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Keywords: car wash, Bauchi, input,Water Board, consumption, volume

Introduction

Car wash can be defined as a facility used to clean the exterior and in some cases, the interior of motor vehicles (International Car Wash Association, 2005). According to Evan (2007), 62% of drivers require the services of car wash. There are basically two categories of car wash systems. They include; manual and computer-automated (Evan, 2007). The automated is the type used in Professional Car Wash. Brown (2002) stated that PCW are divided into three broad categories: conveyor, in-bay automatic and self-service

Car wash is a facility that renders needed services because the present day man hardly have time to wash his vehicle among other challenges. It is a source of employment to the unemployed, the entrepreneur and also a source of revenue to government. However, car wash business has some effects on the environment such as contaminating surface water sources. When driving past the city of Bauchi it is glaring to see many hardworking youth trying desperately to keep up with the demand for cars at their disposals. When it is weekend, a long queue of cars is usually formed, all waiting to be washed. Car wash business is perceived by many as a major employment of labour aimed at reducing the rate of unemployed youths in many states (Benedykt, *et al* 2006). They are located almost everywhere within the city. They are found along the busy streets, beside the road junctions, available open spaces and in the filling stations both used and unused. Essentially, majority of them uses hose (pipe) connected to the municipal water systems from which they source their water for their work. Bauchi State Water Board (BSWB) was created and saddled with the responsibility for the provisions of urban and peri-urban water supplies. According to EIA Report (1989) the design capacity is 4500m^3 in 1980 but due to continuously growing population in the State, the Board increased supply to 45,000m^3 per day (10 MGD) in 1991. Again, the rapid urbanization and industrialization in the town also force the Board to further increase it by 10,000m^3 (2.5 MGD) bringing the total supply capacity to 55,000m^3/Day (12.5 MGD) in 2008 (BSWB, 2009). This was to serve an estimated population of 342,000 people. The rise in

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popularity of Hand-car wash business within Bauchi town is a major concern. This business venture draws its source of water from the treated municipal water. Municipal water supply systems require huge capitals to construct and maintain (Lekan, 1989)

The major environmental concern about car wash is in two –folds, excess water usage and pollution of local water ways. (Brown, 2005). In order to save natural resources and still provide a high-quality wash, new car washing technologies must be employed, including reuse of water (Janik and Kupiec, 2007). According to Rasler and Thompson (2006) there are considerable improvement over the years in car wash. Many car washes already use reclamation facility to significantly reduce water usage and a variety of energy usage reduction technologies (Plah,and Delforg, 2001). This practice was mandatory in the regions where water restrictions are in place (Andrew, 2006).There has been a strong move in the industry to shift to safer cleaning solutions and conservation of water (Brown, 2005). Because of these reasons, many car wash facilities are now required by law to treat and /or reuse their water and to maintain waste-water discharge (Andrew, 2006).

The proliferation of car wash will pose serious challenges to water resources management. In line with this fact, this research aimed at finding out the volume of water drawn by car wash facilities from the municipal water supply by Bauchi State Water Board.

MATERIALS AND METHODS

The study was done in Bauchi town, Bauchi local Government area of Bauchi state Nigeria located at latitude 10^0 17^1N and longitude 09^0 49^1E. With a population of 185550.68 (CENSUS DATA, 2006).

The area is drained by river system such as the River Gongola which originates in the Jos Plateau area. It transverses in a southwest – northeast direction through Dass, Tafawa – Balewa, Bogoro, Bauchi and Kirfi and thence to Gombe state. It has numerous tributaries such as Gubi etc. The river Gongola and its tributaries are of great importance to the area, for instance the impounding of Gubi to provide pipeborne water. Mean daily maximum temperature ranges from 27.0^0C to 29.0^0C between July and August and 37.6^0C in March and April. The mean daily minimum ranges from 22.0^0C in December and January to about 24.7^0C in April and May (Wikipedia 2015).

The sunshine hours ranges from about 5.1 hours in July to about 8.9 hours in November. October to February usually record the longest sunshine hours in Bauchi.

Humidity ranges from about 12% in February to about 68% in August. The rainy season months are May to September, when humidity ranges from 37% to 68%. Monthly rainfall ranges from 0.0mm in December and January, to about 343mm in July. Onset of rain is often in April while they end virtually by October (Wikipedia, 2008).

Data Collection: This research was done using random sampling techniques and simple descriptive method such as Tables, Figures and mean. Materials needed include an open container (20litres), stop watch, flow rate metre, and a hose (5/8II). The research was done in two methods: Bucket and Hose Methods. The former used an open container while the latter, a meter was installed so as to record the volume of water passing through the pipe.

Bucket method: water from the tap was poured into the calibrated Buckets of 20litre and the operators used the water to wash the cars. Time taken for the entire process was noted as well as the number of buckets used. The process was repeated at several intervals for different locations. A total of sixty (60) samples each day for seven (7) days were randomly selected.

Hose method: Metre was used to record the volume of water that passed through the pipe and the time taken for washing was noted. Three (3)-samples were randomly selected in this case.

RESULTS AND DISCUSSION

Tables 1 shows the mean volume of water consumed when washing cars and the time taken for different car wash using bucket method. Table 2 shows the mean volume of water consumed when washing cars and the time taken for different car wash using hose method. The findings of the result shows that bucket method consume 115.5L (25.38G) 27 minutes /car-4,389L (964.62G)/Day and hose method consumes 441.2L (96.97G)-16,765.6L (3,684.75G)/Day

Table 1: mean water used in car wash using bucket method (Base volume=20litre)

Sample	Volume (L)		Time taken (min.)	Number of cars
A	5.4	108.8	27.1	32.4
B	4.8	95	23.0	33.8
C	4.6	91.3	26.8	39.1
D	4.9	108.8	27.5	38.6
E	4.4	79.8	27.3	34.4
F	4.8	95	26.6	36.1
G	5.8	115	29.3	37.5
TOTAL		693.7	187.6	251.9

FIELD SURVEY (2008)

Table 2: mean water used in car wash using hose method

A	14.34	33.5
B	15.30	35.00
C	16.01	29.40
D	14.81	36.33
E	14.33	38.10
F	15.02	32.61
G	17.72	37.77
TOTAL	107.53	242.71

FIELD SURVEY (2008)

The tables above show that an operator who uses hose consumes much more water and spends more time than when bucket is used to wash the same car. A save of 366L, about 625 sachets of 'pure water' is recorded. (Sachet of 'pure water' =50cl)

Secondly, the entire car wash in the town withdraws 1,710,091.2L (375,844.222G) daily from the municipal tap then, in a year, 624,183,288L is withdrawn. This value represents 3.95% of the total percentage of water withdrawn from the municipal supply. 3.95% is more than the quantity of water serving zone 'L' of the 16-zones of Bauchi water demand zones. Zone 'L' has an average estimate of 1.38MLD with an area of 3.19KM^2 (BSWD, 2009). Similarly, N29, 259.72 is wasted daily on car wash, in 30days (1month) =N 877,791.6 will be wasted while for 365-days (year) = N10, 679,797.8.

The amount of water used by car wash in Bauchi can be regulated using hose with a trigger nozzle. For instance, Sydney car wash operators are permitted to wash their cars, boats and caravans with a hose as long as a trigger nozzle is fitted. Also, any standpipe that is used must be metered and issued or approved by Sydney Water (Andrew, 2006).

Many car washes already use reclamation facility to significantly reduce water usage and a variety of energy usage reduction technologies (Plah and Delforg, 2001). This practice was mandatory in the regions where water restrictions are in place (Andrew, 2006). For instance, the work of Brown (2002) reveals that Phoenix in the United States showed the highest water use per vehicle wash in all categories except for self-serve. In part, that was due to the lack of car washes with reclaim systems in the Phoenix sample. However, Orlando's low gpv average is 47.9 gpv below Phoenix and was likely the result of all of the Orlando In-Bay sites using reclaim. In order to reduce stress on the environment, car wash must be zoned to a particular area and should comply with the master plan and some local conditions of that area. This is done to ensure uniformity as well as compatibility with other land uses. (Bruce and Eddy, 2005)

Conclusion: The study of the evaluation of water consumption rate by car wash in Bauchi shows the car wash facilities in the town consume significant amount of water supplied by the Water Board. Also an operator who uses hose consumes much more water and spends more time than when bucket is used to wash the same car. If the current trend continues and with the proliferation of car wash in Bauchi, there will be water shortage to the populace who are the primary beneficiaries.

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