

The Management of Drainage System in Mokokchung: A Case Study

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Abstract: Drainage is the natural or artificial removal of surface's water and sub-surface water from an area. Drainage system minimizes the impact of flooding by safely carrying storm water away from built up areas into rivers and creeks. In this study the drainage systems of the town that are fed by the domestic and commercial wastes have been considered. The attitude of the people towards the disposal of all kinds of waste both liquid and solid directly into the drainage system without proper treatment is the main drawback that leads to the degradation of the drainage system as well as the environment. Disposal of waste especially solid waste which is hard to decompose accumulates in the drains and causes blockage or clogging of drains. The accumulated waste with the pass of time causes breeding of mosquitoes and vector causing germs which causes severe health issues. During heavy rains these clogged drains prevents the free flow of water and as a result the water floods out of the drains. This over flow of water also destroys the road and causes problem to people walking on it. The overflow of water from drains is not only caused by clogged drains but is also the result of poor construction of drains which are unable to hold storm water during heavy rains.

Keywords: Drainage, vectors, storm water.

1. Introduction

Drainage is the natural or artificial removal of surface's water and sub-surface water from an area. Drainage system minimizes the impact of flooding by safely carrying storm water away from built up areas into rivers and creeks. When it rains, some water naturally seeps into the ground. To prevent the rest of it from flowing towards low-lying land, the drainage system directs it into rivers and creeks- and naturally into the sea. The first type of drainage system can be traced back to the Harappa civilization, where ancient Indus of sewerage and drainage that were developed and used in cities throughout the civilization were far more advanced than any found in contemporary urban cities in the middle east and even more efficient than those in some areas of the Indian subcontinent today. All houses in the major cities of Harappa and Mohenjo-Daro had access to water and drainage facilities. Waste water was directed to covered sewers, which lined the major streets. Urban drainage systems have existed as a vital city infrastructure to collect and convey storm-water and wastewater away from urban areas.

There are different types of drains. They are classified into two types. They are

1. Surface drains: Surface drains remove water from the

ground surface prior to infiltration and prevents excess water from flowing on to an area. They collect water

2. From the ground surface and transport it to suitable disposal point. Surface drains can be classified into two groups-
3. Contour, swale or movable drains- These drains are earth furrows. The surface of the drains varies from grass to artificial creek beds.
4. Dish drains- Dish drains are drains constructed of hard units or sections laid to a grade on a solid footing.
5. Subsurface Drains: The main force which influences the movement of water through the soil is gravity. So, the main aim of subsurface drainage is to help this water movement. Subsurface drainage also provides a path for water to leave the soil profile when the water-table rises to its level.

Drainage may also be defined as the artificial removal of water or other liquids. Drain takes foul effluent (toilet waste, washing machine and sink waste etc) from our premises to the public sewer. It is the natural or artificial removal of a surface water and sub- surface water from an area.

A. Types of drains

1. *Private drains:* A private drain is any pipe work for storm water or sewage within your property boundary. The responsibility for preventing blockages and maintaining private drains remains with the owner. If blockage occurs in private drains then it is the responsibility of the individual owner to see to the cause of the blockage.
2. *Lateral drain:* A lateral drain is any pipe work for storm water or sewage outside a property boundary that drains just one property.
3. *Public sewer:* A public sewer is any pipe work for storm water or sewage outside your property boundary and all pipes that are shared with others property within your boundary.
4. *Foul water drains:* Foul water drains take toilet waste from sinks, baths and washing machine and transports it towards the main drainage system.

2. Statement of the problem

1. Improper maintenance of drainage system.
2. Clogged drains causes blockage and overflowing of drains leading to flooding and breeding of diseases.
3. Non- biodegradable pollutants into drainage system cause pollution.

Accumulation of waste causes pollution. Drains are an essential requirement of any settlement be it rural or urban. If proper drains are not maintained, the drains may be clogged leading to foul smell and breeding of disease causing pathogens such as malaria, dengue, typhoid etc. Also when the drains clear, the accumulated waste is washed into the aquatic sink which may also get polluted due to the heavy load of wastes dumped. Drainage systems are vital to keeping our homes dry and free of any excess water. Without drains, homes can become easily damaged or flooded. One of the best benefits of having drainage system installed inside or outside is that it can help prevent water damage and structural issues. Without proper drainage system, there is high range of flood which can cause water damage to the surrounding area. If the mess is not cleaned up then, mould can begin to grow which can cause a host of adverse health effects.

A. Geographical location of the study

Mokokchung is a town in the Mokokchung district of Nagaland. It has all together 18 colonies, of which Kumlong, Sangtemla, Alempang and Yimyu are the largest, and is located at 25.56°N latitude and 93.53°E longitudes. Mokokchung has a mild climate throughout the year. Mokokchung is the cultural nerve centre of the Ao people and is economically and politically the most important urban centre in northern Nagaland. It is in fact the third most important urban hub in all of Nagaland after Dimapur and Kohima. Mokokchung is particularly noted for its extravagant Christmas, New Year, Moatsu and Tsungremmong celebrations. Historically, Mokokchung was one of the first Naga Hills sites where the Assam Rifles, led by Britishers, established their outposts in 19th century. Much of the town initially grew around this post located in the DC Hill.

B. Objectives of the study

1. To study the drainage system in Mokokchung.
2. To analyze the impact of the waste from the drainage system.
3. To encourage community involvement for effective management of the drains.

C. Methodology

Descriptive method is used in the present study.

D. Population of the study

The population of the study comprises of 18 municipal wards.

E. Sample of study

The investigator selected 90 respondents from 3 wards, 30

from each ward. The respondents were selected through simple random selection. The wards selected were Arkong ward, Kumlong ward and Sangtemla ward.

3. Review of literature

Chocat, B et.al., (2004), have elucidated that urban drainage has played different roles in cities. Earlier objectives of urban drainage include provision of a convenient cleaning mechanism of wastes for public hygiene and an efficient conveyance facility for flood protection.

Parkinson, J (2003), in his paper 'Drainage and storm water management,' indicates the drainage problem in urban areas is due to inadequate development control mechanisms and their incompetent enforcement, settlements and construction with little consideration for storm water drainage.

Kumar, S. Ganesh and Nithin Joseph (2012), in their paper 'Drainage and Sewage system in urban India', has highlighted some facts about urban sanitation in India. Drainage and sewerage system in urban areas is an important priority in Indian setting because of rapid urbanization, industrialization and population growth, along with increase in slum population and migration.

Parkinson, J (2003) in his paper 'Drainage and storm water management strategies for low-income urban communities', states the urban conditions exacerbate drainage problems; runoff is increased by impermeable urban surfaces and due to inadequate development control mechanisms and their incompetent enforcement, settlements and construction with little consideration for storm water drainage.

Blom, Kristina (2015) in her paper 'Drainage systems, an occluded source of sanitation related outbreaks', has highlighted that drainage systems and its role in sanitation related outbreaks are evident but still occluded once it has been installed. This drainage system can cause infections and thus be of clinical concern.

4. Data analyses

In the study conducted on the drainage system of Mokokchung, the various sources of the drains were looked into and its flow across the town to its dumping / end point i.e., the river Milak.

A. Connection of the domestic drains to the public drains across the town

The study started with the investigation of the connection of domestic drains to the public drains. It was found that 55% of the kitchen drains were connected to the public drains and 73% of the toilet drains were connected to the public drains whereas 44% of kitchen drains and 27% of toilet drains were not connected to the public drains. The 73% of the toilet drains connected to the public drains show more wastes being dumped at the end point or the river Milak leading to pollution of the river.

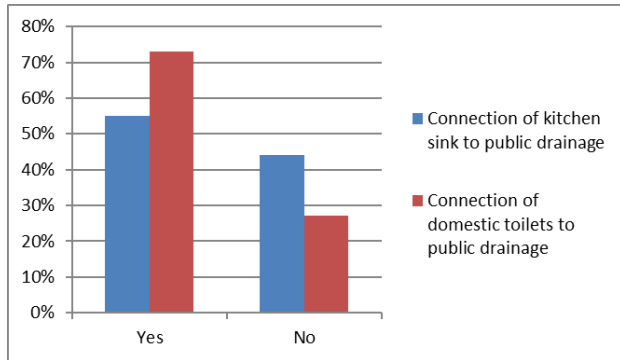


Fig. 1.

B. Disposal of waste into the drains

According to the study of management of drainage system in Mokokchung town, the public or the population dispose both liquid and solid waste to the drainage. Though there is disposal of both liquid and solid waste only 30% of the population agreed that they dispose solid waste to the drainage and the rest 60% said that they dispose only liquid waste to the drainage. So the percentage of disposal of liquid waste is higher than the solid waste in the drainage. The liquid waste disposed by the population consist of liquid waste produced from toilet and bathrooms, liquid waste from kitchens etc. the bathroom liquid waste consists of urines, detergents, soaps, shampoos, bleaching agents etc. which finds way to the water bodies causing degradation of the quality of the water bodies.

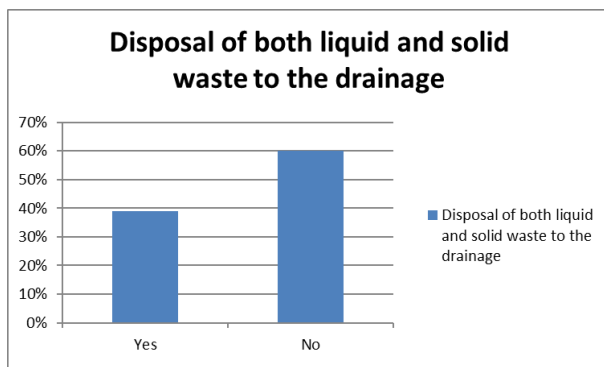


Fig. 2.

C. Characteristics of the drains in Mokokchung

In the study conducted it has been found that 63% of the respondents have agreed that their drainage system is well constructed but 57% have also said that though the drainages are well constructed, the size of the drainage is not big enough to carry away storm water, which causes blockage of the drains resulting to overflowing of water during heavy rainfall and has the potential to cause small landslides and pollution of the land and environment. Since 39% of the respondents surveyed agreed that they dispose solid waste into the drains, it has been found that the drains faces blockage which are not carried away by heavy storm water. Thus, resulting to degradation of the accumulated waste causing foul smell which is a problem for the people living around the drainage.

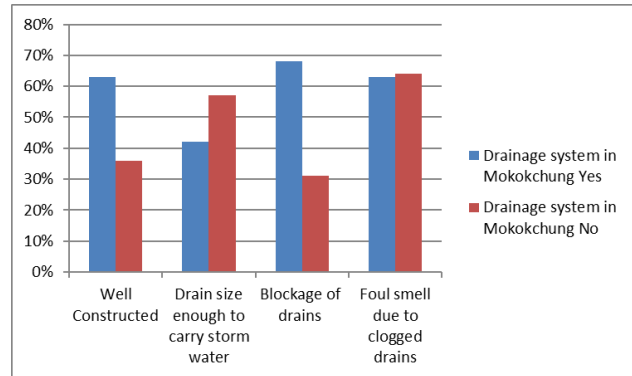


Fig. 3.

D. Initiatives on the management of the drainage systems in Mokokchung

In the study of the management of drainage system it was observed that individuals, colonies and the Mokokchung Municipal Council (MMC), in their own way have taken initiatives regarding the management of the drainage system. In terms of colonies, every once a year or twice a month the people of the colony come and work together for the cleanliness of their respective colonies. And on normal days individuals also take part in keeping the drainage as well as the surrounding clean. The MMC also takes initiatives regarding the management of the drainage by employing workers for cleaning the drainage of the towns etc and also the MMC lays out certain rules or prohibition regarding the disposal of waste in the drainage system.

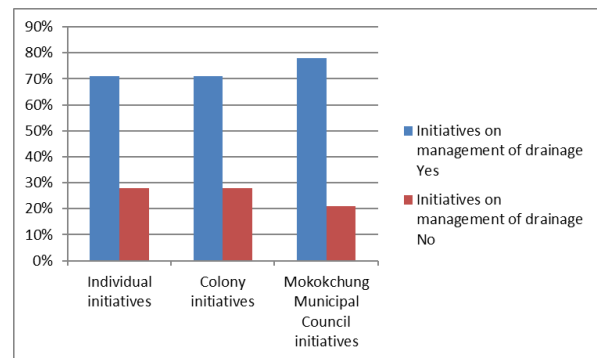


Fig. 4.

1) Management Practice

The study has revealed that regarding disposal of waste into the drainage system, in almost every colony there is strict prohibition to the disposal of solid waste and even fine is involved regarding the dumping of waste in the drainage system. The colony/ward chairman is in-charge of looking after the disposal of solid waste in the drainage. If anyone is found guilty then a sum of Rs 500 or more is imposed to the particular person. And even the Mokokchung Municipal Council also charges such imposition regarding disposal of solid waste to the drainage system. But despite the fine, individual attention, colony chairman scrutiny and also the MMC's active work there are people who still dispose the waste unmindfully

causing the flooding of the drainage system and the dumping of the waste into the river Milak causing adverse effects on the ecology of the river.

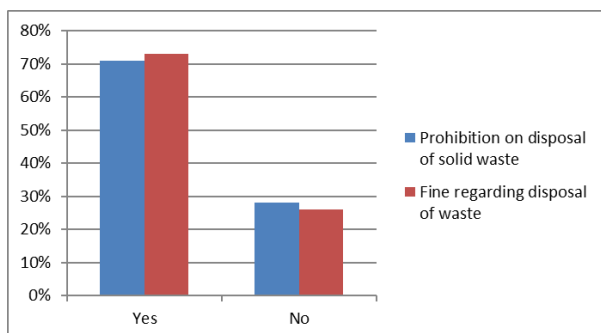


Fig. 5.

5. Discussion

The drainage systems of the Mokokchung town are fed by both domestic and commercial wastes. The wastes generated by Mokokchung Town are transported from the place of origin to the river Milak through drains that runs cross the town which is one of the causes of pollution in the river. The Mokokchung Municipal Council (MMC) headed by the Additional Deputy Commissioner (ADC) has issued directives to the public to stop throwing solid waste into the drainage system. The attitude of the people regarding disposal of all kinds of waste both liquid and solid directly into the drainage system without proper treatment is the main drawback to the deteriorating condition of the drainage system as well as the environment. Disposal of waste especially solid waste which is hard to decompose accumulates in the drains and causes problems. This type of waste blocks or clogs the drainage system and degrades the quality of the drainage. The accumulated waste with the pass of time causes breeding of mosquitoes and other vectors which causes several health issues. During heavy rains these clogged drains prevents the free flow of water and results in flooding of the drains. The over flow of water also destroys the road and causes problem to people walking on it, especially for students walking to school as it makes their uniform and shoes dirty and germs finds easy excess to the body. Overflowing of water from drains is not only caused by clogged drains but is also the result of poor construction of drains which are unable to hold storm water during heavy rains.

Though the MMC provides or issues notices through newspapers to minimize the disposal of solid waste, this effort alone is not enough to tackle with the problem. More improved measures like panniers should be put up in towns, workshops should be held for the general public and if not then at least in colonies ward-chairman should take initiatives to treat the problems caused by drainage.

The Mokokchung district of Nagaland receives funds for the construction of drains from Local Area Development Project (LADP) once a year. Apart from this, for the development of the colonies, the residents of the localities contribute money for

the construction of drains. The Mokokchung Municipal Council also takes initiatives like imposing fines, introducing rules and regulations for the proper disposal of waste for the proper management of the drains. But the people some unaware and some knowingly throw waste into the drainage system and cause blockage despite the fines and strict rules introduced by MMC.

All the waste both liquid and solid disposed in the drains by the residents of Mokokchung Town are carried away to river Milak, which is one of the most important rivers of the town. As all of the waste from the drains flow into the river Milak, the quality of the water is degrading gradually affecting the people as well the fishes present in the river. This river directly or indirectly effects the health of the people because most of the people especially those living in the vicinity of the river are dependent on it for the basic requirements of water, like washing clothes and utensils to even drinking water. As no measures has been taken for the treatment of the river. The wastes from the drains are continuing to degrade the quality of the water, disturbing the beautiful gift provided by the nature.



Fig. 6. Drain in the city



Fig. 7. Blocked drain

Even though most of the drainage system of Mokokchung town is well constructed, the size of the drains are not big enough to carry away storm water and solid waste disposed by the people. Because of the small size of the drains, during heavy rains the drainage faces overflowing of water which directly or indirectly effects the environment. The accumulation of non-biodegradable waste like plastic bags, cans, bottles etc., produced from kitchens and other sources causes severe problems to the free flow of the drains. This non-biodegradable waste accumulates in the drains and clog's the drains. The people though aware of the problems caused by the solid waste

disposed by them, they keep their awareness aside and show their ignorance by continuing their action against the environment. Though the MMC for the betterment of both the people as well as the environment has introduced certain regulations and prohibitions regarding the management of drainage system and disposal of waste, the public continues to carry on their actions.

6. Conclusion

The rules and prohibitions laid out by the MMC as well as by the chairmen of the colonies regarding proper disposal and management of the drainage system are present, still there is disposal of waste of both types-solid and liquid. Therefore, more stringent rules and regulations should be enforced on the people so as maintain a cleaner and hygienic environment. And the enforcement of such rules and regulation on the population of Mokokchung town will be beneficial not only for the environment but also for the people of the town in terms of health and hygiene. The study revealed that no seminars or workshops regarding the proper management of the drainage system have been conducted. Thus, the MMC as well as the chairman of the different colonies should take responsibilities or initiatives regarding educating the people of the town or the colony in the field of management of the drainage system. These type of programs will not only encourage the people for the proper management of the drainage system, but it will also help in the change of the attitude of the people as the bulk of the population, though are aware of the drawbacks and ill effects of the improper management of drainage system, but keep aside their knowledge and practice the mismanagement of the drainage system along with the ignorant population of the society. This ignorance and irresponsible nature of the people brings ignorance to the society. So such programmers' should be undertaken for the betterment of the people as well as the society and environment.

Though the most of the drains are well constructed it has been found that the sizes of the drains are not big enough to carry away storm water as well as waste. Even though the drains are well constructed, if the size is not big enough then the quality of the drains will degrade and the overflowing of water will cause severe damages do the land, environment as well as the health of the people. During heavy rainfall people walking on road face problems regarding the over flowing of drains on the road which is a nuisance to the pedestrians as they have to tread on the dirty water. As a result the MMC should take proper initiatives and responsibilities for the constructions of larger and covered drains, so as to prevent the over flow from such drains.

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