# THE IMPACT OF INFRASTRUCTURAL SERVICES ON TRADITIONAL ARCHITECTURE AND URBAN FABRIC OF THE WALLED CITY OF LAHORE

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**ABSTRACT**

Present Walled City of Lahore is essentially a traditional town transformed largely into a colonial city during 20th century in context of its built environment in general, and infrastructural services in particular. Ninety nine years of the British occupancy of the city has tremendously changed its physical character, layout plan, infrastructural services, road networks, construction techniques, building materials, and connection with outer settlements etc. The pace of these topographical changes within the Walled City of Lahore (WCL) remained slow, throughout the centuries. The housing units of the WCL have been demolished and reconstructed repeatedly. This process has re-shaped its urban fabric, changed its topography, internal layout, and the dynamics of streets.

Before the introduction of infrastructural services[1] the urban fabric of the WCL exhibited identifiable architectural characteristics. The unplanned and ad-hoc provision of infrastructural services has substantially damaged the heritage buildings[2] of the WCL, in particular during the last sixty years[3]. Today clean drinking water is not available to the inhabitants/residents of the WCL. Sewer and storm water drainage system is working inefficiently. The web of electricity and telecommunication cable has brought visual and aesthetic impairment to the façades and streetscape of the WCL.

This paper documents the extant situation of these infrastructural services, exploring their impact on traditional architecture and urban fabric of the WCL, concluding with recommendations for strategic planning to protect the historical building remains and urban heritage belonging to different historical eras.

***Key Words*:** Walled City of Lahore (WCL), Heritage, Urban Fabric, Infrastructural Services, Urban Design, Urban Planning, Restoration, Urban Conservation, Colonial City, Sustainable Development of Walled City, Traditional City.

**ACRONYMS:**

| | |
|---|---|
| LESCO: | Lahore Electricity Supply Company |
| PTCL: | Pakistan Telecommunication Corporation Limited |
| PHA: | Parks & Horticulture Authority |
| SNGPL: | Sui Northern Gas Pipeline Limited |
| SDWCLP: | Sustainable Development of the Walled City Lahore, Project |
| WCA: | Walled City Authority |
| WCL: | Walled City of Lahore |
| WASA: | Water and Sanitation Agency |

## 1. THE CITY WITHIN WALLS

According to Lahore Master Plan 2006 (AKCSP 2008a), the larger city of Lahore measures an area of almost 2300 square kilometers with a populating of more than seven million[4]. The Walled City of Lahore was an old settlement dating to before its occupation by invaders from Central Asia during 11th and 12th centuries. It had remained a nexus between Central Asian regions, Delhi and Multan Sultanate throughout the centuries. Within its walls, a dense urban fabric is present. The Mughal Emperors spent a few years of their lives in Lahore Fort[5] and constructed some significant historical buildings within the WCL. However, they mostly

1 Infrastructural services include electricity, water supply, Sui gas, telecommunication, sewer and rain water drainage.
2 Heritage buildings in WCL include multistory housing units, *havelies,* historical mosques and shrines, wrestling arenas, city gates, etc
3 After establishment of Pakistan in 1947, the mass immigration of non-Muslims from WCL to India offered opportunity to settle new community that did not have any association with heritage buildings.
4 Projected population is based on Census 1998 figure of 5.1 million.
5 Only Emperor Akbar stayed for 14 years in Lahore from 1585-1599 A.D. he then again shifted his capital to Agra.

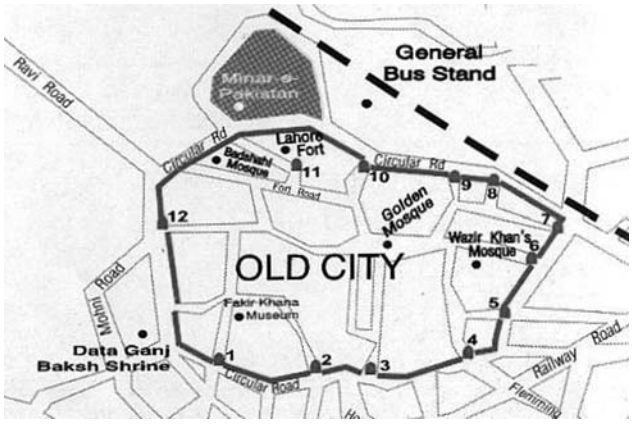


***Figure-1:*** Walled City of Lahore, Main zoning.

constructed extensive monuments outside its periphery[6]. The link of the WCL to Central Asian route, as it appears, was on North-Western corner and was extended towards Delhi through the South-Eastern fringe. (Figure 1)

Today's Walled City of Lahore comprised 22,800 property units[7], spreading over an area of 2.7 square kilometers (AKCSP 2008b), and is enshrined within a Circular Garden that is heavily encroached by the public and private buildings. Just outside this Circular Garden[8] is a Circular Road or a Ring Road in modern urban terminology, connects the WCL to the outer areas which were mostly populated during the Colonial Period[9].

Today, almost 70% built up land area inside the WCL has been commercialized by whole sale traders. The residential population has decreased from 250,000 to 160,734 in the last forty years (AKCSP 2008c). The daytime occupancy of the business related people increases to more than 400,000 during peak shopping hours. There are 1460 illegal encroachments in the Circular Garden, around the WCL[10]. Only few hectares of the Circular Garden now remain green as public parks which are being maintained by the Parks & Horticulture Authority (PHA).

***Figure-2:*** An arial view of the Walled City of Lahore.

## 2. INFRASTRUCTURAL SERVICES IN WCL

The introduction of infrastructural services is not a very old phenomenon when compared in relation to the existence of the WCL. At present there are four line-agencies, providing infrastructural services within the premises of the WCL, one is provincial and other three agencies are Federal[11]. WASA is responsible for providing potable water extracted from the aquifer through a number of tube-wells installed in and around the old city, particularly in the Circular Garden. The sewer and storm water is also collected from the WCL and drained out at various stations in main service areas. For storm water and sewage drainage, diverse range of typologies of systems has been introduced at various places in the WCL. In some areas, open drains and at others covered pipe drainage systems are working presently. (Figure 2)

Lahore Electricity Supply Company (LESCO) is mainly responsible for the provision of power to illuminate the

6 Shalimar Garden, Jahangir, Noor Jahan and Asif Jahs' Mausoleums, Dai Anga Mosque and Tomb, Chau Burgi, Shrines of Hazrat Mian Meer, Shah Chiragh Lahori, Meeran Mauj Darya Bukhari, Abdul Razzaque, Shah Abu al Mu'ali etc are located outside of the WCL but were constructed during the Mughal period.

7 Data is based on Topographical Survey completed by AKCSP for SDWCLP with the help of GIS.

8 This Circular Garden was a moat during Sikh regime that was filled with earth and converted into a garden.

9 Before Colonial Period, the people settled within walls because of the fear of invaders.

10 These also include five number Police Station buildings, eleven private and government school buildings, three number grid stations of LESCO, twenty two number tube water-wells installed by WASA, an office of Tehsil Nazim, several mosques, shrines and shops.

11 Water and Sanitation Agency (WASA) is a provincial department and Lahore Electricity Supply Company (LESCO), Sui Northern Gas Pipeline Limited (SNGPL), and Pakistan Telecommunication Corporation Limited (PTCL) are federally administered agencies.

housing and commercial units located within the WCL. For this purpose, there are three grid stations located in the Circular Garden that not only serve the WCL but also other areas outside the WCL[12]. These grid stations have thus become heavily loaded to cater for the imminent requirements, though now a fourth grid station has been proposed outside Kashmiri Gate by LESCO[13].

Pakistan Telecommunication Corporation Limited (PTCL) provides telecommunication and cable television network services to the residents of the WCL. Both landline and mobile telephone services are available for housing and commercial units within the WCL. In some areas wireless telephone system is also provided to facilitate the users. At a very small level, underground fiber-optic cable is provided.

Sui Northern Gas Pipeline Company Limited (SNGPL) is the service provider for natural gas and its network. The gas is mostly used for cooking and heating purposes, its industrial usage is minimal within the WCL.

## 3. EXTANT SITUATION OF INFRASTRUCTURAL SERVICES IM WCL

The following sections describe the existing situation of these infrastructural services.

### 3.1 Water Supply

The WCL is supplied with potable water from various tube wells located in the Circular Garden. Presently, there are twenty one tube wells out of which only seven are functional. These tube wells are directly connected with the water supply pipelines without any water reservoirs or disinfection measures. The Lahore city as a whole, has more than 160 tube wells (WASA Record) drawing drinking water from the aquifer below the ground.

Currently the water supply system is supported by tube-wells, pumps, pipelines, and reservoirs that are generally in poor conditions requiring minimum regular maintenance. The tube-wells are setup with an injection treatment system. The issue of clean drinking water exists over the supply and usage of chemicals for the treatment process. The practice of illegal connections is a major source of contamination in water supply system that ultimately affects the health conditions of the residents living within the WCL. (Figure 3)

***Figure-3:*** Tube Well located in Circular Garden.

Borehole logs of four tube wells[14] (WASA Record) shows that the wells conform to one of the following (AURECON 2009a);

1. Well hole size 26" (650 mm) diameter with a 20" (500 mm) diameter mild steel housing for the first 210' (64m) to 270' (82m) followed by 10' (250 mm) fiberglass casing (galvanized) to the bottom of the hole at between 600' (182m) to 750' (228m) below the ground surface. The design capacity of the tube wells is given as 4 cusec (0.113 cusec or 113.3 l/s).

2. Well hole size 20' (500mm dia) with a 16" (400mm dia) mild steel housing for the first 220' (67m) followed by 8" (200mm) fiberglass casing (graveled) to the bottom of the hole at 520' (158m). The design capacity of the tube well given as 2 cusec (0.057 cusec or 56.6 l/s).

WASA has used two basic designs of tube wells with a capacity of 2 or 4 cusec each. Borehole logs reflect that the water is collected from various semi-confined aquifers delineated by clay layers. The pumps, being connected directly into the supply pipes, are operated at an average of about 18 to 20 hours daily. For electricity outage hours some tube wells are run by generators. The water table of Lahore is dropping at the rate of 4' to 6' per year (WASA Record) (Figure 4).

12 Bhati Gate and Mochi Gate Grid Stations also serve the areas outside WCL like Data Darbar and its vicinity, Gawalmandi and its vicinity.
13 LESCO started constructing Grid Station in 2004-05 but SDWCLP stopped it as it was considered another intervention in the Circular Garden.
14 These are located in the areas of Iqbal Park, Yakki Gate, and Tehsil Garden.

***Figure-4:*** Water Supply Connections in Street.

In the past years, two water reservoirs were constructed for the storage of water. One of these was located at Langay Mandi, the highest point of the WCL, having the water storage capacity of one million gallons. It was constructed in the later decades of 19$^{th}$ century during the British period. 18 feet high columns constructed of bricks hold four separate steel tanks. The other reservoir is located outside Masti Gate with the capacity of 100,000 gallons. It is an underground RCC tank and was constructed to increase the storage capacity for the residents of the WCL.

The Langay Mandi reservoir is filled with water extracted by five tube wells located in the vicinity of Masti Gate. These tube wells operate round the clock. This reservoir is filled three times daily. The water distribution system is opened at three intervals i.e. from 04:00 to 08:00, from 13:00 to 15:00 and from 17:00 to 20:00, making a total time of nine hours daily. Langay Mandi reservoir rises between 8" to 9" per hour during the fill (WASA Record).

Due to lack of water pressure, the consumers are left with no choice other than using water pumps to pull potable water directly from the supply line to their over head water tanks. This practice results in negative pressure in pipes that contaminates the water by sucking impurities from the old deteriorated pipes. During the Later decades of 19$^{th}$ century, cast iron (CI) pipes were used for distribution of water. However, it reuse have now been replaced at various places by ductile iron (DI), with asbestos or fiber cement pipes below the ground and hot dipped galvanized steel pipes above the ground level (AURECON 2009b).

No metering system exists for measuring the water for an individual household. The consumers are charged flat rate, based on floor area for residential units and a fixed rate for industrial and commercial usage.

***Figure-5:*** Open Sewer Drainage System in Walled City.

### 3.2 Extant Situation: Waste Water

Surprisingly, the WCL has no separate system for waste water disposal. It is the sewer system that let the rain water to flow out. This combined system has given birth to a severe problem of solid waste that is collected into the sewer pipe, choking the system. WASA plans to separate the sewer and waste water drainage, in the long term (Figure 5). This combined stream at present ends at the outer periphery of the WCL in an open concrete and brick lined drain. On the southern side of the WCL, the open drain starts at the Delhi Gate while flowing towards the pump station, situated in the Circular Garden near Bhati Gate. The flow velocity is not enough to take the solid waste along with. On the northern area of the WCL, a drain starts at Masti Gate and flows toward the north-east corner of the WCL, where it is connected with the Greater Lahore drainage system. No Treatment Plant is installed in the close proximity of the WCL. All the effluent is collected and thrown in River Ravi that has become severely polluted by such irresponsible measures.

### 3.3 Existing Situation: Storm Water

Since decades, the storm water is collected combined with the waste water through an open-lined drainage system at the WCL. From the alleys and streets, it is collected in a drain at the periphery of the WCL that is further drained out into an out fall drain and pumped from Babu Sabu Outfall station. In the first and second Punjab Urban Development

Projects, almost two-thirds of the streets were upgraded by providing concrete cover over the open drains. This raised the surface level of the streets, sometime even higher than the ground floor level of existing building units. In the second part, trunk sewer was also laid down. Existing covered drains leave no option for collection of storm water through combined drainage system. At certain points where the concrete slabs are broken, solid waste along with storm water enters into a combined drain that causes various problems of blockage.

During heavy rains, the combined sewer over flows and the water collects in the Circular Garden as a pond that is ultimately infiltrated or naturally evaporated.

### 3.4 Existing Situation: Electricity

The infrastructural services in the WCL have been provided on an ad-hoc and emergent bases without any planning and future vision. The electricity provided to the WCL is separate in terms of High Voltage (HV) and Medium/Low Voltage (MV & LV)[15]. There are three major grid stations (132/11kV) from where electricity is provided to the WCL and its neighborhood. These three grid stations[16] are fed from Ravi, Lahore, Band Road and New Kot Lakhpat 220 kV substations (LESCO Record). (Figures 6 & 7)

The Fort grid station containing outdoor air-insulated equipment is placed in a fenced compound underneath fabric mesh netting that protects against foreign objects (AURECON 2009c). It is the oldest grid station dating back to 1980. It is fed through the greater Lahore transmission network through an overhead line to Ravi grid station and an underground cable to Bhati Gate grid station.

Bhati Gate grid station contains outdoor transformers coupled with indoor gas-insulated switchgear. This nature of equipment uses pressurized Sulphur Hexafluoride gas instead of open air to control the arc of a current fault (AURECON 2009d). This grid station is connected through two under ground transmission lines, one from Fort grid station and the other from Rewaz Garden grid station. This grid station mostly caters for the western region that is outside the WCL and only a small region of WCL is served through this grid station.

***Figure-6:*** Bank of transformers near Masjid Wazir Khan.

***Figure-7:*** Transformer and Electricity Services near Masjid Wazir Khan.

Mochi Gate grid station also contains outdoor transformers coupled with indoor gas-insulated switchgear within a fenced compound (AURECON 2009d). It is connected to the greater Lahore transmission network through two underground transmission lines; one cable to Badami Bagh grid station and second cable to McLeod Road grid station.

The eastern zone of the WCL and eastern and southern regions outside WCL are fed through this grid station. Both Mochi and Bhati Gate grid stations were constructed during 1994-95 and are in good condition.

The Medium Voltage/ Low Voltage (MV/LV) electrical network that supplies the WCL is not properly and systematically designed for a heritage city and is in fact

15 LESCO Transmission is held responsible for HV network and LESCO Distribution looks after MV/LV network within the walled city.
16 These three Grid Stations are located at The Fort, Bhati Gate and Mochi Gate

damaging the visual impact of the heritage buildings inside the WCL. The MV (11kV) network is laid down as overhead cable that hangs from various posts, buildings or whatever is available in the streets. Visually it appears to be unmanageable, but in fact LESCO has given little importance to proper designing and urban aesthetics. These cables include bare conductors within an arm-length reach with bare jointing infect cansin possible.

Within the WCL, pole-mounted oil cooled Transformers of 11kV/400V have been erected on the roads where ever some space is available. In busy and congested areas, clusters of Transformers occupy the public areas. Such cluster type arrangement of pole-mounted transformers reflects the unplanned and haphazard approach of the service provider. Variety of electricity meters ranges from older electromechanical meters to latest meters. These meters are located outside the houses, fixed on the walls to minimize the pilferage of electricity.

### 3.5 Existing Situation: Telecommunication

Telecommunication services within the WCL are also provided without much thoughtful planning and designing. The services provided are land-line telephone, wireless telephone, mobile phone services and cable television services. The PTCL has constructed Shahalami Exchange near the WCL to operate the connections there. At most of the places, telecommunication copper cables are interwoven with electricity cables in a way that these can not be separated. (Figure 8)

Although PTCL provides television cable services, yet there are number of third party cable service providers working within the WCL. PTCL has no near future plan to provide improved version of cables like fiber optics. Unfortunately, the satellite television service is expensive in Lahore that may reduce many cables in the streets and alleys.

### 3.6 Extant Situation: Sui Gas

(SNGPL) remained reluctant in providing gas connection within the WCL for many years. Finally, the political pressure resulted in providing gas in narrow streets and alleys but not less than 8' in width. But now they have provided the service to the streets equal to 5' in width. For such narrow streets, the meters are installed in the beginning of the street and an open GI pipe line goes to the houses. Trunk gas pipe lines are buried underground. Currently a variety of meters are used for commercial and residential units. For domestic connections, SNGPL is using G1, 6 or G4 type of meters (AURECON 2009e). (Figure 9)

The existing outer gas main pipeline next to the Circular Garden is a 6-inch Mild Steel (MS) pipeline with an opening pressure of 70-90 psi (SNGPL Record). Within the WCL, this MS pipe line is reduced to 4 and finally to 2 inch-diameter MS pipeline with an operating pressure of 20 to 25 psi. The house connections are normally 2 inches MS pipeline and at house connection regulators, the pressure is reduced to 0.217 Psi (AURECON 2009e). The current residential gas consumption during the summer months is for eight hours per day at the rate of 60 to 70 cft/hour.

## 4. IMPACT OF INFRASTRUCTURAL SERVICES ON URBAN FABRIC

Electricity, water supply, Sui gas and telephone are the essential basic services for a modern day life. Without their existence, there is no concept of life in urban and rural areas.

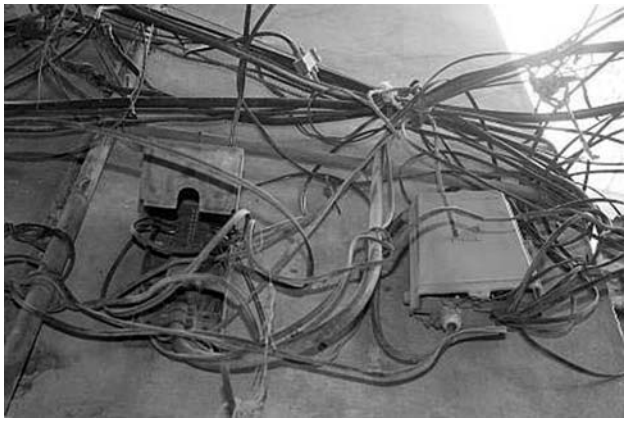

***Figure-8:*** A Network of Telephone & Electricity Cables.

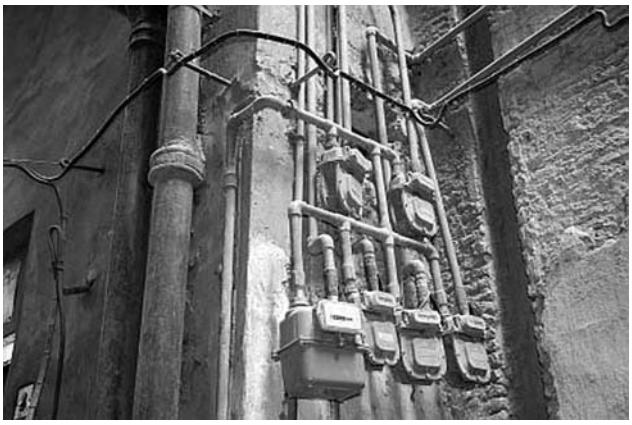

***Figure-9:*** Meters for Sui Gas Supply Lines.

***Figure-10:*** Lahori Gate of Walled City ... Impact of Infrastructural Services.

However heritage buildings pay the price when occupants utilize these services and their consumption is gauged to pay the monthly utility bills through metering. (Figure 10)

The infrastructural services are no doubt an essential need of today's modern life, but their layout plans and provision as practiced is a matter to ponder and re-think. The employees of the line agencies who are the service providers are engineers by profession and are not trained to work within urban areas where heritage buildings exist. Whenever such service is provided, the only intention or consideration of the Sub Divisional Officer or Executive Engineer is lighting up the bulb or to make available the water connection or to provide an operative telephone service for the household. Their leisured, irresponsible, non-professional and insensitive attitude has resulted in the damaging of the architectural features of the heritage buildings located within the WCL. (Figure 11)

The impacts of infrastructural services posed on the traditional WCL and its urban fabrics are as follows:

**4.1 Impact of Distribution Units of Services**

Infrastructural services when reach the serving areas are normally distributed through small operating units placed in the public areas of streets, roads, or leftover open spaces owned by the government. These distributing units for instance, are transformers for electricity and distribution cabinets for telephone etc. Their placement has certain operational limitations of distance. However, then convenience of location and presence in the foreground of the heritage buildings damages the viewing point.

***Figure-11:*** Maryam Zamani Mosque ... Impact of Infrastructural Services.

Transformers[17] of an average capacity have been installed on the roads supported by vertical steel poles that not only hamper the vehicular and pedestrian traffic flow but also encourage the encroachments by offering a space for day-shops. There is no space in between the built up area and the paved or metal road where such services may be located like on a modern planned housing society. Hence such solutions do not work here properly and successfully. Due to non-availability of space, several transformers are installed at various places presenting a view of bank of transformers. The inter-woven electricity, telecommunication and television network cables obstruct the visibility of design motives having heritage value.

**4.2 Impact of Entry Points of Services**

In order for infrastructural services to enter into a (heritage) building, mostly the external wall is damaged by making a hole in it. No drilling equipment may be used to achieve this resulting into a de-shaped and over-sized puncture into an old masonry wall. Since a number of cables and pipes enter or exit from the building hence the intricate design motives are destroyed. The external surfaces of the facades are visually and structurally injured when connection cables are pulled from supply line to the individual building unit where a metering device is fixed on external wall. This practice has brought damage to the heritage buildings of the WCL.

**4.3 Impact of Metering Devices**

Presently, three metering devices are installed on the external

17 Mostly 200 to 300 KVA Transformers are installed in the walled city, because of their easy handling while replacing or repairing.

wall-surface of each house i.e. for water supply, electricity and Sui gas. For multistory structures and that is the case in almost all the units in the WCL the numbering of these metering devices is multiplied for each building.

The fixing of these metering devices on the external wall surface is not systematic, laching order devoid and of aesthetics. The old brick masonry walls do not hold strongly the nails or screws for a long period of time. The line agencies do not allow installing these meters within the house premises because of pilferage possibilities. The external walls of heritage buildings with beautiful architectural details have lost their character by accommodating these services.

**4.4 Impact of Water and Sanitation System**

Similarly, the water supply, sewer, storm water, gas pipelines and their related installations have damaged the outer skin of these heritage buildings. The leakage of water finds its way into foundations of old walls and causes differential settlements of buildings or street flooring[18].

Due to low pressure of water, the ejector pumps are installed at the door-step of the buildings in the street that is a public space. These pumps have also become a source of water leakage. The filled up areas as well as old building structures do not allow space for underground as well as overhead water tanks for storage purpose.

In narrow streets or less than five feet width, the Sui gas and water supply pipelines are laid on the floor surface or clamped on the walls. One can see the web of these pipelines and cables in the streets hiding mostly the architectural details and design motifs of left over buildings. Due to poor workmanship and the absence of regular effective maintenance, these streets usually over flow. The solid waste is collected through these sewer pipe lines that causes regular blockage in flow.

**4.5 Impact of Services on Streets and Streetscape**

The streets and alleys in the WCL have been affected at two levels due to the provision of infrastructural services. One is streetscape and its furniture and the other on the level of its pavement.

The erection of street components of infrastructural services[19] in road side area not hampers the vehicular and pedestrian traffic flow as well as influence badly affects on the visual impact of streetscape. The identifiable elements of the traditional cities and heritage are visually polluted for visitors. Furthermore these infrastructural service components encroach upon the possible space for street furniture. Temporary daily-shops that close up informally under them future hinder the smooth flow of traffic.

In old days there was no practice of paving the streets. The open-drains for waste water were made on two sides of streets and the central area was used for pedestrian movement. When underground services were laid down in place of open drains it became essential to pave the street surface with some flooring material like brick-on-edge, flat-brick paving, tough-pavers of concrete etc.

Along with the underground drainage services, the problem of blockage occurs. For cleaning purpose and giving access to underground pipes, manholes were introduced at regular intervals. Due to the occasional absence of manhole covers, sometime these became death holes and sources for collection of waste. The repeated paving of the streets has resulted in a raised surface street level and heritage buildings of the WCL have became lower in level. This has led to various problems causing increase in rapid deterioration and damaging of the building structures.

**5.0 RECOMMENDATIONS**

The old buildings of WCL are rapidly deteriorating because of unmanaged, poorly administered and ill-planned layouts of infrastructural services by the individual line agencies. The living environment of residential buildings is becoming un-hygienic. The moist environment directly affects the quality of life. Because of rapid deterioration rate of old buildings, new multi-story RCC frame structures of commercial land use are rapidly replacing the old heritage buildings of WCL.

The infrastructural services within the WCL are administratively controlled by the provincial as well as federal agencies. These various controlling authorities have little or no mutual co-ordination and interaction while laying down their services in field. These agencies work independently without consulting and cooperating with each other. For the case of greater Lahore, this approach may be appropriate to an extent but for the case of the WCL it has proved to be a total failure. There is a need to constitute

18 These historical buildings have been constructed over layers of several meters filling.
19 These includes transformers, telephone and electricity poles, Distribution Boards of PTCL and SNGPL, etc.

legislation to declare the WCL as an independent entity in its administrative and technical sphere.

The electricity, gas and telecommunication services should be lent from the federal agencies like WAPDA, PTCL and SNGPL and should be controlled and maintained by the Walled City Authority (WCA) which is planned to be established as an independent body having full expertise and control within the walls of the old city[20].

Use of heavy capacity transformers[21] can reduce their number substantially within the WCL. Further, instead of their erection on the road or street areas, small plots at regular intervals may be purchased within the WCL to accommodate services like transformers, PTCL boxes, etc. Service corridors under the surface of roads and streets will provide sufficient space to accommodate cables, pipes, and supply lines. The visual and aesthetic aspect of these heritage buildings cannot be improved until all these infrastructural services do not go below the ground level.

For water supply, under ground reservoirs have to be constructed outside the walls of old city. The water may be disinfected and pumped into the housing units of the WCL with the pressure so that it can reach the water tanks placed at roof top of the old buildings for availability of water at 24/7.

The collection of solid waste and its regular disposal is an important feature for up-gradation of the living conditions and quality life. The sewer and storm water drainage system should not to receive solid waste, which is a major cause of blockages in the system. Complete paving of streets will not allow the water to penetrate into the foundations of old buildings.

Once the infrastructural components will go underground, then the rehabilitation component may be restored. This will inch changes in facades to revive the homogenous character of street-elevations. It requires an integrated coordinated approach[22] for restoration of the physical components and an independent approach at administrative level.

Project Management Unit of Sustainable Development of the Walled City Lahore Project (SDWCLP)[23] that is working with the technical support of the Aga Khan Cultural Service for Pakistan (AKCSP) since July 2007 for the last four years is required to be re-constituted into a regular technical office of the WCL Authority. The project implementation timeline cannot be spread on a span of few years. It is a regular and an on-going process; hence a regular technical and administrative office need to be established continue and maintain the process of restoration of heritage buildings of the WCL.

20 A legislation named as "Walled City Act 2010" has been framed by SDWCLP with the help of AKCSP through a legal Consultant. In April 2011, it has been passed by Cabinet Division and is ready to place before Punjab Assembly for its final approval.

21 Report by AURECONS Engineers suggests the usage of 1500 kVA transformers but LESCO engineers are not agreed upon due to their handling and repairing issues.

22 AKCSP in its Preliminary Strategic Framework has suggested the same approach where as in beginning (2006-07) when project started, it was planned to get executed the infrastructural services component from the concerned line agencies after designing from the consultants. For the purpose, PC-I was also got prepared but could not be implemented.

23 SDWCLP was established in year 2006 by Planning & Development Board (P & D) of Government of Punjab with the loan agreement from World Bank, for completion of the project within four years time period. In the first phase, only an area of Royal Trail (*Shahi Guzargah*) starting from Delhi Gate and ending to the Maryam Zamani Mosque that is 11% of the total WCL's area and 1.6 km long was planned as pilot project. PC-I was prepared and preliminary socio-economic surveys were carried out by the Urban Unit (another initiative of Government of the Punjab to address the urban issues). In year 2007, after public-private partnership with AKCSP and its role as technical wing, proposed project approach was changed to "Integrated –Coordinated Design Concept" for infrastructural as well as rehabilitation components.

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