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Editorial

‘Water is the driving force of all nature’ - Leonardo da Vinci.

Unfortunately for our planet, supplies are now running dry – at an alarming rate. The world’s population continues to soar but that rise in numbers has not been matched by an accompanying increase in supplies of fresh water. The consequences are proving to be profound.

Across the globe, reports reveal huge areas in crisis today as reservoirs and aquifers dry up. More than a billion individuals – one in seven people on the planet – now lack access to safe drinking water. The exploitation and inappropriate use of fresh water has made it a scarce resource.

The article in this Journal on groundwater assesses its quality by using Canadian water quality index (CWQI) in a mixed use area in Lahore (Kot Lakhpat). This area is a good choice for the author because it is at the junction of two populated towns in the Lahore district and includes residential and industrial areas. The results of the research highlight that the water is of good quality and safe for household use. This water, however, cannot be used for drinking purposes as it contains arsenic and severe bacterial contaminations.

In South Asia, there have been massive losses of groundwater reserves, with reckless abstraction over the past decade. About 600 million people live on the 2,000 sq. km area that extends from eastern Pakistan, across the hot dry plains of northern India and into Bangladesh, and the land is the most intensely irrigated in the world. Up to 75% of farmers rely on pumped groundwater to water their crops and water use is intensifying – at the same time that satellite images shows supplies are shrinking alarmingly.

Moreover, Pakistan is the 8th largest textile products exporter from Asia and 12th globally; it contributes 8.5% of the country’s GDP and 52% in exports. Water is an important utility in the wet processing of textile units. Most of the industries abstract ground water (except in Karachi) and discharge directly into the water bodies without treatment. The lack of water allocation and the self-reliance of the industry has led to abstraction of groundwater without any checks or balances, this obviously depletes the water sources and eventually will stop meeting the needs of the industry as well.

The governments always seek to increase revenues in order to add to available resources. The most common way of managing finances and expenditures by the government remains the imposition of taxes on the citizens upon assets and businesses. There is a need to make cities more resilient in the light of the above problems. The city governments around the globe are increasing their focus on smart and resilient city development and management. However, the availability of finance is a key issue. In Pakistan, the capacity of the local governments to deal with newer challenges such as climate change and natural and man-made disasters is further constrained as they have limited autonomy to attract investments and generate revenues.

This issue of Pakistan Journal of Urban Affairs discusses these tools and international best practices in the context of the municipal finance situation in Pakistan and identifies as to how the best cities can access these financial windows by improving their creditworthiness and performance.

Lastly, this issue focuses on the need for low income housing in the urban centers. By taking the example of Islamabad the author highlights 52 Kachi abadis in Islamabad, out of which CDA recognizes only 10. The population of these slums exceeds 100,000. Pakistan Journal of Urban Affairs brings to light the pressing global concern of water shortage and how it will not only impact the citizens of the country but will have dire consequences for the economy, as water-intensive industries like textile will suffer. In order to safeguard or conduct projects to save the environment the government needs resources the article covers as to how municipal governments can better manage their finances to generate resources.

In whole the Journal attracts its reader to explore how climate control and preservation of natural resources to provide social amenities and housing will result in smarter more resilient urban centres.
Improving Municipal Finance for Climate
Smart Cities’ Governance

Muhammad Arshed Rafiq*

*Team Leader, Sustainable Cities Initiative at LEAD Pakistan
Executive Summary

As the world is getting more and more urbanized, the threats to urban living are increasing and service delivery is becoming more difficult for cash strapped municipal governments and utilities. Therefore, the city governments around the world are increasing their focus on smart and resilient city development and management. However, the availability of finance is a key issue. Different reforms are being done in Pakistan to improve financial situation of municipalities with traditional and new instruments. For example, in Punjab, the automation of property tax and own source revenue generation are getting impetus while reform initiatives are under way such as Sub National Governance Programme, Punjab Public Management Reform Program, Land Records Management Information System and Punjab Cities Governance Improvement Project. Internationally, property tax collection, user fee implementation and marginal cost pricing have emerged as best practices to improve the financial situation of city governments and allied entities.

The capacity of the local governments to deal with newer challenges such as climate change and natural and man-made disasters is further constrained. However, some windows of opportunity exist to provide relief and improve the financial health of municipalities. The said tools and instruments, if applied rationally and with proper planning, can surely help increase the resilience of cities in the face of different urban challenges.

These include but are not limited to:

- Emissions Inventory Development
- Capital Investment Plans
- Green Bond Market
- Clean Technology Fund
- Forest Investment Program
- Pilot Program Climate Resilience
- Scaling up Renewable Energy Program
- BRICS Initiatives
- CAT Bonds
- Adaptation Funds

In addition, various PPP models and private funds have also popped up which can be explored by city governments to fulfil their needs and fit in their situation.

However, most of the cities face difficulties in accessing to these financial windows as they need sovereign guarantees and resistance from central governments for this purpose. Cities Creditworthiness Program of the World Bank has been initiated to address this problem and gives standardized procedure for this purpose. Besides creditworthiness, cities are also working on improving their performance and efficiency by taking various steps including the establishment of monitoring and evaluation systems.
Abstract

As the world is getting more and more urbanized, the threats to urban living are increasing and the service delivery is becoming more difficult for cash strapped municipal governments and utilities. Therefore, the city governments around the globe are increasing their focus on smart and resilient city development and management. However, the availability of finance is a key issue. In Pakistan, the capacity of the local governments to deal with newer challenges such as climate change and natural and man-made disasters is further constrained as they have limited autonomy to attract investments and generate revenues. Recently, some windows of opportunity have opened to provide relief and improve the financial health of municipalities such as Adaptation Funds and other Climate Investment Funds (CIFs). The present paper discusses these tools and international best practices in the context of the municipal finance situation in Pakistan and identifies how best cities can access these financial windows by improving their creditworthiness and performance.

Introduction

Pakistan is the 8th most climate vulnerable country in the world (Harmeling & Eckstein, 2013). The country has experienced major natural disasters and epidemics during the last decade. The high urbanization and population growth rates have further aggravated the situation and put enormous pressure on the already constrained financial resources of city governments and allied entities, resulting in deterioration of urban infrastructure and municipal service delivery systems. As we are living in an urbanized world for the first time in history, the threats to urban living especially posed by climate change are being seen as enormous in magnitude and severest in damage. Therefore, the city governments around the world are increasing their focus on climate smart and resilient city development and management. Cities are increasing their capacity in the face of chronic and emerging threats by increasing their own source revenue, government funding, private capital and different climate funds and schemes.

Background

The 18th amendment to the constitution of Pakistan heralded an era of devolution of powers from the centre to the provinces. Under the said amendment, the provinces have more flexibility and resources but at the same time, they have more responsibility to be open, responsive and transparent in expenditure on service delivery. Some political and administrative changes are catalysing this transition process such as the adoption of the right to information as a fundamental right, the consensus on local governments, and increased focus on performance based politics. Similarly, a few social changes are also happening to facilitate this process such as the increased citizen awareness, getting impetus from a free electronic media and independent judiciary. However, the economic side remains bleak in context with the provinces whereas tax collection and generation of own source revenue also remain big problems. In Pakistan, the provinces raise only 0.4 percent of gross domestic product (GDP) in tax revenues and spend almost 16 times higher (WB, 2013).

Punjab, which is the most urbanized, most prosperous and most populated province of Pakistan, draws most of its funds from the federal disbursements and 80 percent of its revenue comes from federal transfers. The remaining funds are generated through different taxes as detailed in Table 1.
Pakistan is more progressive than other provinces in bringing about fiscal and taxation reforms. Notable actions at provincial level include:

1. Punjab Revenue Authority (PRA) has been established in 2012 to improve tax collection. The PRA is mandated to introduce semi-autonomous revenue administration which is an internationally recognized doctrine of tax collection. The initial focus of the Authority is to reform general sales tax collection system. However, its primary mandate for future is to expand UIPT collection and other tax bases (WB, 2013). The effectiveness of the Authority to increase own revenue of the province is being increased through allied legislation.

Besides the strengthening of PRA, the capacity of the age old departments of Excise & Taxation Department and Board of Revenue are also being increased by bringing reforms such as plugging the leakages through computerization of tax collection systems (GoPb, 2014).

2. Sub National Governance Programme (SNG) is the flagship program being implemented by Finance Department of Punjab in collaboration with the Department for International Development (DFID). It is based on a three tiered approach developed from international best practices i.e.

### Table 1: The Punjab Government’s Income from Taxes

<table>
<thead>
<tr>
<th>Tax source</th>
<th>BE 2013-14 PRs in Million</th>
<th>RE 2013-14 PRs in Million</th>
<th>BE 2014-15 Estimated PRs in Million</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales Tax on Services</td>
<td>62,350.000</td>
<td>52,000.000</td>
<td>95,000.000</td>
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<tr>
<td>Stamp Duty</td>
<td>14,697.157</td>
<td>13,944.739</td>
<td>18,937.262</td>
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<tr>
<td>Land Revenue</td>
<td>11,583.643</td>
<td>11,036.299</td>
<td>11,788.682</td>
</tr>
<tr>
<td>Motor Vehicle Tax</td>
<td>538.426</td>
<td>531.112</td>
<td>550.000</td>
</tr>
<tr>
<td>UIPT</td>
<td>7,254.663</td>
<td>5,278.268</td>
<td>7,750.000</td>
</tr>
<tr>
<td>Electricity Duty</td>
<td>4,948.518</td>
<td>6,035.447</td>
<td>6,540.500</td>
</tr>
<tr>
<td>Capital Value Tax</td>
<td>4,938.755</td>
<td>4,938.755</td>
<td>5,432.631</td>
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<tr>
<td>Registration</td>
<td>4,680.457</td>
<td>4,640.866</td>
<td>1,612.271</td>
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<tr>
<td>Excise Tax</td>
<td>1,782.608</td>
<td>1,500.000</td>
<td>1,782.608</td>
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<tr>
<td>Agricultural Tax</td>
<td>2,018.938</td>
<td>830.000</td>
<td>2,018.938</td>
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<tr>
<td>CVT on Moveable Assets</td>
<td>0.000</td>
<td>101.352</td>
<td>200.002</td>
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<td>Professional Tax</td>
<td>583.359</td>
<td>583.359</td>
<td>583.359</td>
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<tr>
<td>Farm House Tax</td>
<td>17.000</td>
<td>0.536</td>
<td>15.000</td>
</tr>
<tr>
<td>Opium</td>
<td>6.886</td>
<td>0.050</td>
<td>0.050</td>
</tr>
<tr>
<td>Tax on Luxury Houses</td>
<td>0.000</td>
<td>44.440</td>
<td>500.000</td>
</tr>
<tr>
<td>Receipts under MV Acts</td>
<td>10,100.117</td>
<td>9,361.643</td>
<td>11,255.341</td>
</tr>
<tr>
<td>Other Indirect Taxes</td>
<td>1,202.272</td>
<td>962.128</td>
<td>713.600</td>
</tr>
<tr>
<td>Total</td>
<td>126,702.799</td>
<td>111,788.994</td>
<td>164,680.244</td>
</tr>
</tbody>
</table>

Source: GoPB, Finance Department

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• Develop policy, planning and budgeting linkage in financial management;

• Shift to a top-down approach from bottom-up budgeting;

• Bring in performance based budgeting in place of input based budgeting by linking inputs to outputs and outcomes.

SNG is assisting in creating fiscal space through better resource management, controlling expenditures and generating revenue (WB, 2013).

3. Provincial Finance Commission Award (PFCA) was established to ensure continuous and adequate financing of devolved functions after promulgation of Punjab Local Governments Ordinance (PLGO) 2001. Currently, PFCA is being re-designed on the recommendations of the study commissioned by Punjab government to assess the effectiveness, the adequacy, and predictability and equalization effects of the PFCA transfers and the sustainability of local government expenditures (WB, 2013).

4. Punjab government has also commissioned a study to analyse the proposed implementation of Needs Based Budgeting. This is being done for better planning and service delivery through allocation of funds in the Annual Development Plans on the basis of their need and demand from the constituencies of the city governments.

5. A comprehensive Expenditure and Quantity of Service Delivery Survey (EQSDS) is being conducted in the province to improve efficiency of public spending for better public service at district level.

Though, the province is trying to implement the above reforms agenda and increase its fiscal space, the city level local governance has received little attention in the devolution process and municipal revenue generation capacity is critical owing to poor financial management. Therefore, cities are heavily dependent on national and provincial disbursements for service delivery.

Recent International Trends in Municipal Finance

In developing countries like Pakistan, municipal budgets normally cover operating costs and recurrent expenditures and don’t sufficiently cover capital investments. Municipal governments struggle to expand their resource base, tap missed opportunities and control over-spending on service delivery. They are expected to integrate innovative ideas and tools on expenditure management and improve their local tax collection (WB E- Institute Web Portal).

The municipalities need to identify new resource generation areas and strengthen the existing ones. For example:

i. UIPT has a great potential to increase the municipal revenue and municipalities in some countries like Canada use it as their main source of revenue. However, other municipalities like New York, Tokyo, Paris and Chicago levy 20 to 30 different taxes.

ii. Municipalities should turn to marginal cost pricing for services to meet the cost on service delivery infrastructure. This will provide an incentive to locate closer to existing services and development and would reduce sprawl.

iii. User fee for water supply and waste collection is another instrument which should be marginally priced to motivate people to reduce their water usage and garbage generation (Slack, 2014).

However, in the climate era, the traditional financial outlays would not the sufficiently provide for the infrastructure needs of cities which have to bear up to 80 percent of the expected US$80-100 billion per year adaptation costs. The infrastructure needs of cities in developing countries exceed $1 trillion a year while they are currently getting $125 billion only as official development aid (WB, n.d.). The cities need to learn how to integrate climate resilience into planning and product design. For initial resilience upgrading, they would need emerging non-conventional financing instruments. For example:
1. The low carbon town planning and urban development yield financial dividends for municipal governments and utilities. Activities for smart city planning include greenhouse gas inventories development and tools for emission reduction potential.

The World Bank estimates that up till now, only 30 largest cities of the world have gathered the necessary analytics for low-carbon planning. An accreditation program has therefore been started internationally to train officials and private sector professionals of the cities intending to conduct greenhouse gas inventories. For this purpose, Global Protocol for Community Scale Emissions methodology is used. The inventory development helps cities to profile their emissions and identify the right mix of policies and investments and tap the emissions reduction potential completely (WB Press Release, September 25, 2013). Some international best practices exist for emissions inventory development. For example, the city government of Rio de Janeiro has developed a greenhouse inventory and a modern operations centre besides implementing a range of low carbon measures such as bike sharing scheme, cycling paths and sanitation schemes. These measures will reduce emissions, increase resilience to climate change and above all help it to access capital available under different carbon markets (WB Feature Story, September 25, 2013).

An important policy tool promoted recently is the capital investment plan which helps local governments to forecast their future capital procurements and project implementation needs and prioritize them according to their demand and benefit. A well-designed plan also increases the credit and bond rating of municipal governments and puts lesser burden on their finances in terms of debt servicing. This method is also helpful in climate smart city development through which the local authorities can choose the most carbon and cost effective options (WB Feature Story, May 15, 2014).

2. The World Bank and IFC have helped pioneer the green bond market which is 20 billion dollar international market to provide private finance for climate mitigation and adaptation. Green bonds are fixed income, liquid financial instruments that are used to raise funds for green growth projects around the world. Since 2008, the World Bank has issued more than $7 billion in green bonds in 17 currencies, and the International Finance Corporation has issued $3.7 billion in green bonds. Other issuers are also coming in the market in new currencies and with innovative structures. This initiative has been taken because in the climate change era, the cities are in critical need of finance to remodel the existing and build new infrastructure in virtually every sector such as water supplies, energy, transport, farms and food supplies, schools and hospitals. Climate change poses increased risk to global supply chains without new investments.

Green bonds increase the access of the governments to the $80 trillion bond market and channelize the private investment to climate-friendly projects worldwide. This market was initiated in 2013 and since then it has seen exponential growth to fund environment friendly growth. They are the first market based simple investment tools that are dedicated to adaptation and mitigation projects. They are fixed income, liquid financial instruments that provide investors lucrative monetary and reputational benefits. The proceeds from institutionally backed green bonds are further invested in activities that support green growth such as renewable energy, energy efficiency, sustainable transportation, forest and watershed management, and flood resilient infrastructure.

The Green Bond Market is getting momentum and has great potential for populated and finance hungry cities in the developing countries. This is because, the Green Bond Market has the backing of IFC and World Bank which provides the credibility, security, development mandate, awareness and assurance to the investors that proceeds will be used for the stated purpose and environmental impact and that the investors have climate-friendly opportunities at their disposal. The municipalities and utilities are making an increased use of this financial instrument and even issuing their own bonds. For example, the French utility GDF Suez has issued the largest green bond to date ($3.4 billion) to fund renewal energy projects. This was very well received and
over subscribed. Earlier record was of $1.7 billion set by Électricité de France last year, 25% proceeds of which will go to solar energy projects. The market is getting further impetus with the growth of asset managers such as Black Rock in the market with the mandate to increase and manage green bonds.

Successful projects being carried out with green bond proceeds include a geothermal project in Indonesia that has been designed to increase access to affordable and clean energy that will reduce 1.1 million tons of greenhouse gases annually. Another energy efficiency project is being carried out in Chinese factories with a potential to cut greenhouse gases by four million tons a year. A large-scale solar power facility has been erected in Mexico to meet the energy needs of 164,000 people without government subsidies while in India, a company is using the proceeds from the green bonds to set up an establishment to recycle e-waste consisting of electronic gadgets (WB Brief, October 23, 2014).

3. Cities can work with provincial and federal governments to get project funding under the following Climate Investment Funds. For example:

a. Clean Technology Fund worth $5.3 billion has been operational since 2008 to provide a funding window for the demonstration, deployment and transfer of low carbon technologies and reduction of long-term greenhouse gas emissions in middle income countries. This is concessional financing for large-scale projects in renewable energy, energy efficiency, and transport.

b. Forest Investment Program is $602 million pilot initiative to support REDD+ efforts such as reduction in rate of deforestation and forest degradation, promotion of sustainable forest management and enhancement of forest carbon stocks.

c. Pilot Program Climate Resilience provides a funding window of $1.2 billion as part of Climate Investment Funds to integrate climate resilience into development planning. The program not only builds on existing efforts under National Adaptation Programs of Action (NAPAs) but also offers funding for piloting innovative initiatives to manage climate risks.

d. Scaling up Renewable Energy Program (SREP) offers $524 million to Low Income Countries (LICs) for deployment of renewable energy options, increasing energy access and creating economic opportunities. SREP aims to demonstrate the economic, social, and environmental viability of low carbon development pathways building on existing energy initiatives of these countries (CIF Web Portal).

e. OECD countries give 25.6 billion USD annually through bilateral (85%) and multilateral (15%) arrangements as climate related aid to low and middle income countries. Under bilateral aid arrangements, about 11.4 billion is given for adaptation activities, 6 billion for adaptation and 4.1 billion for overlapping activities. Some of the funds besides those mentioned above include:

- Global Environment Facility (4.4 Billion USD)
- Global Energy Efficiency and Renewable Energy Fund (0.2 Billion USD)
- Least Developed Countries Fund (0.9 Billion USD)
- Global Climate Change Alliance (0.4 Billion USD)
- (UNDP MDG Carbon, 2014)

4. Municipalities can work with local businesses to get investment for climate smart city development in different PPP models. A survey released by The Economist Intelligence Unit (EIU) in December 2014 shows that 90% of business leaders believe they can help prepare cities for the effects of climate change, with 51% saying that investing in climate change resilience gives them a competitive edge. For business, the biggest perceived market and operational risk from climate change is the disruption of energy supplies, which could severely impact on a company’s ability to operate. Increased competitiveness, improved employee health, greater productivity and lower absenteeism and cost savings are other drivers for corporate investment in climate resilience building.

5. International Development Association’s (IDA) adaptation funds are an instrument to finance...
preventive maintenance, monitoring and emergency management systems. The fund is financed from different sources especially the clean development mechanism project activities and finances adaptation projects in developing countries participating in the Kyoto Protocol.

6. Catastrophe (CAT) bonds are an innovative scheme that came in the market in response to increased frequency and damages of hurricanes in the US cities almost two decades ago. They were a kind of reinsurance to diversify the risk through a managed pool of re-insurance policies. Currently, they are designed to pass the extreme risk to a pool of private investors in exchange for a potential heavy substantial interest on their investment. Governments have started issuing their own CAT bonds such as Mexican government issued catastrophe bonds in 2006 to generate funds for disaster response. The World Bank has also established a Multi-Catastrophe Program five years ago to help governments against multiple kinds of catastrophe risk. The active use of the CAT bonds is to spread the risk across a number of cities and invest the proceeds in risk reduction measures in the cities. The passive use is to hold the proceeds for disaster response in case of extreme event (ICLEI, 2011).

Overcoming the Bottlenecks

There are many bottlenecks to access the non-traditional finance such as the sovereign guarantees (issued by the federal government). City governments are considered high risk borrowers by private and international lenders which increase their cost of borrowing. In order to increase their credibility, new mechanisms are emerging which are framed and promoted particularly by the World Bank. Credit rating systems have been developed through which a city entity can get confidence of the lenders, reduce their cost to access available funding streams and become independent from the federal government. However, before obtaining formal credit rating, the city governments need to address some issues and improve some areas. These include:

1. Cities need to improve their creditworthiness. The World Bank analysis show that only 20 out of 500 major cities in the developing countries are deemed creditworthy in international financial markets while another 100 more in local markets. For low carbon and development and erection of climate smart infrastructure, the cities need to be attractive for private lenders and investors and they should have free access to financial markets. Therefore, a City Creditworthiness program has been designed by the World Bank and its associates. The program facilitates the financial departments of the city governments to review their revenue management systems and conducts the training of their staff. The initial assessments are very promising and it is estimated that the investment in creditworthiness program will mobilize 100 times more private sector financing.

Some cities have started their journey to get credit ratings. This is rather a long and continuous process and on an average consumes 3-5 years. The World Bank assists the aspiring cities to develop innovative solutions and mechanisms and attract private financing. One of the possible solutions is to pool resources of city governments requiring the same type of investment and development programs (WB Feature Story, September 25, 2013).

Some of the international best practices are given below to draw lessons to get improved credit rating for better city governance in Pakistan:

a. The city entities of Swaziland have increased their creditworthiness by seeking assistance of Public Private Infrastructure Advisory Facility (PPIAF). The Public-Private Infrastructure Advisory Facility (PPIAF) is a multi-donor trust fund that helps developing countries to develop the enabling environment for private investment by improving their legal and institutional framework and government capacity. Under this program, different activities were conducted including the capacity building workshops in different cities and a creditworthiness guide to give an overview of the technical and management issues. This helped different cities including the Matsapha Town Board and the Manzini City Council to get long term credit rating. (PPIAF, 2012)

b. Six municipalities in Peru sought the assistance of Sub-National Technical Assistance (SNTA) Program of PPIAF six year ago to get credit
ratings. This resulted in securing a 70 million dollar commercial bank load by the Municipality of Lima and a $10 million commercial bank loan by Arequipa without a sovereign guarantee.

c. In the year 2009, some Latin American countries have been able to improve their creditworthiness through the Regional Credit Rating Improvement Program. Three Mexican sub-national governments carried out Credit Diagnostic Assessments and successfully obtained credit ratings. These credit ratings secured commercial bank loans of $79.5 million and $10.9 million for the states of Guerrero and the Municipality of Puebla respectively (PPIAF Web Portal).

2. Performance improvement is the next most important aspect on the journey to improve subnational and municipal finance. The first step is to take focused steps to eliminate the issue that pinch the lenders. The typical financial performance improvement activities range from small steps to improve auditing and reporting to more ambitious work such as restructuring of a utility. The technical assistance for performance improvement is also provided under PPIAF’s SNTA program which helps city governments to develop financial sustainability plans, strengthen revenue flows and monitoring mechanisms, diagnose problems and increase transparency. Following are some of the success stories achieved under SNTA program:

a. In 2008, the organization of La Promotora of the Colombian city of Pereira improved its credit rating through placing risk management system, improved costing system and strategic planning initiatives and extended $6.5 million loans for infrastructure improvement projects in Pereira. In the same year, the city of Dakar reviewed its public financial management system using Public Expenditure and Financial Accountability (PEFA) methodology. The results of this exercise helped this African municipality to improve the fiscal management, resource allocation of resources and municipal services delivery mechanism. These improvements also increased creditworthiness of the city and a €10 million loan was extended by a private bank to finance a public lighting program of the municipality.

b. The city of Ouagadougou in Burkina Faso conducted a Public Expenditure and Financial Accountability study in 2009 and an action plan in 2010 to increase the transparency in its financial management systems. As a result of this exercise, the city received major financial tranches as loans and grants from the French Development Agency to finance the rehabilitation of its public transportation management system.

c. The water utility of DESO owned by Sergipe state in Brazil improved its financial performance after collection of financial and operational information to provide to lenders and impact assessment of its institutional development program. As a result, DESO obtained an $11 million loan from the International Finance Corporation for a non-revenue water reduction project (PPIAF Web Portal).

Conclusion

With an improved municipal finance system, achieved through a right mix of local and international best practices, climate smart cities can be developed and maintained in Pakistan under the existing institutional framework of the country. Furthermore, the city governments are required to come with increasingly sophisticated responses for mobilizing and utilizing their financial resources in the climate era. These include human resource development, performance measurement, management of revenues & expenditures, local assets and services, and external resource mobilization.

The municipalities in Pakistan are working with World Bank and other development agencies in all but the last of these areas. This is because; the external resource mobilization is the trickiest area and requires that a municipal borrower has sufficient management and administrative capacity to properly manage the loan obtained on affordable terms. It also has to ensure that the interests of the municipality are protected in the lending agreements. In order to avoid the vicious circle of debt servicing, all the areas of financial and revenue management are streamlined to avoid delays and penalties. The annual budget should reflect these payments transparently and regular financial reporting must be carried out to explain any anomalies to the people and other stakeholders.
The borrowed money is a costly way of financing but it has its own benefits if properly managed, utilized on priority infrastructure and paid back on time. Perhaps the most important issues relate to the use of the borrowed funds. Furthermore, it must be ensured that proper planning and homework is already done before receiving loans to avoid unnecessary interest payments. This can only be done once the municipality has developed its financial management capacity to a certain level and shown commitment to spend the borrowed funds as per international best practices (PPIAF, 2009).

Abbreviations and Acronyms

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Abbreviation</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>AIIB</td>
<td>Asian Infrastructure Development Bank</td>
<td></td>
</tr>
<tr>
<td>BRICS</td>
<td>Brazil, Russia, India, China and South Africa</td>
<td></td>
</tr>
<tr>
<td>CAT</td>
<td>Catastrophe</td>
<td></td>
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<td>CDG</td>
<td>City District Government</td>
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<td>CIF</td>
<td>Climate Investment Fund</td>
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<td>Companhia de Saneamento de Sergipe</td>
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<td>Department of International Development</td>
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<td>EIU</td>
<td>Economist Intelligence Unit</td>
<td></td>
</tr>
<tr>
<td>EQSDS</td>
<td>Expenditure and Quantity of Service Delivery Survey</td>
<td></td>
</tr>
<tr>
<td>E&amp;TD</td>
<td>Excise and Taxation Department</td>
<td></td>
</tr>
<tr>
<td>FDI</td>
<td>Foreign Direct Investment</td>
<td></td>
</tr>
<tr>
<td>FY</td>
<td>Financial Year</td>
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</tr>
<tr>
<td>GDP</td>
<td>Gross Domestic Product</td>
<td></td>
</tr>
<tr>
<td>GoPb</td>
<td>Government of Punjab</td>
<td></td>
</tr>
<tr>
<td>ICLEI</td>
<td>International Council for Local Environmental Initiatives</td>
<td></td>
</tr>
<tr>
<td>IDA</td>
<td>International Development Association</td>
<td></td>
</tr>
<tr>
<td>IDAMP</td>
<td>Integrated Development and Asset Management Plan</td>
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</tr>
<tr>
<td>IFC</td>
<td>International Finance Corporation</td>
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</tr>
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<td>Low Income Countries</td>
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</tr>
<tr>
<td>LWMC</td>
<td>Lahore Waste Management Company</td>
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</tr>
<tr>
<td>MDG</td>
<td>Millennium Development Goals</td>
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</tr>
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<td>MIS</td>
<td>Management Information System</td>
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</tr>
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<td>MFSA</td>
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</tr>
<tr>
<td>MV</td>
<td>Motor Vehicle</td>
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<tr>
<td>NAPA</td>
<td>National Adaptation Program of Action</td>
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</tr>
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<td>National Development Bank</td>
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</tr>
<tr>
<td>OECD</td>
<td>Organization for Economic Co-operation and Development</td>
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</tr>
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<td>OSR</td>
<td>Own Source Revenue</td>
<td></td>
</tr>
<tr>
<td>PBIT</td>
<td>Punjab Board of Investment and Trade</td>
<td></td>
</tr>
<tr>
<td>PCGIP</td>
<td>Punjab Cities Governance Improvement Program</td>
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<td>PEFA</td>
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<td>Parks and Horticulture Authority</td>
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<tr>
<td>PLGO</td>
<td>Punjab Local Government Ordinance</td>
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</tr>
<tr>
<td>PPP</td>
<td>Public Private Partnership</td>
<td></td>
</tr>
<tr>
<td>PRA</td>
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<tr>
<td>PPIAF</td>
<td>Public Private Infrastructure Advisory Facility</td>
<td></td>
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<tr>
<td>PPPRA</td>
<td>Punjab Public Procurement Regulatory Authority</td>
<td></td>
</tr>
<tr>
<td>REDD</td>
<td>Reducing Emissions from Deforestation and Forest Degradation</td>
<td></td>
</tr>
<tr>
<td>SNG</td>
<td>Sub National Governance Program</td>
<td></td>
</tr>
<tr>
<td>SNTA</td>
<td>Sub National Technical Assistance</td>
<td></td>
</tr>
<tr>
<td>SOP</td>
<td>Standard Operating Procedure</td>
<td></td>
</tr>
<tr>
<td>SREP</td>
<td>Scaling up Renewable Energy Program</td>
<td></td>
</tr>
<tr>
<td>TIF</td>
<td>Tax Increment Financing</td>
<td></td>
</tr>
<tr>
<td>TMA</td>
<td>Tehsil Municipal Administration</td>
<td></td>
</tr>
<tr>
<td>UIPT</td>
<td>Urban Immovable Property Tax</td>
<td></td>
</tr>
<tr>
<td>UNDP</td>
<td>United Nations Development Program</td>
<td></td>
</tr>
<tr>
<td>USD</td>
<td>United States Dollar</td>
<td></td>
</tr>
<tr>
<td>WASA</td>
<td>Water and Sanitation Agency</td>
<td></td>
</tr>
<tr>
<td>WB</td>
<td>World Bank</td>
<td></td>
</tr>
</tbody>
</table>

References


11. PPIAF (2012). PPIAF’s Sub-National Technical Assistance Program: Results. Washington, DC.


Distribution and Prevalence of Drinkable Water Contamination and Significance of Water Quality in Lahore

*Sana Shaukat* and *Dr. Ali Iqtadar Mirza**

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**Department of Geography, Govt. College University, Lahore, Pakistan*
Abstract

Water is vital for life and the availability of quality drinking water is the basic necessity and right of every human being. Over exploitation and misuse of fresh water has made it a scarce resource expecting current practices in future many countries are going to face severe water crisis. Pakistan is also at risk because of its depleting fresh water resources. Main causes of water pollution in Pakistan are the human activities including the discharge of untreated industrial waste in the fresh water bodies. In this study ground water quality is determined using Canadian water quality index (CWQI) in the area of Kot Lakhpat. This area is chosen because it is at the junction of two populated towns in the Lahore district and it includes both residential and industrial area. The results shows water is of good quality and safe for household use but as far as drinking water is concerned this water is not safe because of the higher arsenic and bacterial contaminations.

Keywords: Water, Drinking Water, Water Contamination, Water Quality Index, Pakistan.

Introduction

Water is vital for life but lately a lot of concerns relating to water are arising. Fresh water is a scarce resource, moreover, the quality of water is also deteriorating. According to a press release by UNO Secretary General on World Water Day 2002, “Around 1.1 billion people do not have access to safe drinking water; 2.5 billion people lack access to proper sanitation, and more than 5 million people die annually because of water borne diseases. Although water supplies are abundant but they are at risk due to increasing pollution and ever increasing demand. By 2050, around two third of world’s population is likely to inhabit in the countries with the moderate or severe water shortage.”

Even though three third of earth surface is covered with water, only 3% of that water is fresh and yet the water available for human use is 0.01%. Human race should learn to live sustainably with this small fraction of fresh water supply. But if the current water usage practices continue, in coming decades we would bear the consequences of our actions in form of severe water crises. According to a UNO report, world population and water supply are having an inverse relation, population is increasing exponentially while resources are depleting. In future many countries are going to face water shortage problems and this situation is going to become even worse for the developing countries because of the overpopulation, mismanagement of resources, lack of polices and professional and financial constraints.

Pakistan is a developing country and is also facing water crisis. In the last few years the per capita water availability has dropped, moreover, the quality of the ground and surface water is declining due to unchecked disposal of untreated industrial wastes. In Pakistan more than 44% of the population is living without having access to safe drinking water. This situation is even worse in the rural areas where upto 90% of the population is living without safe drinking water. Only 3% of the sweet water resources are used for drinking in the households. If water is defined as safe drinking water according to the international standards only 25.61% (rural 23.5% and urban 30%) of Pakistani population is availing this facility.

Drinking water quality is checked and monitored by the public and private institutions to make sure that people have access to safe drinking water. Water is considered polluted when various substances are present in excess than the permissible limits. Common pollutants are pathogenic organisms (bacteria, viruses and protozoa), organic and inorganic pollutants can pose serious health impacts if their concentration exceeds the allowable limits. In Pakistan drinking water is frequently contaminated with the bacteria and toxic metals like arsenic, cadmium and iron, such contamination can have deleterious effects on health [1]. There are various ways to identify the water quality but one of the convenient way is water quality index (WQI). Water Quality index can be used to summarize the complex water quality data, and make the factor understandable for a layman or general audience.
Material and Methods

Kot Lakhpat is chosen as the study area, it is situated in Lahore and contains various types of land use. Lahore is the second biggest city of Pakistan and Kot Lakhpat is a residential and industrial area located at the junction of two populated towns i.e. Gulberg and Allama Iqbal. Kot Lakhpat is bound by Ferozpur Road in the north and east. On the western side of the site Model Town is situated. Township is located in the south west of Kot Lakhpat. Residential area is present in the north and comprised of Bahar Colony, Model Colony and Pindi Rajputana while industrial area is located in the south. Major population of Kot Lakhpat belongs to middle class income group.

Description of Sampling Site

Drinking water samples were taken from the residential as well as industrial areas. Ten drinking samples were collected from study area. Samples were collected by PCRWR surveyor and tested at the PCRWR Laboratory. Some 21 different parameters were taken into consideration. These parameters were divided into two groups:-

1. Physio-chemical parameters
2. Bacterial Parameters

Physio-Chemical Parameters

Physio chemical parameters include Alkalinity, Bicarbonate, Calcium, Carbonate, Chloride, Color, Conductivity, Hardness, Magnesium, Odour, pH, Potassium, Sulfate, Sodium, taste, TDS, Turbidity, Nitrate and Arsenic. Temperature, TDS and pH values were evaluated at the site using TDS and pH meters. Sodium concentration was determined by using flame photometer. Titration is used to determine alkalinity and hardness. Turbidity meter was used to determine turbidity. Bicarbonate and carbonate was evaluated using standard table [4].

Bacterial Parameters

Bacterial parameter Total Coliform, Total E.Coli was evaluated using MPN technique. The MPN index/100 mL was determined from standard tables.

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Water Quality Parameters</th>
<th>Permissible Limits</th>
<th>S1</th>
<th>S2</th>
<th>S3</th>
<th>S4</th>
<th>S5</th>
<th>S6</th>
<th>S7</th>
<th>S8</th>
<th>S9</th>
<th>S10</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Alkalinity (m mol/L)</td>
<td>NGVS</td>
<td>4.6</td>
<td>4.6</td>
<td>5.3</td>
<td>6.6</td>
<td>4.6</td>
<td>6.6</td>
<td>7.4</td>
<td>6.99</td>
<td>7.6</td>
<td>5.8</td>
</tr>
<tr>
<td>2</td>
<td>Bicarbonate (mg/l)</td>
<td>NGVS</td>
<td>240</td>
<td>230</td>
<td>270</td>
<td>210</td>
<td>230</td>
<td>340</td>
<td>320</td>
<td>366</td>
<td>382</td>
<td>290</td>
</tr>
<tr>
<td>3</td>
<td>Carbonate (mg/l)</td>
<td>75 (KSA)</td>
<td>20</td>
<td>52</td>
<td>30</td>
<td>18</td>
<td>94</td>
<td>20</td>
<td>32</td>
<td>36</td>
<td>74</td>
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<tr>
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<td>Calcium (mg/l)</td>
<td>NGVS</td>
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<td>Nil</td>
<td>Nil</td>
<td>Nil</td>
<td>Nil</td>
<td>Nil</td>
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<td>Nil</td>
<td>Nil</td>
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<tr>
<td>5</td>
<td>Chloride (mg/l)</td>
<td>250 (WHO)</td>
<td>17</td>
<td>29</td>
<td>24</td>
<td>22</td>
<td>33</td>
<td>51</td>
<td>41</td>
<td>27</td>
<td>112</td>
<td>24</td>
</tr>
<tr>
<td>6</td>
<td>Colour (TCU)</td>
<td>15 (WHO)</td>
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<td>Unobjectionable</td>
<td>Unobjectionable</td>
<td>Unobjectionable</td>
<td>Unobjectionable</td>
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<td>Unobjectionable</td>
<td>Unobjectionable</td>
<td></td>
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<tr>
<td>7</td>
<td>Conductivity (micro-S/cm)</td>
<td>NGVS</td>
<td>630</td>
<td>542</td>
<td>702</td>
<td>746</td>
<td>858</td>
<td>952</td>
<td>988</td>
<td>812</td>
<td>11.06</td>
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<td>8</td>
<td>Hardness (mg/l)</td>
<td>500 (WHO)</td>
<td>90</td>
<td>205</td>
<td>100</td>
<td>120</td>
<td>310</td>
<td>95</td>
<td>155</td>
<td>390</td>
<td>415</td>
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<td>Magnesium (mg/l)</td>
<td>150 (WHO)</td>
<td>9.72</td>
<td>19.44</td>
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<td>15</td>
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<td>11</td>
<td>18.22</td>
<td>38</td>
<td>51</td>
<td>15</td>
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<tr>
<td>10</td>
<td>Odour</td>
<td>Odorless</td>
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<td>3.7</td>
<td>0.9</td>
<td>1.5</td>
<td>3</td>
<td>2</td>
<td>1.6</td>
<td>8</td>
<td>0.2</td>
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<td>11</td>
<td>pH</td>
<td>6.5-8.5 (WHO)</td>
<td>7.58</td>
<td>7.42</td>
<td>7.52</td>
<td>7.33</td>
<td>7.17</td>
<td>7.6</td>
<td>7.78</td>
<td>7.07</td>
<td>7.73</td>
<td>8.12</td>
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<tr>
<td>12</td>
<td>Potassium (mg/l)</td>
<td>12 (EC)</td>
<td>3.7</td>
<td>0.9</td>
<td>1.5</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>1.6</td>
<td>8</td>
<td>0.2</td>
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<tr>
<td>13</td>
<td>Sulfate (mg/l)</td>
<td>250 (WHO)</td>
<td>78</td>
<td>78</td>
<td>86</td>
<td>90</td>
<td>170</td>
<td>166</td>
<td>124</td>
<td>56</td>
<td>125</td>
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<tr>
<td>14</td>
<td>Sodium (mg/l)</td>
<td>200 (WHO)</td>
<td>102</td>
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<td>126</td>
<td>148</td>
<td>70</td>
<td>540</td>
<td>172</td>
<td>170</td>
<td>112</td>
<td>136</td>
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<td>15</td>
<td>Taste</td>
<td>Unobjectionable</td>
<td>Unobjectionable</td>
<td>Unobjectionable</td>
<td>Unobjectionable</td>
<td>Unobjectionable</td>
<td>Unobjectionable</td>
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<tr>
<td>16</td>
<td>TDS (mg/l)</td>
<td>1000 (WHO)</td>
<td>365</td>
<td>381</td>
<td>450</td>
<td>478</td>
<td>546</td>
<td>365</td>
<td>611</td>
<td>520</td>
<td>738</td>
<td>443</td>
</tr>
<tr>
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<td>Turbidity (NTU)</td>
<td>5 (WHO)</td>
<td>2.4</td>
<td>1.2</td>
<td>1.09</td>
<td>3.88</td>
<td>1.8</td>
<td>0.6</td>
<td>0.043</td>
<td>4.2</td>
<td>1.1</td>
<td>0.5</td>
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<tr>
<td>18</td>
<td>Nitrate as N (mg/l)</td>
<td>10 (WHO)</td>
<td>0.24</td>
<td>BDL</td>
<td>0.035</td>
<td>0.042</td>
<td>0.24</td>
<td>0.24</td>
<td>0.057</td>
<td>2.3</td>
<td>4.5</td>
<td>BDL</td>
</tr>
<tr>
<td>19</td>
<td>Arsenic (mg/l)</td>
<td>10 (PSQCA)</td>
<td>27.49</td>
<td>16.15</td>
<td>29.2</td>
<td>32.9</td>
<td>30.4</td>
<td>27.49</td>
<td>18.36</td>
<td>25.23</td>
<td>17.73</td>
<td>18.34</td>
</tr>
<tr>
<td>20</td>
<td>Total Coli form MPN/100 m</td>
<td>10 (WHO)</td>
<td>5</td>
<td>Nil</td>
<td>0</td>
<td>240</td>
<td>240</td>
<td>5</td>
<td>Nil</td>
<td>2.2</td>
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<tr>
<td>21</td>
<td>Total Coli form MPN/100 m</td>
<td>10 (WHO)</td>
<td>4.4</td>
<td>Nil</td>
<td>0</td>
<td>240</td>
<td>24</td>
<td>4.4</td>
<td>Nil</td>
<td>2</td>
<td>Nil</td>
<td>38</td>
</tr>
</tbody>
</table>
NGVS No guideline values  
KSA Kingdom of Saudi Arabia  
WHO World Health Organization  
PSQCA Pakistan Standards and Quality Control Authority  
BDL Below Detection Limit

*Water Quality Index*

Canadian water quality index was used to evaluate the quality of drinking water, while WHO values were used as the standard values. Canadian water quality index was developed by Canadian Council of Ministers for Environment. This index is able to measure both the frequency and the extent to which each parameter is exceeding to given limit.

Canadian WQI is calculated by using the given equation:

\[
WQI = 100 - \sqrt{\frac{F1^2 + F2^2 + F3^2}{1.732}}
\]

Whereas

- **F1** = Scope: the percentage of variables whose objectives are not met at least once, it is calculated using following formula.

\[
F1 = \left( \frac{\text{Number of failed variables}}{\text{Total number of variables}} \right) \times 100
\]

- **F2** = Frequency: represents the percentage of individual tests that do not meet objectives [3].

\[
F2 = \left( \frac{\text{Number of failed tests}}{\text{Total number of tests}} \right) \times 100
\]

- **F3** = Amplitude: represents the amount by which failed test values do not meet their objectives. F3 is calculated in three steps.

**I. Excursion:** The number of times by which an individual concentration is greater than (or less than, when the objective is a minimum) the objective is termed an “excursion” and is expressed as follows [3].

\[
nse = \left( \frac{\sum_{i=1}^{n} \text{excursion}}{\text{Total number of tests}} \right) - 1
\]

**II. Normalized sum of excursions:**

The collective amount by which individual tests are out of compliance is calculated by summing the excursions of individual tests from their objectives and dividing by the total number of tests [3].

\[
\text{Excursion} = \left( \frac{\text{Failed test value}}{\text{Objective}} \right) - 1
\]

**III. F3** is then calculated by an asymptotic function that scales the normalized sum of the excursions from objectives (nse) to yield a range between 0 and 100 [3].

\[
F3 = \left[ \frac{nse}{0.01nse + 0.01} \right]
\]

*Results and Discussion*

The numerical summary of the data collected from the ten sampling sites is given in the table 1, which depicts the standard values and observed values for 21 selected parameters. Considering those standards the category of water quality index is determined using following table.

Table 2: WQI Values
According to the statistical data shown in the Table most of the parameters were within the permissible apart from Carbonates, Sodium, Arsenic, total Coliform and total E. coli.

The standard value for carbonate is 75 KSA. Although the concentration of carbonate is found in access i.e. 94mg/L only at one sample site (S5). PH and carbonate values show that groundwater of the study area is slightly basic but this accessibility do not cause any health implications. But if this water is used for washing purposes it may need more soap.

Another parameter which shows abnormality is sodium at sample site S6. Slightly high concentrations of sodium do not cause serious health implications but it may be problematic for the patients of hypertension, heart and kidney diseases because they need to maintain a low sodium intake.

Arsenic was found in higher concentration at all the samples sites. Water with high arsenic concentration is bad for human health because arsenic is carcinogenic.

Fecal contamination was also found in the ground water of Kot Lakhpat, in this study the standard value is taken as 10 MPN/100 ml and this value is taken from global drinking water quality index development and sensitivity analysis report.

The values of F1, F2 and F3 are Given below

\[
F1 = 23.80 \\
F2 = 8.57 \\
F3 = 7.65
\]

For safe drinking water the important factor is the presence of fecal coliform and its concentration must be zero according to WHO drinking water standards. According to the Azizullah et al., 2011 the major sources of ground water contamination in Pakistan are human activities, for example inappropriate and untreated disposal of the municipal and industrial wastes. Both chemical and bacterial pollutants

**Conclusion**

Water quality index is used to calculate the quality of ground water in Kot Lakhpat. Various physio-chemical and bacterial parameters were collected and tested at the Laboratory of PCRWR. Their results show that there were five Parameters that were exceeding the permissible limits, water was found contaminated with parameters like

<table>
<thead>
<tr>
<th>Categories</th>
<th>CCME WQI Value</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excellent</td>
<td>95-100</td>
<td>Water quality is protected with a virtual absence of threat or impairment; conditions very close to natural or pristine levels [3].</td>
</tr>
<tr>
<td>Good</td>
<td>80-94</td>
<td>Water quality is protected with only a minor degree of threat or impairment; conditions rarely depart from natural or desirable levels</td>
</tr>
<tr>
<td>Fair</td>
<td>65-79</td>
<td>Water quality is usually protected but occasionally threatened or impaired; conditions sometimes depart from natural or desirable levels [3].</td>
</tr>
<tr>
<td>Marginal</td>
<td>45-64</td>
<td>Water quality is frequently threatened or impaired; conditions often depart from natural or desirable levels [3].</td>
</tr>
<tr>
<td>Poor</td>
<td>0-44</td>
<td>Water quality is almost always threatened or impaired; conditions usually depart from natural or desirable levels [3].</td>
</tr>
</tbody>
</table>

According to the statistical data shown in the Table most of the parameters were within the permissible
Arsenic, Total coliform and total E.Coli as mentioned in the Table 1. Above mentioned parameters can cause serious health implications if used for drinking purposes but water was found safe for other household purposes.

**References**


Auckland Experience of the Bus Rapid Transit (BRT)

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Abstract

This paper applied principles of public transport network planning: line structure, frequency, transfers and fare systems, on the Bus Rapid Transit (BRT) in Auckland, New Zealand. The data concerning the BRT and its associated network was collected from policy and planning documents, timetables and websites. The data was further verified by conducting detailed field work on the selected network. The results show that the BRT exhibits some network planning principles such as a simple straight line route, high frequency and transferrable fares. However, the BRT is poorly coordinated with the surrounding bus network which could be improved to achieve integrated transport planning. The analysis indicates that the poor performance of public transport in Auckland can be addressed in the short term by improving public transport services at relatively little cost.

Keywords: BRT, Network planning, Auckland

Introduction

Efficient public transport such as the Bus Rapid Transit (BRT) is integral in improving the economic, social and environmental sustainability of city transport system (Vuchic 2005; Cervero 1998). However, there are a range of long term and short term factors that influence the development of BRT system. The physical (Newman & Kenworthy 1999), social and economic characteristics of a city (Dargay et al. 2007), its political system (Stone 2013), and institutional arrangements (Sohail et al. 2006) are long term factors that need to be considered in making BRT successful. The short term factors include improvements in frequency, reliability, transferring and fares by adopting simple and grid-based line structures (Mees et al 2010; Stone et al. 2012). The aim of this paper is to investigate the short term factors that are capable of improving the existing BRT services in Auckland.

This paper first reviews the short-term factors of improving BRT services from network planning perspective, followed by the research design and the reasons for selecting the Northern Express (the only BRT line) in Auckland. The analysis of the Auckland BRT in the following section focuses on various elements of network planning such as line structure, frequency, reliability, fare structure and transferring, followed by a discussion and conclusion.

BRT Improvements in Short Term – Literature Review

The short term factors include improving BRT services at relatively little cost. These fixes may include improvements in frequency, reliability, transferring and fares by adopting simple and grid-based line structures adopted as a network.

a) Line or route structures: The network planning approach to BRT demands the adoption of a straight line principle, moving from origin to destination using the most direct path possible given the surrounding land uses and topography (Mees 2000; Nielson 2005). The primary reason for this is that straight line patterns offer the most direct and quickest travel paths for passengers and develop a simple system which can be easily understood by passengers. Mees et al. (2010) argue that BRT lines should be a ‘defined and unchanging physical route with a fixed stopping pattern, a specific timetable, and a unique name and number’ (p.20). The straight line structure is adopted in cities like Zurich and Toronto to minimise travel time and make the public transport network more efficient, and achieved efficiency without a BRT system in place (Mees 2000, 2010; Stone et al. 2012; Nielson 2005; Thompson 1977).

by adopting a straight line principle, BRT and its associated public transport line structure moves in a cross-city pattern where the outer suburbs and central city are not the start and end destinations. Instead, BRT operates north-south and east-west directions, creating a grid pattern, where passengers can ‘go anywhere, anytime’ using the most direct path possible (Thompson 1977). As a result, a very comprehensive public transport service network is created as all areas of the city can be accessed from any other part. The only requirement is normally for passengers to transfer at least once to reach their final destination. This pattern is also suitable for today’s dispersed travel patterns as activities become more decentralised. For example, the CBDs in United States’ cities
contain less than 10 per cent of city jobs (Thompson & Matoff 2003), and therefore a city wide public transport network is needed. In line with this principle, this paper explores the types of BRT line structures present in Auckland.

b) Transferring: Shifting between modes or services to reach an end destination is a key concept in the grid-based network planning approach. Coordinated transfers offer a greater range of travel destinations and improve operational flexibility and efficiency, ultimately achieve integrated public transport network (Lo et al. 2003; Mees 2010; Stone et al. 2012; Nielson, 2005). In Hong Kong, travellers often need to transfer three or four times to reach their end destination (Lo et al. 2003). Similarly, 70 per cent of all Munich and London underground trips, 40 per cent of all Paris public transport trips and 30 per cent of New York subway trips require at least one transfer to reach an end destination (Guo & Wilson 2011). Due to well-designed transfers, patronage levels remain high in these cities because ‘transfers open travel paths to and from non-CBD destinations that are reachable in radial systems only by lengthy and circuitous travel’ (Thompson and Mataoff 2003, p.298). However, if timely and quality transfers are not provided, transfer becomes a negative element in BRT travel as ‘riders may perceive it to be more acceptable to take modified routes that eliminate transfers, even if initial waits and riding consume more time’ (Horowitz & Zlosel 1981, p. 282). Therefore, the provision of quality transfer points and a connected network needs to be a priority in BRT service design. This research seeks to investigate whether BRT in Auckland facilitates transfers between different lines and modes.

c) Frequency: Frequency of BRT refers to how often a bus travels along a particular route. Often, frequency is determined by patronage levels at particular times; if BRT patronage falls, then frequency levels will be reduced and vice versa (Carey & Crawford 2007; Ceder 2007). This approach creates a demand responsive system in which evening and weekend services are irregular, infrequent and even non-existent because of low demand. Network planning requires a supply-led approach based on desired levels of BRT services (Mees 2000; Nielson 2005). This approach involves looking at the entire public transport network and then allocating BRT frequencies so that services become integrated with one other. This in turn ensures that they operate as a singular network and not as individual BRT line. This supply-led approach involves providing a consistently high quality service that will operate using a 24 hour schedule. Where possible, high frequency corridors need to be offered with services running at least once every ten minutes. When this is not practical, services must then be coordinated using a method such as the ‘pulse timetable’ technique (Mees, 2000, 2010; Stone et al. 2012; Nielson 2005) to ensure that the lower frequency will not make users uncomfortable. The pulse timetable technique involves timing different public transport lines so that they arrive and depart on BRT stations at the same time. This works to address long waits involved with low frequency services and allows passengers to transfer without missing connecting services (ibid). This research explores the frequency levels of BRT services in Auckland.

d) Fare structures: Fare structures refer to how passengers are charged to use BRT services. The most common structures are; 1) flat fares where passengers pay the same price for BRT tickets regardless of distance travelled 2) zonal fares where price is dependent on distance travelled (Leutze & Ugolik 1979; Rock, 1975). Network planning requires a zonal fare system which allows for transfer between services without imposing additional costs on passengers (Nielson 2005). By coupling a zonal system with transferable fares, passengers pay an appropriate price for their total travel distance. Such an approach means that public transport looked upon as a single entity rather than a series of individual components. Transfer charges reduce the willingness of passengers to transfer or to use service at all. However, it is difficult to organise such a fare system when multiple operators run services within one network (Stone et al. 2012). Cross subsidies required from profitable to less profitable services which is only possible if the regional public transport agency pools fare revenue and allocates routes via a competitive tendering process (Nielson 2005). This arrangement has become successful in many European cities, Singapore and Perth. Therefore, when choosing fare systems, it is important to consider the need for transfer-friendly
fares and integrated ticketing. This research asks the question, do fare structures in Auckland encourage the use of BRT and its associated public transport network?

In summary, BRT service provision principles include: straight line and grid-type line structures, high or timed frequency corridors, the provision of quality transfer interchange points and the provision of transferable friendly fares, these are all key components in making short-term improvements to BRT.

Methodology

The research has been conducted in Auckland, the largest city in New Zealand with a population of approximately 1.5 million people (Statistics New Zealand 2013). Public transport in Auckland comprise of rail, BRT, buses and ferry services and cater for only seven per cent of all journey to work trips (ibid). There are several agencies at multiple levels of government responsible for transport planning in Auckland. At the central government level, the New Zealand Transport Agency (NZTA) provides occasional funding to public transport infrastructure while Kiwi Rail is responsible for managing the rail network. At the metropolitan level, Auckland Council and its subsidiary Auckland Transport (AT) is responsible for formulating transport strategies and planning. Public transport was deregulated in 1989 and several bus companies operate services in Auckland. Due to the deregulated environment, there is a competition between bus services and rail services (Stone et al. 2012).

The desktop data analyses relevant transport planning documents, timetables and other information publically available on websites. Detailed fieldwork was conducted for two weeks recently in relatively warm weather to count and observe transfer behaviour in different BRT stations. Fieldwork confirms waiting times, ticket prices, walking distance between transfers, fare structures, and frequencies on transferring lines.

There are some limitations to this research design. This research did not gain access to commercially sensitive information such as patronage data for individual public transport lines, which would have enabled a more in-depth analysis. Moreover, conducting interviews to ascertain stakeholders' perspectives would have further strengthened and validated the research findings.

Auckland BRT (The Northern Express) - Service Provision Analysis

This section critically assesses the state of public transport services in north Auckland by identifying the type of line structures, frequency, transfers and fare structure of the BRT and the surrounding network.

a) Line structure analysis: Auckland is notorious for its overly complex bus line network (Auckland Regional Transport Authority, 2010b). However, the BRT provides a good example of a simple bus line as it travels straight from north Auckland (Albany station) to the CBD by using the most direct route. This bus line travels along the first bus right of way to be built in New Zealand. The BRT service commenced in November 2005, but the infrastructure was formally opened in February 2008, including five stations along the corridor – Albany, Constellation, Sunnynook, Smales Farm and Akoranga.

The BRT is proving to be very successful, with patronage levels continuously increasing from 0.3 million passengers in 2006 to 2.3 million passengers in 2013 as show in Figure 1. By comparison with the BRT, most other bus lines take indirect routes, meander around many local streets and travel long distances before reaching their destinations. These service designs create a complex network which transport planners are simplifying. In short, the simple and direct line structure of the BRT contributes to the success of public transport in northern Auckland and, as a consequence, is being applied to other parts of Auckland.
b) Frequency analysis: The BRT provides a good example of a ‘forget the timetable’ high frequency corridor. The BRT offers frequency levels of one bus every 4 minutes during morning peak periods, 10 minutes during the daytime, and 15 minutes late at night, and at weekends and public holidays.

The reliability of the BRT has been achieved by providing bus lanes and bus rights of way. Therefore, buses take around 24 minutes to travel from the origin (Albany Station) to destination (Britomart Station in the CBD). This is compared to a 45 minute journey when travelling by car (Auckland Regional Transport Authority, 2010c). However, outside of the bus right of way, the buses are subject to local traffic conditions. This becomes a problem, particularly during peak hours. With the motorway becoming full by 7am during the morning peak period, the journey in some sections becomes very slow (such as between Albany and Constellation, and again soon after Akoranga to Britomart). With the Harbour Bridge being the only road access to downtown Auckland traffic bottlenecks at this point making bus travel unreliable and slow. Nevertheless, travelling along this bus corridor is still faster than car travel because of the presence of the busway. In short, frequent services on dedicated lanes provide reliable bus network services as in the case of BRT.

c) Transfer analysis: Generally, the public transport services in Auckland discourage transferring due to the provision of highly complex, indirect and radial bus routes. In order to analyse the transferability, transfer data was collected during the fieldwork for the BRT and its surrounding bus network. The BRT provides the best infrastructural set-up in the city to potentially foster transfer opportunities between services. For the BRT analysis, the five stations along the line were used as transfer points, with data being collected on ten local or suburban buses arriving at these stations. Figure 2 shows a map of the BRT and the suburban bus routes studied. For the BRT, the bus line was tested on the basis of city bound trips with suburban buses arriving into the transfer points and then transferring onto a BRT heading to downtown Auckland.

Figure 1 Northern Express patronage

Source: Data compiled by authors from the Auckland Transport and ARTA Annual reports

Note: Data represents financial year starting July to June. BRT service commenced in November 2005 and therefore 2005-06 data is from November 2005 to June 2006.
BRT infrastructure being designed to facilitate transfer. The BRT stations and fares are both designed with transfers in mind, while the surrounding network is not designed in a way that encourages transfer.

Figure 3 shows the significant infrastructural development at Albany Station on the BRT. The BRT transfer points offer design elements such as complete shelter from the weather, real-time information, bike stands and lockers, ticketing machines, help and emergency points, and food, drink and newspaper kiosks. By contrast, the 007 bus infrastructure is basic, offering no more than bus shelters.

Figure 3 Northern Express Bus Station (Photos taken by Authors)

Even though the BRT performed well in this analysis, the ranking of transfer factors would have been much lower if the analysis had recorded data for a return journey from downtown Auckland. In particular, the scores for wait time and transferring line frequency would have dropped significantly. This is because the suburban buses do not operate at the same frequency as the BRT, nor do they operate using a pulse timetabling system. Furthermore, the actual design of the suburban bus system hinders attempts to use it as a feeder bus service. This is because it has not been designed to easily connect people from the suburbs with the BRT. Suburban bus routes are indirect, uncoordinated and haphazard (see Figure 2). As a result, people are not using these bus services as feeder services, as seen in the field work investigations. This complex network is therefore, limited by the maximum capacity of the park and ride facilities (See Figure 1), and due to the deficiencies of the suburban bus network the ‘network effect’ needed for a public transport system in Northern Auckland to be successful is absent.

Furthermore, it is also important to note that all day park and ride facilities are provided at only Albany and Constellation stations – 514 at Albany and 273 at Constellation. These facilities become full very early in the morning (just after 7a.m. on weekdays); it is likely that motorists finding them full will continue to drive themselves to their destination. This makes the BRT service seem unreliable to these potential passengers, with their ability to use the bus service being constrained by their inability to access a car park. What this further shows is that the suburban services are not effective in attracting passengers. In short, the BRT does not offer good transfer to and from different suburban services despite the building of high quality bus stations.

d) Fare structures: A zonal-based fare system (locally called Stage) operates in Auckland. Under this system, passengers pay higher fares for longer travel distances. This system, however, is highly complicated due to being there at eight different zones and nine separate public transport providers in the city (Auckland Regional Transport Authority, 2010e). Recently the Auckland Council simplified the system by introducing a smart card (the HOP card), although it is still not useable on all bus services meaning that the fare system still remains complex. To further add to this complexity, there is one exception to the zone based system as the BRT and its surrounding network offers a time-based ticketing system, where passengers pay for their journey time and not the distance. Despite the existence of this anomaly, the zonal-based fare system can still be used on these services (Auckland Regional Transport Authority, 2010e).
Concession tickets allow seniors to travel for free while approved tertiary students can receive a 40 per cent discount on fares (Auckland Transport, 2013). However, because Auckland generally does not offer transferrable fares, users pay each provider and for each mode of transport used. However, transferrable tickets can at times be offered for services provided by a single transport operator, but competing operators do not accept each other’s tickets (Auckland Regional Transport Authority, 2010e). Under the MAXX brand, and now the Auckland Transport website journey planner appears to provide a coordinated public transport system, but this appearance is not confirmed by passenger experience.

Despite this transferrable fare being in place, the North Shore suburban bus network is not in fact being used as a feeder. The survey data shows that between one and nine passengers transfer from the suburban buses to the BRT in any one morning peak period from 7a.m. - 9a.m. During this two hour period, most of these services feed four buses to the BRT. Very few passengers are therefore, using the suburban buses for transfer purposes. Despite this, the BRT buses are consistently full meaning that this bus line is not attracting passengers because it is part of a quality public transport network but rather because it is a quality bus line in and of itself.

Discussion and Conclusion

The previous section applied four principles of network planning (straight line structure, frequency, transfers and fares) to the analysis of service quality offered by the BRT in Auckland.

The analysis shows that peak hours commuters are the focus of many planning documents. This being emphasised in the BRT – a straight line public transport service designed to specifically target peak period travellers from Northern Auckland heading into the CBD. The BRT epitomises the definition of a straight line structure. The direct travel path offered plays a key role in its success, with the line being one of the most highly patronised public transport lines in the city. Due to BRT success, the major bus lines were redesigned to follow a simple, straight line structure, resulting eventually in increased patronage levels. There have also been some recent attempts to redesign cross town bus lines to increase use by shoppers outside peak time. This shows that there is a demand for simple and direct routes, not only during peak hours, but also in off-peak hours. However, these bus lines operate in isolation rather than being designed to form part of a simple, and straight-line based network.

Frequencies significantly influence BRT use, and can be developed to meet either existing patronage levels (Carey and Crawford 2007; Ceder 2007) or desired patronage levels (Mees 2010; Stone et al. 2012; Nielson 2005). Generally, customers demand high frequency BRT services and this can be facilitated by a pulse-timetabling system designed to time services in such a way that main line and the feeder services all arrive at and depart from a destination at the same time (ibid). However, public transport frequencies in Auckland are generally very poor. Within the entire network, only three high frequency lines; the BRT and the two b.lines were found, with no pulse-timetabling occurring throughout the rest of the network. The BRT and two b.lines offer reliable and frequent all day services to passengers during the week and are therefore highly patronised. This demonstrates that people utilise high frequency public transport lines when they are offered. However, these lines offer much lower frequencies at weekends and during the evening. Although frequencies can be reduced during off-peak hours, the service must remain regular and coordinated with the wider network to remain effective. This does not happen due to the absence of pulse timetabling which can eliminate or significantly reduce waits experienced by passengers. When a pulse timetable is not provided the network does not operate as a single entity. Instead, the BRT operates in isolation, attracting customers based on the quality of the individual line’s performance and the availability of park and ride facilities, with the surrounding bus network being poorly patronised. There is no reason why the BRT passengers and new passengers would not utilise a local bus network, if a quality system was provided.

Transfer is a key element in the provision of a successful BRT network (Guo & Wilson 2011; Shrivastava, et al., 2007). The quality of transfer points and timely transfers influence people’s
willingness to transfer between services (Lo et al. 2003; Mees 2000, 2010; Mees et al. 2010; Stone et al. 2012; Nielson, 2005). The Auckland public transport network however, has not been designed to accommodate transfer; in fact it has been designed to avoid transfers wherever possible. However, the BRT offers high frequency and world class stations as transfer points (see Figure 3) but the surrounding bus network does not meet frequency standards and straight line principles (see Figure 2). These buses are infrequent and uncoordinated. This means that passengers using them to transfer will find transferring time consuming and inconvenient – particularly when transferring onto a suburban bus from the BRT. The fieldwork shows that few passengers are transferring between lines. This is largely due to the different buses operating in isolation from one another – even competing in many instances. Chowdhury and Ceder (2013) argue that although the BRT stations provide information integration and integrated physical connection of transfer, improved network, fare and ticketing integration and integrated timed-transfer are also needed. The document review shows that little attention is being given to facilitating transfers in BRT. The focus is on the development and expansion of park and ride facilities as transfer points. This shows that public transport trips remain dependent on private vehicles and the availability of car parking. This strategy might reduce CBD congestion but only shifts that congestion to the park and ride facilities in the suburbs. Clearly, this approach does not promote the utilisation of the wider public transport network. The current approach means that each public transport line is utilised according to its own strengths rather than on the accumulated strength of the wider integrated network.

Public transport networks should operate using an integrated and transfer-friendly ticketing system (Mees 2000, 2010; Mees et al., 2010; Nielson, 2005). This means the adoption of a zonal fare system where passengers pay according to the total distance travelled. This is because public transport needs to be looked at as a single entity and not a series of individual components (ibid). The research shows that Auckland has primarily adopted a zonal fare system, but the public transport system also charges passengers for individual trips and transferrable fares are not readily accessible across the entire system. The BRT and buses operated by any particular company generally offer their own transferrable ticketing using a time-based system. These differences within the wider network make fare structures complicated and difficult to understand for users. The document analysis show that the implementation of a single transferrable fare gained significant attention from transport planners and a HOP smart card was recently issued which is the first step towards providing a single integrated ticketing system for the city.

Auckland public transport is operated by several private companies and therefore lacks cross-subsidisation. Auckland Council and Auckland Transport do not pool and then re-distribute all public transport revenues and subsidies. Currently, subsidies are based primarily on patronage levels rather than performance standards. Managing subsidies in this manner encourages operators to provide long and elaborated routes that access as many key destinations as possible. These routes often travel on similar paths, access the same key points and cluster on high-demand corridors. Routes therefore are purposefully designed to attract as many passengers as possible but this does not result in successful public transport. When operators are paid subsidies based purely on performance targets such as punctuality and reliability of arrival and departure times, there is an incentive to provide a high quality public transport network, as the focus is no longer on increasing patronage and competing against other transport operators. By pooling and re-distributing revenues and subsidies in this way, Auckland Council would be paying operators according to the quality of the services offered and not on the number of passengers using their services.

The discussion clearly shows that complex route structures, and uncoordinated bus services and fare structures create passenger confusion and deter public transport system use. However, the BRT counters this trend due to its line structure, frequency, speed, simplicity and reliability it is well patronised (2.3 million boardings per year in 2012 or 6500 per day). However, these figures are much lower than Vancouver’s express, trunk bus services (called the B-Line) which carry 20-30,000
passengers per day (Mees et al. 2010). This service replaced a large number of low-frequency suburban routes with a feeder network connecting to the B - Lines at specially designed interchange stations. With Auckland BRT, the surrounding bus services are not designed as frequent, coordinated feeder routes despite the presence of high quality bus stations. There is an opportunity to increase patronage by learning from the success of the Vancouver B - Line rather than expanding the park and ride facilities.

This research investigates short-term approaches to improve the existing BRT system in Auckland including line structure, frequency, transfer and fare structures. The research finds a meandering, radial line pattern to exist apart from the straight line route of the BRT. The BRT line structure is simple and straight, high in frequency, has world class bus stations, and offers a transferrable fare to connect to the wider north Auckland bus network. When compared to the rest of Auckland, the BRT experiences high patronage levels with the potential for further increases. It therefore shows the potential for short-term network planning factors to improve city public transport.

The main lesson learned is the importance of adopting network planning principles in the design of BRT services. This involves: 1) designing BRT lines to create a simple and straight line network, as already started in Auckland 2) providing more high frequency corridors and utilising pulse-timetabling techniques for low frequency corridors 3) designing BRT services to facilitate planned transfers to and from feeder buses 4) fully developing integrated fares in such a way that transferrable tickets can be used on the BRT and its feeder services, and 5) benefitting from ‘network effects’ in the short-term rather than focusing on new public transport infrastructure and technology.

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References


Determinants of Slums in Islamabad
A Philosophical Approach

Anwar Shah*
Abstract

One of the issues of large cities, in general, and Islamabad in particular is slums (Kachi Abadis). According to Capital Development Authority CDA, there are about 52 kachi abadis in Islamabad, out of which it recognises only 10. The population of these slums exceeds 100,000. We find considerable literature about the determinants of slums from various resources. This paper aims to contribute in the available knowledge by examining the determinants of slums in large cities, in general, and Islamabad in particular through a philosophical approach.

The paper assumes that the creation of slums in modern world is a natural outcome (by-product or negative externality) of the conventional philosophy of maximisation. We know that all subjects of social sciences in general and economics, in particular are based on the philosophy of maximisation of private gains. This philosophy of optimisation has led to the creation of various institutions such as banks and investment corporations whose main job is to maximise the profits. The study hypothesises that this philosophy of maximisation has left the provision of houses to the market forces. While the market forces are efficient in the provision of houses to the higher segment of society, however, is inefficient and badly fails to launch even a scheme of affordable houses for the lower segment of society.

It provides a case study of Centaurus in Islamabad, as is evident, in support of the hypothesis. The study shows that the philosophy of maximisation helps the planner of Centaurus project in Islamabad to attract billions from market and serve the rich. However, a plan of affordable houses is less likely to attract investments from markets. This is in spite of the fact that housing shortfall is currently estimated at over 10 million units across country. Based on the case study of Centaurus in Islamabad, the study claims that without giving up the philosophy of maximisation, we might not be able to solve the issue of the creation of slums in Islamabad and elsewhere.

Keywords: Slums, Affordable Houses, market failure

Introduction

Every society is bestowed with economic resources for the fulfilment of its needs. It is the responsibility of a society to match the resources with the needs in a way to ensure the provision of basic needs (food, shelter, education, health etc.) to all people. The question remains how to match resources with needs in an efficient way. In this regard, three systems provide answer of the above question. Each system claims that if resources are allocated per its prescription, the outcome will be efficient. In other words each system takes the prerogative that if resources are allowed to be allocated according its doctrines, then the needs of people within an economy will be satisfied. These three systems are Capitalism, Socialism and Islam. Capitalism or market economy is based on the philosophy of individual freedom. Socialism or command economy is based on the philosophy of freedom of government and restricted individual freedom. Islam is based on the concept of vicegerency, that is, individual freedom within the bounds of social responsibility (see Chapra, 1995).

Currently, the philosophy of capitalism prevails in the world. Most of the countries in the world have allowed market to allocate scarce resources for the fulfilment of the needs of people. The housing sector is no exception. This paper hypothesises that the market based system has failed to provide affordable houses to society, hence, slums arise.

What is a slum? A slum is a heavily populated urban informal settlement characterized by substandard housing and filth. While slums differ in size and other characteristics from country to country, most lack reliable sanitation services, supply of clean water, electricity, timely law enforcement and other basic services. Slum residences vary from shanty houses to professionally-built dwellings where poor quality design or construction turns into slums.1
According to UN-HABITAT (2007), around 33% (about 863 million people) of the urban population in the developing world were living in slums. This is despite the fact that every society consists of high level of development and high level of income (See Stokes, 1962). The proportion of urban population living in slums is highest in sub-Saharan Africa (61.7%), followed by South Asia (35%), South East Asia (31%), East Asia (28.2%), West Asia (24.6%), Oceania (24.1%), Latin America and the Caribbean (23.5%), and North Africa (13.3%). Among individual countries, the proportion of urban residents living in slum areas in 2009 was highest in the Central African Republic (95.9%). Between 1990 and 2010, the percentage of people living in slums dropped, even as the total urban population increased. The world's largest slum city is in Mexico City.

Scholars consider diverse reasons for the growth of slums. Some of the factors are: rapid rural-to-urban migration (Davis, 2003), colonisation and segregation (Obudho & Aduwo, 1989) economic stagnation, depression, high unemployment and poverty (Un-Habitat, 2004), informal economy (Becker, 2004), poor planning, politics, natural disasters and social conflicts and language (Gilbert, 2007). Nevertheless, we find rare literature proclaiming market system as the root cause of slums. This paper assumes that slums in general and in Islamabad in particular are the negative outcomes of market based economy. In a market based economy, resources flow towards a project where it gets maximum profit. Hence, in Islamabad, projects like Centaurus attract funds but project of affordable houses for low income groups such as security guards, clerks, sweepers etc., does not attract funds at all. Consequently, people move towards slums for having life in line with their means.

Demand-supply gap and Slums in Islamabad

Islamabad is located in the northwest of the country on Potohar Plateau. The city was built in 1960 to replace Karachi as the Capital of Pakistan. Since 1963, Islamabad is the capital city of Pakistan. The city is divided into eight basic zones: Administrative, Diplomatic Enclave, Residential Areas, Educational Sectors, Industrial Sectors, Commercial Areas, and Rural and Green Areas. In the available zoning, there is no provision for slums. However, poor urban planning for the workers of Islamabad appears to have encouraged the mushroom growth of slums. A significant gap in the growing demand for housing and insufficient supply of affordable housing by the market has led to the formation of slums. Slums are mostly populated by the city’s working classes who are unable to bear the expensive life of the city. The Economist summarizes this as “good housing is obviously better than a slum, but a slum is better than none.” (ohi and Phoa, 2007)

The creation of slums in Islamabad dates back to 1960s when slums emerged during the construction process of the city. Initially, there were two labour settlements, one in G-8/3 and the other in Muslim Colony near Bari Imam. Once the initial development needs ended in the 70s, Capital Development Authority (CDA) started to evict these settlements, resulting in resistance, particularly in the G-8. Over the time CDA accepted the existence of these colonies and allowed people of different occupation to settle in various areas around the city. For example, most of the Christian labourers (consisting mostly of sanitation workers) were settled in G-7, G-8, F-7 and F-6 (to serve the upper-class population of these sectors), Kashmiri/Hazara labourers were located around Muslim colony, and Pakhtun labourers were settled in the outskirts, I-11/H-11 and I-10 sectors.

According to CDA figures, there are about 52 slums in Islamabad. However, CDA recognises only 10 out of it. The population of these slums exceeds 100,000. The biggest demographic category among slums is Punjabi Christians who comprise roughly 35 percent of the population of slums. Other Punjabi/Potohari groups are around 26 percent, Pakhtuns are around 20 percent, and Kashmiri/Hazaras around 10 percent of the population respectively. The vast majority of slums are labourers, sanitary workers, domestic workers, or lower-staff government servants. The slum residents provide a steady, local source of labour for jobs and services crucial to Islamabad’s development and maintenance.
The Dilemma of Housing Market in Islamabad and Slums

Generally it is claimed that insufficient financial resources and lack of coordination in government bureaucracy are the main causes of poor housing planning. However, the conjecture in this paper is rather opposite to this claim. This paper conjectures that it is not the lack of financial resources that lead to poor supply of affordable houses; rather it is the inefficient allocation of financial resources by market forces that fails to provide affordable houses. In a market based economy, financial resources flow towards projects where profits are high. Hence, the availability of financial resources is not an issue rather it is the viability of a projects that matters from funding point of view. The dilemma of market forces in housing sector, is that on the one hand, there is an acute need of affordable houses for those who do not own one, on the other hand the market provide houses to those who already own a house. An eye opening example of the market dilemma in Islamabad is the project of Centaurus.

The Centaurus is a mixed-use development project in Blue Area of Islamabad. It is a project of the Pak Gulf Construction (Pvt.) Ltd. (PGCL). The entire project costed USD 350 million. The complex has 37-storeys, 7 star deluxe hotel, with two 21-story residential towers, a 25-story corporate office tower, and a 5-story shopping mall. The complex has a parking lot to accommodate over 2,000 vehicles. It is designed to withstand up to 9.5 magnitude of earthquakes. Besides serving residential, commercial and business purposes, the complex symbolises the soft image and growth of Pakistan. It has also the capacity to host international conferences and seminars in Pakistan’s capital city. Centaurus is equipped with firefighting system, fire proof door, water feature and elevators.

It is worth mentioning that while inaugurating the project the then president General Pervez Musharraf said that that the project would be sustained to alleviate poverty through greater economic activity. However, the residential apartments are not for poor who can only dream of such luxuries. Musharraf also said that the policies of de-regulation; liberalization and privatisation (all are the hall marks of marked based economy) have helped bring in more direct foreign investment. The then Interior Minister also said that the government has undertaken several projects in the federal capital and in three year time, 1000 five-star hotel rooms will be available. He said a number of hotels to cater all segments of society would be built besides adding a series of recreational centres for the people.

The project of Centaurus has attracted millions of dollars as well as the support of government. Yet, the project serves only rich segments of the society as the cost of a residential flat in Centaurus is in millions of rupees. Naturally, any person willing to buy an apartment in Centaurus will be the owner of some other house. Hence, the market forces in case of Centaurus serve only the rich and fail to serve low income group of Islamabad.

Is it possible for a market to attract funds for affordable houses? The answer is “NO”. The reason is that market based economy has led to the development of financial intermediaries in the form of banks which collect most of the saving of people and re-direct it towards rich corporation and companies for higher returns. The project of affordable houses cannot offer banks profit at par with big corporation, hence rarely banks allocate funds for such projects. Thus, free market forces are unable to fund projects of affordable houses.

One can raise an objection and say that various housing schemes in Islamabad are providing homes to the people purely based on market forces. The reply to such objection is that the objective of such housing schemes is not the provision of a house to people rather these are investment projects. The reason is they attract funds from people for investment purposes. Majority of buyers are speculators in such projects. In addition, such projects rarely offer a house directly to the end users. Everyone among them buys a plot considering it a safe investment and gets it en-cashed after some time. This is the reason that rarely do we observe the construction of houses in such schemes. In case there is any, it is a positive externality. Moreover, most of such societies enter...
the market for grabbing money from people and then disappear

A Model of Solution?

Before providing a model for solution, we have to acknowledge that market forces are inefficient to provide solution for the provision of affordable houses. Consequently, we have to explore alternatives. It is pertinent to mention here that the market for affordable houses is similar to any other market and consists of demand and supply model. Nevertheless, the demand side of housing further consists of two types of people, speculator and non-speculator. The speculators are not the end user of a house. They are not interested in a home to live in. Rather, they buy a house in order to resell it later and pocket the difference between the buying and selling price. The problem with such type of demand is that the second and third buyer is also likely to be speculators. Thus, the market allocates a house to the end user very late and that too on a very high price. Therefore, the first solution for the provision of affordable houses is to clear the market from speculator. This will shift the demand of houses downwards.

The supply side solution is that we need an institution such as a construction company whose objective is profit but not profit maximisation. Such company can generate funds on the basis of partnership from various institutions in the market. In addition, the government can constraint all financial institutions to provide seed money to such a company. The company will, then, build affordable houses after satisfying all preliminary legal requirements. Let the company raise seed money for hundred houses. The company will, then, put all houses on auction for the end users only. We have already mentioned that demand side has to be cleared from speculator and the company can exclude them by taking the following measures. The auction of houses on instalments rather than cash. This is likely to exclude rich people who can otherwise enter the market indirectly through poor end user.

The equilibrium based on demand - free from speculators and supply, free from firms with the objective of profit maximisation, is likely to be very efficient. The reason is that only the end user will get a house. In addition, the constraint of shifting a family after winning the auction will allocate home to a person who does not own already a house. Similarly, the allocation of a house through auction will enable the desperate end users to bid high. Hence, the home will go towards those (among the end users) who is valuing it the most. This will make allocation of houses more efficient than the current allocation of houses. The supplier after receiving instalment and some down payment can use same money for building more houses. This process in the market will continue and enable people of low segment income to own a house.

Such process is not followed by any construction company or a housing scheme in the market of Islamabad or Pakistan. Currently, every housing project is open for all people whether they are speculators or non-speculators. This makes the allocation of houses very inefficient. We assume that an experiment will enable us to test the efficiency of the above model. Nevertheless, without empirical testing one could not deny the positive aspects of this model.

Conclusion

Having a shelter is one of the fundamental needs of every family. However, the current economic system working on the basis of market forces has badly failed to provide this basic need to a family. Rather, this system has aggravated the problem of housing at international and national level. Islamabad which is the capital city of Pakistan is no exemption. People living in slums in Islamabad have multiplied over the time both in term of proportion of population and in terms of the number of slums.

The dilemma of private housing sector in Islamabad is that on one hand there is the construction of homes by market for those who are already owning a house. On the other hand, there are many needy people in search of a house, but cannot afford to buy it. The market is unable to provide an opportunity of owning a house to these people. This is the reason that people with middle and lower income groups are flowing towards slums of Islamabad. Hence, the number of slums from two has reached to 52 slum in Islamabad per statistics of CDA.
Various factors such as zoning laws, poor planning and management, inefficient governance, corruption and poverty etc. are termed as determinants of slums. However, rarely do we find a work declaring the conventional paradigm of capitalism as the root cause of the creation of slums. This paper attempts to show that the conventional philosophy of economics with the key focus on maximisation is playing a key role in the determination of slums in Islamabad as well as other parts of Pakistan. The paper highlights that there is no dearth of financial resources for the construction of affordable houses. However, the conventional philosophy of maximisation does not allow such fund to flow towards a project with relatively low profit. Rather the funds flow towards housing projects which serve those who already own a house. The paper presents that the efficient matching of demand and supply requires clearing of demand side from speculators and supply side from profit maximisers (see also Salihu et al., 2011 and Ayub, 2007).

The history of slums shows that it has grown faster when the market philosophy was consolidating both theoretically and politically. Likewise, researchers in academia were supporting the freedom philosophy and people in politics were making laws ensuring freedom to individuals. The industries were allowed to explore the market for more profits and the owners were allowed to fix the wage of the labour based on the market forces. When many people were unable to bear the expenses of cites, they resort to peripheries. On the same time when industries were flourishing, new building and skyrocket projects along with slums were developing. It shows that the philosophy of market economy is responsible for the creation of slums as this philosophy has led to the institution of banks which flow funds towards projects with higher probability of profit. It is worth mentioning that banks attract fund from society but do not use the same funds for the service of all segments of society. Rather the fund flows on average towards those who are rich and have strong collateral. Such fund is further invested in the projects which give profit more than or equal to the level of prevailing interest rate. Affordable housing based on the proposed model are long term projects and is less likely to earn profit above the prevailing interest rate. Therefore, the presence of interest is one of the key hurdles in developing the projects of affordable houses (See also Chapra, 1985).

The paper reiterate that the project of affordable houses is less likely to attract funds from market based on the conventional philosophy of capitalism. In other words the presence of slums is less likely to end in the presence of the conventional paradigm of profit maximisation. If we are interested to bring end of slums, we have to give up the conventional philosophy of maximisation and make our student understand the negative externality of this philosophy at micro and macro level and ask them to come up with theories where micro economic agent is not the sole maximiser of profit and utility.

We can materialise the dream of affordable houses through a simple model. On demand side we need to clear the market from speculator and on supply side from the objective of profit maximisation. Once the suppliers provide houses after collecting seed money, the same can be passed on to the demand side through auction. The auction price can cover all the cost including reasonable profit. Once the supply starts working the recovered money can be used for the construction of more houses. In this way we can stop the flow of working class towards slums.

References:


Habitat, U. N. (2007). What are Slums and why do they exist. Documento presentado en la Vigésima primera Sesión del Consejo de Administración,


Appendix A

Capital Development Authority Publicnotice
Un-Authorised Housing Schemes In Islamabad

It has come into the notice of the authority that plots are being sold/marketed, in the name of following illegal housing schemes/agro Farming Schemes (as the sponsors of these illegal schemes/land subdivisions have not obtained any approval/NOC from CDA) in Islamabad:

Zone-2, 3 & Sector E-11
Islamabad Co-operative Farming Scheme, Sector D-17 2 Paradise City, Sector G-17 3 Green City, Sector D-17, E-17 4 Supreme Court Employees Housing Scheme, Sector G-17 5 Gulshan-e-Rahman, Sector C-17, D-17 6 Pakistan Overseas Housing Scheme, Sector F- 16 7 Jammu & Kashmir, Sector F-15 8 Services Housing Scheme, E-11 9 Pakistan Town Phase-II, Sector G-16, F-16 10. Federation of Employees Housing Scheme, E- 11 11 Ali Town (Zone-3) 12 Green Hills (Zone-3) 13 Green Meadows North Ridge (Zone-3) 14 Major Makhdum Society (Zone-3) 15 Al Rayan Society (Zone-3) 16 Arcadia City (Zone-3)

Zone-4
Adil Valley, Simly Dam Road 2 Mufti Mehmood Enclave, Off Lehrtrar Road 3 Ali Model Town 4 Muslim Town, Simly Dam Road 5 Al-Syed Avenue, Park Road 6 Muzaffar Abad Town (Pind Bhegewal), Simly Dam Road 7 Bahria Enclave-I, Kuri Road 8 New University Town (near COMSATS), Park Road 9 Burma Town, Lehrtrar Road 10 OGDC Town, near Chattar, Murree Road 11 Doctor’s Enclave, Simly Dam Road 12 Park Lane Valley, Park Road 13 Ghouri Town (all phases in Zone-4), Islamabad Expressway 14 PTV Colony, Simly Dam Road 15 Ghouri Gardens, Lehrtrar Road 16 Royal Avenue, Park Road 17 Green Avenue, Park Road 18 Royal City/Royal Villas (near PINSTECH, Nilore), Lehrtrar Road 19 Green Avenue-II, Kuri Road 20 Samaa Town, Kirpa Road, off Lehrtrar Road 21 Green Valley (1&2), Simly Dam Road 22 Satti Town, Lehrtrar Road 23 Green View Villas, off Lehrtrar Road 24 Simly Valley (1&2), Simly Dam Road 25 Gulberg Town Housing Scheme (Phase-2), Lehrtrar Road 26 Spring Valley, Simly Dam Road 27 Hameed Town (Mouza Mohrian), Kuri Road 28 Adil Farms, Simly Dam Road 29 Hill View Houses, Simly Dam Road 30 Badar Farms, Simly Dam Road 31 Iqbal Town, Islamabad Expressway 32 Government Officers Co-operative Farming Scheme 33 Islamabad Saif Garden, Kirpa Road, Off Lehrtrar Road 34 Green Fields, Simly Dam Road 35 Japan Valley, Kirpa Road, off Lehrtrar Road 36 Islamabad Farms, Simly Dam Road 37 Kiani Town, Kirpa Road, off Lehrtrar Road 38 J&K Farms, Islamabad Highway 39 Madina Town, Islamabad Highway 40 Naval Farms (4, 5 & 8-Kanals), Simly Dam Road 41 Marwa Town, Islamabad Highway 42 Olive Wood Farms, Simly Dam Road 43 Media City-I, Kirpa Road, off Lehrtrar Road 44 Shaheen Farms, Simly Dam Road 45 Paradise Point Zone-4,
Islamabad. 46 M/s Tricon Agro Farms, Simly Dam Road 47 Ittefaq Town, Old Kirpa Road, Off Lehtar Road 48 Danial Town, HArno Thanda Pani, Lehtar Road 49 Arslan Town, Lehtar Road. 50 Abdullah Gardens, Kuri Road 51 Royal Homes, Lehtar Road. 52 Canterbury Enclave near Park Road. 53 Gakkhar Town, Lehtar Road 54 Al Nahal Housing, Simly Dam Road 55 Usama Town, Lehtar Road 56 Al Rehman City View, Lehtar Road, near PINSTECH, Nailore. 57 Zahoor Town, Lehtar Road 58 Makkah Town, Harno Thanda Pani, Lehtar Road 59 Al Qamar Town near Margalla Town 60 Qurtabal Town, Islamabad Highway 61 City Views near Nailore 62 Margalla Gardens, Lehtar Road 63 City Town, Lehtar Road 64 Eden Life, Zone-4

ZONE-5

Gulshan-e-Rabia, Off Japan Road 2 Gulshan-e-Rehman , Off Japan Road 3 Morgah City, GT Road 4 Hamza Road, Kahuta Road 5 Parliamentarians Enclave, Off Japan Road 6 National Co-operative (former Aewan-eSadar), Kahuta Road 7 Media Town, PWD Road, Off Islamabad Highway 8 Tele Town, Off Japan Road 9 National Police Foundation, PWD Road, Off Islamabad Highway 10 Azim Town, Off Kahuta Road 11 Pak PWD Off Islamabad Highway 12 Dhanyal Town , Dhanyal Town 13 Pakistan Town, Phase-II, PWD Road, Off Islamabad Highway 14 Ghouri Town, Phases in Zone-5, Japan Road/Islamabad Highway. 15 Askaria Town, Off Japan Road 16 Judicial Employees Housing Scheme , Kirpa Chirah Road 17 Bankers City, Off Dharwala Road 18 Rasheed Town, Japan Road 19 Bankers Town, Kahuta Road 20 River View , Off Kahuta Road 21 Fatima Villa, GT Road 22 Television Media Town 23 Gulshan-e-Danish , GT Road 24 Fiza Town, Hoan Dhamyal, Sihala 25 Aliya Town, Mouza Lohi Bher Dakhli JAw 26 Dhanyal Town, Hoan Dhamyal, Sihala 27 Aiza Garden Mouza Lohi Bher Dakhli JAw 28 Sadozai Town, Kangota Sayedan 29 New Model Town Humak/Roshan Enclave, Mouza Niazian

Housing schemes namely Muhafiz Gardens, Rawat Enclave, Faisail Town, Grace Land Housing and Air Line Avenue are being marketed as located in Islamabad, whereas neither the subject schemes fall in Islamabad nor any approval/NOC has been obtained from CDA for launching and marketing of the schemes.

• Through this notice, General Public is therefore cautioned/warned in their own interest to refrain from making any booking/purchase of plots in these or any other un-authorized and illegal housing scheme and must consult authority (051-9252494 for Zone2,5 &E-11 and office of Director Regional Planning, CDA for Zone 3 & 4 at 051-9252605) before making transactions about the legal status of the schemes. CDA Website www.cda.gov.pk may also be visited for having updated status of the schemes.

• The marketing/advertisement of Housing Projects without NOC from CDA is illegal and unauthorized. The advertisers/marketing agencies are restrained from misleading advertising/marketing of illegal housing schemes. The sponsors are further directed to refrain from marketing and development of Housing Schemes without NOC from CDA.
The Water Stewardship - A Tool for the Natural Resources Management in the Industrial areas of Pakistan

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Abstract

The growing steps of the economy of any country are; primary production, technological and services based economy. So the economic development of any country depends on resource utilization, government policies, environmental sustainability, science and technology and awareness of the latest tools for the economics. As Pakistan’s population is growing, the trend of urbanization is increasing in the country. With the increase of urbanization, businesses are expanding which are also creating problems and challenges for the modern world for the sustainability of the natural resources. Pakistan has the 9th largest labor force in the world with 59.6 million workers. Textile sector is one of the most water and energy intensive, polluting, and energy consuming sectors in Pakistan.

Pakistan is the 8th largest textile products exporter from Asia and 12th globally; it contributes 8.5% of the country’s GDP and 52% in exports. There are about 1545 textile processing SMEs in Pakistan, of which the majority are situated in the Punjab province i.e. 1395 (Pak. EPA, 2010). Water is an important utility in the wet processing of textile units. Most of the industries abstract ground water (except the industries residing in the Karachi) and discharge directly into the water bodies directly and indirectly without treatment. Although the water in Punjab is going down due to over abstraction and lack of water policy, but still the groundwater is used in the industries as a common practice. Energy is another important utility in textile mills. Mostly self generation of electricity is the source in large and medium textile mills because of the shortfall or the energy crisis in the country. So the industries prefer to use some alternative resource for the continuous supply of the electricity to their industries for the production and timely delivery of the orders.

This paper will share the experience of WWF-Pakistan’s project entitled “City-wide partnership for sustainable water use and water stewardship in SMEs of Lahore, Pakistan” in collaboration with WWF-UK and Cleaner Production Institute (CPI) funded by EU. It will show how the natural resources in the industrial premises could be saved by adopting stewardship tools and with some simple practices named Best Water Management Practices (BWMPs). It will also highlight the cost-benefit analysis by adopting these BWMPs with business case in the textile sector. It will also recommend the partnership of stakeholders for conserving and managing the resources sustainably.

Introduction

Economic development is the development of economic wealth of countries or regions for the wellbeing of their people. The economic development is a continuous process which results in an increase in per capita income, provide basic necessities and benefits to the public. The progress of any country can be estimated by the Gross Domestic Product (GDP/capita) of that country (S.P.E.A. 2010). GDP/capita is equal to the product of labor productivity (GDP/hour worked) and labor utilization (hours worked/person). So if the labor utilization is increased, the GDP will also increase and vice versa.

The Figure1 shows the developmental steps in the economy of countries. The first step of the economical development is the primary production or domestic level manufacturing that is followed by the poorest nations of the world. The next development section is the industrialized economy in which there are low-quality, less-skilled and low-paid jobs which often involves the use of outdated equipments that are not only economically inefficient to run but also hazardous for the environment. This step involves lowest standards of occupational health and safety and wastage of resources. Many developing countries fall in this range. The third step of the development includes advanced industrialization with better awareness of the environment, resource efficiency and management. The fourth stage involves transition to a knowledge-based service economy. The incomes are higher, the technology is advanced and there is an increased awareness of the environment and social impacts. Many European countries fall in this range.
An important part of the economical development is the adoption of high technologies, knowledge based services, awareness and mobilizing the workers for the sustainable consumption of the resources.

Factors Affecting the Economic Development

Factors impacting at the economic development are as follows:

i. Resource utilization
ii. Government policy
iii. Environmental sustainability
iv. Adoption of Science and technology
v. Awareness
vi. Negotiations

Resource Utilization

The natural resources are an important aspect on which the economical development depends. The resources can be sub-divided into the categories of exhaustible (minerals, salts, metals etc.) and inexhaustible (forests and grasslands). The primary problems with respect to the utilization and protection of resources include lack of policy/mechanism which results in extravagant use of resources and the outflow of pollutants can cause a collapse of economy in the long run. So the distribution of the resources by means of administrative intervention helps to support the economy (White Paper, 2010).

Water is one of the most important natural resource and is one of the major source in the economy of any country. Pakistan is an agro-based country and most of the industries are agriculture dependent. Pakistan is a water stressed country and poor water management and governance practices are causing increasing water scarcity. The 2011/2012 Annual Plan of Pakistan’s Planning Commission recognizes that water is vital for urban development, achieving the Millennium Development Goals (MDGs) and for reducing poverty. Although the major portion of the rivers’ water is taken by the agriculture sector, but the businesses are the most water dependent and contribute major portion of the pollution in the water bodies. So once water is scarce in the country, the most affected group is the business sector.

As the population of Pakistan is growing, the problems are increasing while having strong impacts on the natural resources of the country (i.e. specially on water). The climate change is also impacting the water and mismanagement of water resources is a major challenge in Pakistan.

Textile is the largest industrial sector of Pakistan with respect to production, export and labor force employment. Pakistan is the 8th largest exporter of textile products among Asian countries and 12th globally. There are about 1545 Textile processing units in Pakistan out of which 1395 lies in Punjab (CPI, 2012) and 8000 weaving mill units (Pakistan Textile Journal, 2011). The textile sector has existing established capacities of 1,550 million kg of yarn spinning, 4,368 million square meters of fabric weaving and 4,000 million square meters of fabric finishing (CPI, 2010). It contributes 8.5% of the country’s GDP and 52% in the export. This sector employs 38% of the manpower in the manufacturing sector and accounts for 31% of the total investment in the country. Major textile export products include cotton fabrics, knitwear (hosiery), cotton yarn, bed wares, readymade garments, towels, synthetic textile and raw cotton.

Generally each industry has installed 1 to 4

![Figure 1. Changes in economic development, social, health, environmental and resource intensity performance of economies](image-url)
pumping units with a capacity ranging between 0.5 to 1.5 cusecs depending upon the type of processing involved in the industry. According to conservative estimates and assumptions of pumps capacity, the estimated industrial water use in Lahore is 675 cusec (365 MGD) (Sarwar, A. and Hasnain, 2014).

Besides all the export and business of textiles, the total annual quantity of wastewater produced in Pakistan is 4,369 MCM including 1,309 MCM from industrial use. The total wastewater discharged to the major rivers is 1782 MCM (about 1/3rd of all wastewater), which includes 344 MCM of industrial effluents (The World Bank, 2010). Textile processing being a big shareholder of the water consumption produces wastewater and discharges directly into the water bodies without any treatment.

Following processes are the main sources of wastewater generation in the textile processing as

a) De-sizing
b) Bleaching / scouring
c) Mercerizing
d) Dyeing
e) Printing
f) Color Kitchen
g) Boiler
h) Cooling water wastage
i) Screen Development Section
j) Screen Stripping Area
k) Laboratory

Water Stewardship Initiative in Pakistan

Water stewardship is a concept which gives the idea of realizing all the stakeholders to sit together and solve the problem on water instead of playing blame game. World Wide Fund for nature (WWF) gave an idea of water stewardship in the businesses. Water stewardship for business is defined as progression of increased improvement of water use and reduction in the water-related impacts of internal and value chain operations (WWF-International, 2013). A question may arise in mind as to why water stewardship in businesses? The reason is the stewardship always cares about ecosystem, habitat and natural resources for the well being of humans, so the businesses are the key players in the environment.

The businesses always deal with three kinds of risks i.e. physical risks, regulatory risks and reputational risk. In order to tackle these risks, the water stewardship has 5 steps ladder which is

i) Water awareness
ii) Knowledge of impact
iii) Internal action
iv) Collective action
v) Influence governance (WWF-International, 2013). The stewardship steps start from water awareness which includes the individual as well as community awareness regarding to water and then ladder goes towards knowledge of impact. After the knowledge, there arises an internal action which everyone takes within its own premises and then collective action for combined actions by all the stakeholders. After the results of collective action, the stewardship ladder goes finally towards the influence governance. At this stage after the success stories from the collective action, the stewardship involves governance and moves towards policy making in the country.

![Figure-2. The Water Stewardship five Steps Ladder](image)
WWF-Pakistan took an initiative in a project entitled “City-wide partnership for sustainable water use and water stewardship in SMEs of Lahore, Pakistan” and the purpose of that project was to start working with SMEs for reducing water consumption, pollution reduction and increasing the water efficiency in the four water intensive sectors (Textile processing, Leather, Pulp and paper and sugar). The WSP project is funded by the European Union and is being executed by the group of three organizations i.e. World Wide Fund for Nature-Pakistan (WWF-Pakistan), World Wide Fund for Nature-UK (WWF-UK) and Cleaner Production Institute (CPI). The Lahore Chamber of Commerce and Industry (LCCI) and Punjab Small Industries Corporation (PSIC) are associates of the project. This Water Stewardship Project is focused in major cities of Punjab i.e. Lahore, Faisalabad, Sialkot, Gujranwala, Sheikhupura and Kasur. The objective of the WSP is to reduce the pollution and water consumption by adopting the Best Water Management Practices (BWMPs) in the SMEs.

The objective of the WSP is to reduce pollution and water consumption by adopting the Best Water Management Practices (BWMPs) in the SMEs.

The overall objective of the project is that ‘By 2025 water efficient production and consumption predominates as best practice in Pakistan’s major industrial cities as part of a broad engagement of business in water management, contributing to improved environmental sustainability and poverty reduction within the context of sustainable development’. One of the specific objectives is to ‘reduce the water consumption by at least 15 per cent and pollution load by 15 per cent in 25 water intensive SMEs in Lahore by 2015’.

![Figure 3: The Project Site for Water Stewardship Project (Green Highlighted)](image-url)
2.1 Stewardship activities

The main purpose of this water stewardship initiative was to take all stakeholders on one platform for resolving the issue of water within the region. For this purpose, in the 1st phase of project 35 SMEs were mobilized with pre and post audits for the industries regarding to Best Water Management Practices (BWMPs). On the basis of database, the SMEs were given training for the implementation of BWMPs in their premises. These BWMPs are a series of recommendations from simple to updated technologies. After implementation in Textile sector, the capacity building sessions started to mobilize the business sector for adopting those recommendations.

In the realm of this project, two studies were conducted, one on the Situation Analysis of water resources of Lahore which highlighted the water resources of Lahore with water consumption pattern among domestic user, industrial and agricultural stakeholders. This study also highlighted the issues of mismanagement of water with suggestions to resolve the water crisis within the city.

The second study was conducted on the Water Footprint of the industrial sectors of Punjab. This study showed the water footprint of Textile, pulp and paper, sugar and leather sector Water footprint with their supply chain (Linstead et al., 2015).

On the basis of the findings of the project and report ‘Situation Analysis of Water Resources of Lahore’, a city level partnership is developed including all major stakeholders for highlighting the water issues and moving towards solution. This partnership will be driven by the steering group comprising of technical experts, government, private sector and civil society.

Figure. 4: Slideshow of Project Activities
Findings of the Project

Pre and post audit surveys of the target 35 industries identified different business problems under water management, water associated energy conservation and wastewater pollution reduction. There are different possible solutions available to overcome the business problem of textile mills of Pakistan under three categories: i) water management; ii) energy conservation; and iii) wastewater pollution reduction. The implementation of these possible solutions makes business sense directly and indirectly for these industries of Pakistan.

Generally, newly established SMEs are progressive and able to implement modern concepts of resource conservation briskly. The SMEs (textile) which consume up to 75 m3/ton (75 liter/kg of product) are considered to be water efficient industries (textile≤75). The SMEs (textile processing) which consumes between 76 and 100 m3/ton (textile>75) are considered to be moderately water efficient and water inefficient industries respectively. Water efficient industries had already implemented best water management practices (BWMP) and as a result the project found less scope to implement them in these industries. The scope of BWMP implementation was significant in 68 percent of the moderately efficient and inefficient industries.

The SMEs, which had high unit chemical oxygen demand (COD) loads (more than 100 kg/ton) are considered highly polluting industries and SMEs with low unit COD loads (less than 30 kg/ton) are least polluting industries. About 43 percent of industries were highly polluting. The percentage of moderately polluting (31 to 100 kg COD/ton) and least polluting industries was 40 percent and 17 percent respectively. The scope of BWMP implementation with respect to wastewater pollution reduction existed in 83 percent of highly polluting and moderately polluting industries. The least polluting industries (17 percent) had already implemented cleaner production options, which provide little scope for pollution reduction.

Cost Benefit Analysis (Business Case)

The 35 SMEs (from four sectors) implemented different BWMPs for water management, water related energy efficiency and pollution reduction. The majority of implementation was among textile mills due to their major share in the surveyed SMEs. An overall investment of Rs.119.90 million was realized to implement BWMPs in all the targeted sectors. These BWMPs resulted in annual water reduction of 4.46 million m3 which resulted in reduction of annual pumping energy of about 1,119 MWH. Most industries reduced water from three percent to 31 percent depending on the size of the mill and the type of BWMP implemented. Low reductions in water were for those industries which were already water efficient and had implemented BWMPs.

Target SMEs are saving Rs. 177.80 million annually, in terms of water, energy and chemical use reduction. The simple payback varies but most BWMPs payback within a year.

There are three categories of BWMP implementation i.e. high, medium and low frequency (frequency: percentage of industries which implemented a possible solution). The BWMP implementation resulted in investment realization of Rs. 75.32 million, Rs. 9.17 million and Rs. 35.18 million, under high, medium and low implementation frequency options by all the four sectors respectively. A total of Rs. 119.90 million was invested by the 35 partner industries for implementation of all BWMPs. Sector-wise investment is as under:

The implementation of recommended solutions (BWMPs) makes business sense and will result in direct and indirect benefits for industries. Implementation of these solutions will result in
water and energy efficiency and environmental improvement. The possible solutions are classified in three groups based on their business priority for the partner industrial sectors.

Business case scenario -01 (frequently implemented with quick payback period) is for those BWMPs which are low cost options with quick paybacks (less than one year) and will have high frequency of implementation. Most industries will implement these options as a first set of implementation on high priority. An example of such a solution is the reuse of cooling water and reuse of reverse osmosis (RO) reject water. A business case for these BWMPs will be established and industries will be mobilized to immediately implement this set of solutions.

Business case senario -02 (important with moderate to quick payback periods) is for those BWMPs which are high cost options with relatively moderate to quick paybacks (one to three years) and are considered to be very important for the industry in terms of high savings but require high capital cost. These possible solutions will be implemented as a second set of implementation due to their high capital cost. An example of such options may be a caustic recovery plant and reverse osmosis plant. A business case for these BWMPs will be established and industries will be mobilized to implement these options as the second set of priority.

Business case senario -03 (absolute) comprises of a full menu of BWMPs mentioned in the above two categories. The WSP project will attempt to implement absolute BWMPs and establish their business case. All three business case scenario will be presented to industries in order to mobilize them to implement the absolute scenario or any set of options as per their requirement and priorities.

These three business case scenarios offer very attractive business cases for the businesses with substantial benefits in terms of water conservation (five to 30 percent), chemical savings, energy efficiency (five to 10 percent) and pollution reduction (10 to 30 percent).

City-wide Partnership

On the basis of the findings of the project, a city level partnership is developed including all major stakeholders for highlighting the water issues and moving towards solution. This partnership will be driven by a steering group comprised of members of government, private sector, civil society and experts. The composition of the steering committee must be a representative of the key water stakeholders including government, chambers of commerce, multinational company, water expert/private and academia. The participation in the committee will be totally voluntary and will be responsible for realizing the full scope of the partnership which includes:

• Develop a common understanding amongst all stakeholders (business, government, civil society) on the water risks to Lahore and to business, communities and government.

• Establish an agreement on the key priority water risks, building on the situation analysis and water footprint studies conducted as a part of the project.

• Identify the mitigation options necessary to address the priority risks at the policy/management level.

• Develop strategies and actions (e.g. lobbying) to address those risks.

• Act as a collective voice for the key changes that all stakeholders want to see on water management in Lahore.

• Access funding (from national and international donors) to implement projects.
Conclusion

Water stewardship is a new idea that came from the developed world to the developing people for their shared risks. The shared risk is an idea where the businesses can take initiatives and invest for the water management and sustainable water management beyond the fence-line of the industry. The partnership is expected to serve as an advisory group to the Punjab Government on water management issues drawing on the healthy mix of expertise available on water resource management, governance, industrial water management, water footprint, water pollution etc. The committee is responsible to supervise the advisory services of the partnership extended to the government.

Although stewardship is provoking discussions at international level but we should be transparent about our objectives which is the essential foundation for fruitful partnerships. In short, stewardship is not the responsibility of any organization, department to save water but it’s a collective action which realizes that everyone is responsible for the water and should be water stewards.

References:

Govt. of Pakistan, Ministry of Finance. 2014. Economic survey of Pakistan


PTA. 2011. Pakistan Textile research journal-2011


WWF-International. 2013. Water Stewardship, perspectives on business risks and responses to water challenges
Book Review

Designing Spaces for Natural Ventilation: An Architect’s Guide

By Fawad Saeed*

Additional Director, Central Contract Cell, WAPDA
This book is meant to serve as a handbook of theories, principles, and concepts. Designing Spaces for Natural Ventilation is an essential resource for designers, researchers, and students. The authors present both historical and modern examples of successfully naturally ventilated spaces and offer discussions of recent research that challenge the perceptions of coolness and thermal comfort provided by air conditioning.

Through this book, the authors have tried to bridge the gap between the science of fluid dynamics and architectural design by means of scientific and architectural visualization tools. Ventilation is the process by which ‘clean’ air (normally outdoor air) is intentionally provided to a space and stale air is removed. In buildings designed to exploit natural ventilation, air must be able to flow freely through the building. This may be accomplished by either natural or mechanical means. Spatial layout, the idea of how different areas of a building connect, is very critical when considering flow through a building. The reason why natural ventilation has been so difficult to evaluate is its complex, dynamic, three-dimensional nature. In buildings, designed to exploit natural ventilation, air must be able to flow freely through the building and opening sizes should be adjustable. Smaller openings increase the air velocity; large openings slow air down.

The authors considers natural ventilation a design discipline like daylighting, that may be taught in design studios and not just in the technology classes as an add-on. They have tried to provide answer to fundamental questions like; how to achieve a certain healthy ventilation rate with natural means and how to achieve healthy air exchange rates with minimum energy consumption? Designing a building with natural ventilation requires knowledge of prevailing wind directions and weather data, as well as solar orientation and radiation intensity. The book very clearly guides about designing for all eventualities and strategies for the best combination of openings.

Natural ventilation is a key factor in green, energy-efficient, climate-responsive design both in the developed and especially in the developing world. Buildings can breathe naturally, without the
use of mechanical systems, if one design the spaces properly. One can achieve truly natural ventilation by considering the building’s structure, envelope, energy use, and form, as well as giving the occupants thermal comfort and healthy indoor air. It should be read globally and applies to many climate regions. In the twentieth century, architects have depended more and more on the mechanical engineer to provide light and air within the building. But in the context of Pakistan, one cannot afford to consume meager resources in this manner – which is of course actually an advantage, for it means that the building itself must, through its very form, create the “controls” which the inhabitant needs. Such a response compels much more than just sun glass and louvers; it must involve the section, the plan, the shape, in short, the very soul of the building. Most importantly, natural ventilation needs to be designed; it cannot be added later.

The content of this book was developed with the designer, student, or professional architect in mind. Of course it also speaks to the engineer, and provide an overview for the educated and interested amateur. By using scientific and architectural visualization tools given in this guide, one can develop ventilation strategies without an engineering background. Handy sections that summarize the science, explain rules of thumb, and detail the latest research in thermal and fluid dynamics keeps designs sustainable, energy efficient, and up to date. The book is an attempt to translate engineering knowledge into architectural drawings and case studies. It works well as a support for the intersection of technology teaching and the design studio because it touches on both sides of the architecture spectrum. The authors’ simple language has made fairly complex knowledge accessible to students and practicing readers, and function as an educational and teaching tool. Thus, in an ideal sense, this is a book between science and visualization and a book about space and air.
Guidance Notes for the Preparation of Paper for Pakistan Journal of Urban Affairs

These guidelines are intended to help authors for submission of papers to the Journal.

GENERAL

Pakistan Journal of Urban Affairs published by the Urban Unit, under the flagship of Planning and Development Department, Government of the Punjab deals with worldwide aspects of urbanization and a broad range of environmental matters. The Unit aims at publishing papers presented by national and international researchers, practitioners and officials involved directly with issues pertaining to urbanization and papers from national and international conferences and symposia.

Journal subscribers will be interested to hear about the cutting-edge research being undertaken by academics and professionals in their field. Operational, Scientific, Technical and Research papers are welcomed, and both short and full-length papers are encouraged.

Papers to be published in the Journal must be original and of a high standard – not only in respect of their subject matter and its treatment but also in the quality of writing. Particular attention must be paid to clarity and conciseness of expression. Authors are encouraged to draw out generic messages from their work in relation to urban affairs and environmental issues. This is particularly important for case study papers.

All papers are expected to have a literature review setting the work in its research and practical context, as appropriate. We will sometimes publish papers consisting entirely of review material, provided they provide a critical overview and demonstrate original thought. Those submitting papers derived from MSc and PhD theses should ensure they produce a concise summary of their work within the prescribed word limits.

SUSTAINABILITY

Papers submitted to Pakistan Journal of Urban Affairs should encompass the principles of sustainable development as defined in the Bruntland Report (World Commission on Environment and Development, Our Common Future, 1987). Papers which promote clearly unsustainable practices will not be accepted for publication. Authors should conduct and report research in an ethical manner and are required to sign a declaration that their work conforms to the legal requirements.

REFRENCING

Expert referees will assess each paper and a decision regarding publication will be made by the Editor-in-Chief on the basis of the referees' reports. The editor's decision will be final. Sometimes authors will be invited to resubmit their paper for consideration in the journal, feedback will be given to authors to help them with the revision of their papers. When papers will not be accepted for publication, the editorial board will not be bound to give any reason for rejection. The authority of the Board will be final.

EDITING

The Editor-in-Chief reserves the right to amend a manuscript if it does not comply with the Journal's requirements and not to publish any parts which he considers superfluous or to which he takes
exception. Authors will be sent a final proof of their paper for checking prior to printing.

**PUBLICATION**

Papers that are in their final form will be published online on the journal website ahead of their appearance in a print issue. These papers will be fully peer reviewed and proofs will be corrected by the author. Accepted papers will be typically published in the printed Journal within 12 months of submission.

**LANGUAGE**

Authors whose first language is not English should ensure that their paper is carefully checked by a fluent English speaker for language accuracy and appropriateness. Authors may choose to have their manuscript professionally edited before submission to improve English.

**SUBMISSION GUIDELINES**

Papers should be submitted using Pakistan Journal of Urban Affairs website: www pjua.gov.pk. There is a help function on the website to guide you through the process. Files can be uploaded in Word (.doc), RTF (.rtf) or PDF (.pdf) format.

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**LENGTH**

Papers, including illustrations, tables, and references, must not exceed (the equivalent of) approximately 5000 words in length. Short papers (between 1500 and 2500 words) are also encouraged. Authors are asked to give a word count at the end of the paper.

**PRESENTATION**

Papers should be arranged in single column text, not as two columns. If a paper is accepted for publication, the Copy Editor will format the paper to the industry standard format.

**LAYOUT**

The layout of the main body of the paper will depend upon the subject but, in general, a paper should follow the following format: Title page; Abstract; Key words; Introduction (this should not repeat what has been said in the abstract); Main exposition, subdivided as appropriate for the subject; Discussion, if required, e.g. of experimental results; Conclusions, which should be numbered (they should not include tables, figures, or references); Acknowledgements; References; Word count; Appendices, if necessary; figure legends; tables.

**TITLE PAGE**

The title of the paper should be as short as possible with a clear indication of the subject matter. The name(s) and appointment(s) of the author(s) should be given. If the paper has been presented, the date and venue of the presentation should be given. In the case of multi-author papers one author should agree to act as the corresponding author to whom queries and proofs will be sent. An e-mail address and other contact details for the corresponding author should be provided.

**ABSTRACT**

An abstract of not more than 150 words and not less than 100 words should be included at the beginning of the paper. It should briefly indicate the subject and scope of the paper, calling attention
to points of special interest, e.g. method of investigation and important results.

KEYWORDS

Up to 8 key words should be listed in alphabetical order for use in retrieval systems.

HEADINGS

Not more than three levels of headings should be used. Main headings should be typed (in bold letters) centrally on the page, and secondary headings (in bold letters) at the left of the page. Third level headings should be typed in italics at the left of the page. Numbering of paragraphs and sections of a paper should be avoided.

UNITS

The System International (SI) should be used for all units of measurement as far as possible. The oblique stroke (e.g. m /d) should be used instead of the negative index (m d ). Temperature should be expressed in °C.

ILLUSTRATIONS

Diagrams should be drawn without boundary boxes and should be as simple as possible, but should contain enough information to be understood without reference to the text. Any map should include a compass point. Photographs can help to enhance the overall appearance of a paper. Captions should be concise and be listed on a separate page at the end of the paper. When a paper is initially submitted all figures should be embedded into the main text file for review purposes. Please note that after acceptance separate high resolution print quality figures will be needed as described below.

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Tables should be as few and as simple as possible. Graphs are often preferable to tables, and the same data should not be presented in both forms. Please place tables on separate pages at the end of the file after the figure legends. Captions should appear above tables.

ACKNOWLEDGEMENTS

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REFERENCES

References should be cited using the Harvard Referencing System.

Citations in the text take the form of author names and dates (e.g. Smith 1990). Sort references chronologically and then alphabetically within dates (e.g. Smith 1990; Brown 2001; Walton 2001). For references with three or more authors, use the first author's name and 'et al' in the text.

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Written discussion in response to papers published in Pakistan Journal of Urban Affairs is welcome. The authors of the original article will be invited to write a response and the comment and response articles will proceed through the review process together. Individual items of discussion should not exceed 500 words in length and may be submitted through www.puja.gov.pk.

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(The paper title should be typed in capital letters for each word of the sentence as demonstrated above.)

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*Author’s Affiliation, e.g. School of Environmental Engineering, University College Dublin, Ireland.

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Author is a lecturer at the School of Urbanization. His / Her current research focuses on the changing politics of the working poor. This is sample. This is sample. This is sample. This is sample. This is sample. This is sample. This is sample. This is sample. This is sample. This is sample. This is sample. This is sample. This is sample. This is sample. This is sample……………………………………..

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Abstract

An abstract of not more than 150 words and not less than 100 words should be included at the beginning of the paper. Use Time New Roman Font and 12 Font size being Italicized.

Keywords: Up to 8 key words should be listed in alphabetical order for use in retrieval systems.

Format

Your paper should be submitted on A4 (210 mm x 297 mm) page and typed in two tier single-column format as shown in this manuscript template. The text must fit exactly into the typed area. Formats for Equations, Tables, and References are also presented. Page numbers must be inserted on every page. Paper, including illustration, tables, and references, must not exceed approximately 5000 words in length. Short papers (between 1500 and 2500 words) are also encouraged. Authors must give a word count at the end of the paper. Details of the Styles used in this template are given in Table 1.

Headings

First Order Headings

Each word of the main headings should be typed, bold faced, and not numbered (Style: Heading 1).

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Second order headings should be typed with the first character of every word capitalised, Italics faced, and it should not be numbered (Style: Heading 2).

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Place the all figures and tables on separate pages at the end of the file. Number them consecutively, making no distinction between diagrams and photographs. Figure caption should be placed immediately below the Figure. Type Figure caption as follows: Figure 1: Caption (Style: Figure Heading). Example of a Figure is shown below. Figures should have complete description of matter/context which they aim to highlight; thus having proper units, titles, and legend. In case of maps, scale units and directional arrows i.e. North direction should be mentioned on it. It is preferred that figures and/or photographs are coloured.

Place tables in one column (See Table 1 for table reference also). Table caption (Style: Table Heading) should be placed immediately above the table, and type as follows: Table 1: As shown above

![Figure 1: Economy of Pakistan (Source Details)](image-url)
Equations

Enter equations using MS Equation editor and number the equations consequently (Style: Equation). After entering the equation, press tab and enter the equation number within parentheses. Refer to equations by this number in the text. Equation (1) below is shown as an example.

Taylor’s tool life model is, \( (1) \)
where, \( V \) is the cutting speed and \( T \) is the tool life.

Citation

Citation of the references should be made within circular brackets for example, (Author Last Name, Year).

Table 1: Style and Font Size (Source Details)

<table>
<thead>
<tr>
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<th>Times New Roman, Bold face, 18 point, Capitalized Each Word, Centred</th>
<th>Title of the Paper</th>
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<td>Author</td>
<td>Times New Roman, Bold &amp; Italics 15 point, Centred</td>
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<td>Affiliation &amp; Body Text</td>
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<td>Third Order Heading</td>
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Acknowledgements

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• Journal:

• Book:

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Word Count: Maximum 5000 words
Call For Papers / Abstract

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It is important to mention here that the premise of this research and development initiative is - to emphasize the multitude of urban development challenges; and to generate scientific discourse leading to sustainable strategic and policy options leading toward improved decision making and a better urban future. Moreover, the Pakistan Journal of Urban Affairs is being published by the Government of Punjab, yet the focus is national; because the current urban development issues faced by Pakistan call for an integrated and sustainable strategy for development.

Pakistan Journal of Urban Affairs welcomes submission of papers from a broad spectrum of scholars, practitioners, researchers and public sector professionals. Research papers are expected to be - policy based; solution oriented; a sound critique/analysis of existing projects; and a platform to propose new strategies for tackling issues related to urbanization. Coverage of topics includes, but is not limited to:

- Urban Governance: urban planning, public service delivery (urban transport, urban water and sanitation, urban solid waste management) privatization of urban service delivery, urban security.
- Urban Growth and Development: political economy of urbanization, urban sprawl and suburbanization.
- Urban Economy: urban employment generation and issues, rural-urban migration, food security, poverty and urbanization.
- Urban Environment: Urban environment and impact assessment, urban pollution, urbanization and climate change, urban environment policy, sustainable urban ecology.
- Urban Living: urban housing, urban spatial management, preservation, conservation, restoration, rehabilitation, reconstruction of cultural heritage.
- Research and Development: Critical role of academic research and scholarship for R&D in urban issues, urbanization and education, social sustainability and urbanization.