

Urbanization and Its Effects on Water Resources: An Exploratory Analysis

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Abstract: Urbanization often causes environmental degradation and harms human health in developing countries. This study has an imperative focus on the effects of rapidly growing urban life and its impact on water resources in the Muzaffarabad city. The data for this paper comes from 20 in-depth interviews with members of the local government, political workers and local residents of the city, carried out during the year 2015, to analyze the ways in which increasing urban life is affecting water quality in the area. The findings indicate that waters of both rivers Jhelum and Neelum are being viciously contaminated by the local residents, which results in a scarcity of drinking water and a number of viral diseases.

Key words: Urbanization, water, Muzaffarabad, pollution, Neelum, Jhelum.

Introduction

Urbanization is a process in which increasing number of people migrate from rural to urban areas. Ultimately it leads to horizontal or vertical growth of urban areas. A country is considered to urbanize when over 50 per cent of its population live in the urban areas. The criteria used to define urban can include population size, space, density and economic organization (Grannis, 1998).

The consequences of urbanization vary across different regions of the globe. The United Nations has estimated that by the end of 2008, half of the world's population would live in urban areas. It is predicted that, by 2050, 64.1% and 85.9% of the developing and developed world respectively, will be an urbanized international (Tribune, 2008). Urbanization is not a new phenomenon; however, since the process of urbanization

is ongoing it is dynamic and multi-faceted. Relationship between land use change and water quality has been analyzed in several studies. Both of these factors have been affected by human activities influenced by rapid urbanization, industrialization and rural land conversion. Unexpected population growth is related to water quality degradation and is causing large increase in nutrients and microbial loads (Ghosh et al., 2014; Krishnan et al., 2013; Maillard and Santos, 2008). Therefore, urban areas have the potential that generate ecological and environmental impacts at multiple scales (Ghosh et al., 2014). These special ecosystems provide the solutions to challenges as well as problems for sustainable development in a rapidly urbanizing world (Breuste and Qureshi, 2011; Grimm et al., 2008; Hanjra and Qureshi, 2010).

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In addition, land use change due to urbanization has changed the flow patterns of waste water and storm water, that ultimately has an impact on the aquatic life in the receiving water i.e. rivers (Astaraie-Imani et al., 2012).

Urbanizations reflect more than demographic change. It is not only driven by the context and processes of development but also influences it greatly. It puts forth direct and indirect benefits to the struggle towards global sustainability and human development. Cities are the root cause of numerous environmental problems that are related to air and water pollution (Reddy, 2004).

Economic growth together with changes in demography is generally seen as the driving force for urbanization. But unfortunately the process of urbanization has resulted in environmental degradation besides economic growth. Rapid development at social and economic levels in Asia has caused the lack of infrastructure, lack of housing, traffic congestions, overall decay in environment especially in sustainable development of major cities and towns, as reported by The Asia-Pacific Forum for Environment and Development (Ichimura, 2003).

Across the world, rapid urbanization has led to serious consequences. On the positive side, it had led to the birth of gigantic cities as discussed above, it has opened up new opportunities, and importantly it has led to competition at national and international levels. While on the negative side, it has led to a series of health hazards. It has been reported that urbanization is not only causing land use change but excessive use of energy and resources have overburdened the ecosystem and has worst implications on the human health (Kelly et al., 2008).

In the context of developing countries like Pakistan, the rapid pace of modernization, urbanization and industrialization has led to serious environmental concerns. In the past few decades, due to transformation of economy and society natural resources have been depleted extremely fast. This unabated degradation of environment in any country is a continuous risk for people's health, their livelihoods, survival of species and ecosystem in general (Banister, 1998; Chen et al., 2014).

Nowadays, the biggest environmental hazards of any developed nation is insufficient supply of clean water, rapid increase in population, and the artificial methods of cultivation. Moreover, clean water has been contaminated by excrement through sewers, industrial effluent, urban and agricultural excess and saline intrusion. In Pakistan, quantity and levels of waste disposed off in the rivers has immensely increased

over the period of past few years (Alam, 2010). Soil particles from construction and demolition sites, and also oil and toxic chemicals from car maintenance and runoff from road surfaces are among the other sources of water pollution which tend to occur in urban areas.

Safe drinking water is basic human right and prerequisite for healthy life. In many parts of the world clean water has become limited and is in scarcity. It is being predicted that in the next century, it will become even more limiting due to increased population, urbanization and climate change (Jackson et al., 2001). Sadly, due to rapid population growth, industrialization, contamination of fresh water from the factories and household effluents, water quality in developing countries like Pakistan has extremely deteriorated. As a result of water resources contamination from domestic and industrial effluents, number of Asian cities are facing increase in organic and nutrient material in drinking water (Ray et al., 2006). Drinking water quality standards, particularly for issues with regard to bacteria, are reported to be higher than for river water (Organization, 2005).

Although, the issue of the quality of drinking water has been taken up as a concern in developing world, it remains under-explored in developing countries. The fact that Pakistan has the availability of about 1,200 m³ per capita that is rapidly declining, ranked it among the water stress countries. In addition, the production of domestic and industrial wastewater, discharged directly into water bodies, is about 4 million acre feet per year in Pakistan. Among this only 3% is brought under consideration by the authorities. In Pakistan about 70 percent of the people rely heavily on ground water for their household uses (Malik et al., 2010).

Though there is abundance of academic literature on urbanization and water quality across the world, the previous research is deficient in offering a sociological analysis of urbanization and water quality. To fill this gap this study is aimed to offer a sociological analysis of the relationship between urbanization and water quality in the context of Pakistan. The paper is an attempt to analyze the effect of urbanization on water scarcity and to explore urbanization as a major cause for water pollution.

Review of Literature

Majority of urbanization is not only occurring in developed countries but also in developing countries. Although it is a motivating force for transformation, financial and industrial development, there is also an

increased apprehension about its effects on ecosystem. Rapid urbanization is in an alarming state in many developing countries because of the associated problems such as unemployment, economic crisis, health issues, poor sanitation, increase in urban slums, and degradation of ecosystem (Adepoju, 1993; Angotti, 1993). Increased urbanization and demographic trends for employment, food security, water supply, and shelter and sanitation implications, especially the disposal of wastes (solid and liquid) that the cities produce are overwhelming (Goodland et al., 1992). Water shortage and pollution are among the developed world's greatest challenges. Related to such challenges are the issues of water scarcity and water pollution in the developing world.

The safe drinking water supply is important in terms of both quality and quantity as it is essential to human existence (Peavy, 1985; Shilling and Manahan, 1994). As the civilization evolved, human activity increases and changes occur in the nature of pollutants entering into watercourses (Hussain et al., 2014). Rivers are waterways of strategic importance across the world, providing main water resources for domestic, industrial and agricultural purposes (Singh et al., 2009).

Numerous studies have analyzed and probed the impact of urbanization on wastewater systems as well as the receiving water quality. For instance, Tong and Chen (2002) reported that in the State of Ohio, USA, there is a significant relationship between land use and in-stream water quality at a regional scale. The response of surface water quality to urbanization in Xi'n, China, was further investigated by He et al. (2008). Another study by Liu et al. (2009) has defined the application of the impact of new developments on river water quality in the integrated wastewater system context. In the same context one of the review was provided by Jacobson and Delucchi (2011) on the impacts of urban invulnerability on hydrological systems in various regions.

Water is prerequisite for livelihoods, health, food security and general economic growth. Minhas (1996) stated that by keeping in view the context of South Asia's unavailability of safe and clean water, the cause of water-borne diseases is markedly high in Indian slums. In Pakistan, every fifth citizen has illness or disease caused by contamination of water and among the water-borne diseases diarrhea is the leading cause of death of toddlers and children (Mohsin et al., 2013). The global proportion of urban population has increased from 28.3% in 1950 to 50% in 2010, an example can be seen of the largest cities in India which are urbanizing at exceptional pace (Organization, 2012). Because of the same reason one of the demographic issues in the

21st century in India is urbanization (Ramachandra et al., 2012).

Urban population in Iran has tripled from 15.7 million in 1976 to 47.9 million in 2006. According to Fanni (2006), rapid increase in Iran's urban population has tripled from 15.7 million to 47.9 million from 1976 to 2006, reflecting that about 32 million people now reside in urban centres in contrast to 30 years ago. As a result, quantity and quality of ground resources of urban water are under huge stress. Studies conducted by Ghafoori et al. (2011), Khazaei et al., (2004) and Mirzavand and Afrous (2015) have reflected on the quality of underlying water resources as an impact of growing cities in Iran. The same topic has received increased attention and considerations by the researchers of Iranian universities.

In Pakistan, as in many parts of South Asia, population growth, elite capture of public benefits, rapid urbanization, and shifts in production and consumption patterns have placed unprecedented stress on water resources. Like other South Asian countries, the water resources in Pakistan are also under enormous stress due to rapid increase in population, urbanization, gain of public benefits, shifts in productivity and utilization patterns (Homer-Dixon, 2010).

The water pressure in Pakistan is intensifying the instability and volatility of the country. Unavailability of clean water is causing not only protest on daily basis in number of cities but also lot of chaos among farmers and landowners over water rights and lost livelihoods. Most of the communities are prone to worst social and economical situations and have been displaced internally due to water scarcity and environmental risks. This deficiency has further jeopardized the political stability and recruitment opportunities for extremist groups. There is a need to establish national policy, laws and strategic planning to monitor water usage, for improving the economy, food security and demolishing the extremism in the region. If no significant attention will be paid, climate change and rural-urban migration will further add fuel to the fire (Tufail and Khan, 2013).

Unavailability of clean water is one of the major issues faced by the residents of urban areas. Despite living in urban areas with most of the facilities, the majority has no access to their basic right of clean drinking water. Even the water provided through existing networks of water supply schemes is not up to the standards of the World Health Organization (Azizullah et al., 2011).

In order to fulfill the water need, barely half of the urban population of Pakistan has the facility of tap water

inside their houses, whereas five percent are dependent on the water supply outside house, 38 percent counts on hand pump and motor pump, and the rest of the population rely heavily on systems such as digging wells, public standpipes, water sellers, etc. Unsafe water has been reported to take a number of lives each year; the number being 30,000 for only Karachi per year. Bhatti et al. (2007) reported that unsafe water is the cause of taking 30,000 lives per year only in Karachi excluding number of deaths in other cities of the country.

Theoretical Framework

Present research is explicated by relating two theories that address environmental problems (*Urban Environmental Transition Theory*) in cities and proposed solution (*Collaborative Planning*) for which role of a planner is most significant. In early 1990s, the urban environmental transition theory was developed by McGranahan (2007). This theory is established and developed from studies stating a connection between urban environmental burdens and increasing abundance in wealth (Bartone et al., 1994; Berry and Colls, 1990; Lee and Park, 1994; McGranahan et al., 1996). Much of the discussion revolves around the effect of affluence of cities upon any transformation among environmental burdens. There is a shift, delay and dispersion in the environmental issues because of the process of wealth accumulation.

For cities which have comparatively low earnings and revenues, the challenges to environment are abrupt, confined to that specific area, and pose a serious threat to people's health. On the contrary the cities that are more progressive the challenges to environment are at large scale, intergenerational and harmful to ecosystem. The authors however have been very careful in determining that these tendencies are the consequences not something that is determined beforehand. The role of planners is seen as essential in this regard; they can be the mediators in such negotiations, support alliance, strengthen and broadcast the viewpoints. Collaborative planning is actually a very clear normative planning theory that gives direction to the role of planners. It states that role of planners is so far people sensitive and is essential in finding solutions for economical, social and environmental challenges (Davoudi, 2005).

In the light of the above discussion the remainder of this paper will explore the relationship between urbanization, water scarcity and water quality in the context of Pakistan.

Methodology

Study Site

The locale of the study was Muzaffarabad City located on the banks of the Jhelum and Neelum rivers. For present study two communities Chehla Bandi, located on the bank of Neelum River and Domail, located at Jhelum River were selected.

Research Design

Qualitative research design was used for present academic investigation. In this regard interview schedule was used as a tool for data collection. A total of 20 in-depth interviews were conducted from the two communities. Inclusion criterion was based on the local members especially residing besides the banks of two rivers, members of Local Government and political workers.

Sampling Technique

For present study, purposive sampling was used to select respondents for interviews (Marshall, 1996; Miles and Huberman, 1994). Purposive sampling also aims for maximal variation of the data (Patton, 2002). Sampling of respondents was done until saturation was reached, i.e. when no substantial new information with regard to the research questions were collected (Dahlgren et al., 2007).

Coding and Analysis

The interviews were conducted in local language from the community members and later their responses were transcribed and translated into English. The analysis was done after carefully going through the transcriptions several times to become familiar with the data and to avoid any misinterpretations. Further the themes and sub-themes were generated by researchers after several discussions on the codes and contents of the interview. In order to validate the overt and covert ideas by the respondents the themes and sub-themes were carefully reviewed and defined.

Results and Discussions

Respondents of the community were of the view that they can observe that population of the city is growing rapidly and this is causing many issues especially related to water scarcity and pollution. These are considered to be very serious threats for local community and all the inhabitants of the city.

Reasons for the Rapid Growth of Urban Life

According to view of respondents there are many reasons for the growing population in the study area and this population (Muzaffarabad City) growth is a serious threat to natural resources and the indigenous community as well. Degradation of forest can be experienced because of the unplanned urban settlement. They argued that though

We have enough land to accommodate many people but over crowded city will affect our lives and natural resources too.

Majority of the arguments which were recorded revealed that modern facilities available in the city attract people to seek residence. Economic opportunities are other pulling factors for individuals across the areas to reside in the city. Many people came in Muzaffarabad after earth quake 2008 and they are doing their businesses and employed in many government and private sector organizations.

There are many factors which are considered to be responsible for the unplanned growth of population in Muzaffarabad city. Availabilities and provision of basic facilities related to the human social life as well as economic opportunities attracted people to reside in study area. Respondents were of the view that population is growing rapidly and it has its hazardous effects on all the inhabitants.

Although it is a hilly area and facilities of life are not as much as there are in big cities, it is the only city which has big hospitals, university and market for shopping and doing business. All institutions have their branches in the city and people come here for jobs, education and for the purpose of business.

Due to the jobs, educational attainments and for the purpose of business many people are intended to settle down in the city. This rapidly growing urban settlement has many effects on human life. Due to the urban mess both rivers which are passing from the east and west of Muzaffarabad city are being polluted by the garbage and human waste which people directly throw in these rivers. They were of the view that

We are not annoyed with people who are coming to the city for residences and for jobs but, including those who are living prior to these new comers, everyone should keep the city clean.

Problems due to Urbanization

Problems related to sanitation and water is found to be prevalent because of this growing population. Residential issues are also prevailing due to the growing population and people are facing problems related to the settlement of housing as well as availability of clean drinking water which is going to be a scare for all the inhabitants of cities. Water pollution owing urban mess and similarly air pollution due to traffic smoke are very emerging and common problems in the study area. Participants were of the view that people are migrating towards the city and it is a very serious threat to all of us. Clean drinking water is becoming a scare for residents and there is no surety that water from water supply and from local resources which they named *Chashma* (spring)¹ is pure. Water of the rivers is polluted now and there are many risks of diseases due to the pollution of water.

We are suffering from many diseases like kidney failure, stomach problems due to this impure and polluted water and many epidemics in the seasons of heavy rains and floods.

Unplanned urbanization has disrupted human life in many ways, especially housing settlement is a major problem because Muzaffarabad is a hilly area and town planning according to the model cities is not possible. This growing urban mess has polluted water of the rivers and underground water resources are also being affected because of leakage of sewerage pipes.

Water Contamination

There are two sources of drinking water for the members of the communities in Muzaffarabad. One is provided by the local government (water supply) and second from spring that is a natural reservoir of drinking water. These two sources according to the local communities cannot be considered as completely pure and hygienic. Water of these rivers is not reliable and safe for drinking.

We do not know if the purification of water is reliable or not. That's why we cannot have a trust on these plants but do not have any other option.

Water is not clean enough to drink and we do not have any guarantee of water which we bring from Chashma (spring) is pure. It passes through the surface of land and human waste and sewerage pipes might contaminate it.

¹*Chashma* is urdu word used for fountain or spring of water.

People usually live with shortage of water and this occurs on routine basis. Water remains short for domestic use and they manage it from natural spring for household use and for drinking purpose. It is not easy to bring water in a bulk amount from *Chashma* (spring) or to arrange water tanks from private water suppliers.

Human waste and improper sanitation system is a major cause for the contamination of water as well as land sliding is another major factor that makes the water impure. Construction material and all solid waste and garbage of the city are also major factors that make the rivers dirty. Both the rivers in study area are being polluted by many means and all these are intentional and deliberate efforts of local communities; they can play a positive role to overcome these situations or they can accelerate these issues more and more. The rainy seasons and floods in rivers cause many waste and garbage from the adjacent areas.

A study by Siegmann and Shezad (2006) revealed that in order to achieve the goal of Pakistan water intervention there is a need for inclusion of all stakeholders, handling the bureaucratic power, proper interventions, provision of economic incentives etc. similar strategies can also help in the issue of water contamination in Muzaffarabad.

Some important points from the discussion of the participants were coded which show that garbage of the whole city include household mess people throw into the rivers. Filth of shops is being rapidly thrown into the rivers.

We face many problems during the season of flood and heavy rains. During this season, rivers include much trash and scrap in their water and throw it directly to those areas which are little beneath the bank of these rivers.

Other than flood and rainy season, garbage and mess of the whole city is directly thrown into the river including heavy stones and worthless construction material and household things. All these elements make these rivers more dirty and polluted.

The findings support the urban environmental transition theory (Murray et al., 2001), as it gives the wider picture of those developed cities that have result in shift from access to water and sanitation and indoor air pollution to metro-wide air and river water pollution (Piracha and Marcotullio, 2003). Due to urbanization, the same shift can be seen in the city of Muzaffarabad.

Strategies for the Solution of Problems

While discussing about the issues and their solutions communities members advocated many measures and strategies to overcome these problems which are related to the water pollution especially the contamination of two rivers Neelum and Jhelum in study area. They were of the view that human waste and garbage is viciously contaminating the water which is a valuable asset. They suggested that this is the responsibility of government and all the citizens to think about all these issues, related to the urbanization and water. Local communities should take care of their natural resources and they should protect their rivers from these wastes and garbage.

Our government is careless and do not pay any attention to clean the city and to pay attention or look after the rivers; local bodies are just concerned to their own interests and ultimate suffering is for us. Those who have means to buy mineral water they do not care about the contamination of Chashma (spring) or water supply.

Local community members were very much concerned about these water related issues and this growing urban life which is serious threat for their water resources. They considered it a major problem for upcoming years for the urban settlement and water scarcity. They suggested many solutions including awareness and self-help to overcome these problems. They cannot stop the urban migration but they can reduce many issue related to the urban life.

A study by Qiu (2013) and Xu et al. (2013) emphasized that the urban environmental transitions in Japan by classifying it into four categories: public hazard control phase, energy saving and amenity-town phase, eco-city and cycling economy promotion phase and low carbon society development phase. Urban environmental transition in Japan revealed that in order to cope with this transition in positive way Japan followed the following steps. First it is responding to its environmental issues through legal and regulatory actions. Secondly Japanese government stressed a lot on the role of planning in urban environmental management. Thirdly it is essential for local city governments to formulate urban environment plans which are focusing on promoting eco-city, eco-town, low-carbon city, etc. If same practices can be implemented in the developing entities like Muzaffarabad, there are significant prospects of eliminating the environmental hazards as a result of urbanization.

Conclusion

Availability of clean drinking water is a basic need for good health and it is also a basic right of all the human beings. The research was conducted to get an overview of urbanization and its effect on water resources in Muzaffarabad. The water pollution underground and on ground is a consistent source of breaking out the communicable diseases. Due to mismanagement, bad civic conditions and natural disasters in developing countries there is a very high ratio of underground water contamination.

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