PERFORMANCE AUDIT REPORT

ON

SERVICE DELIVERY OF STREET LIGHTS MANAGEMENT SYSTEM

IN

MUNICIPAL CORPORATION RAWALPINDI

AUDIT YEAR 2023-2024

AUDITOR-GENERAL OF PAKISTAN

SERVING THE NATION BY PROMOTING ACCOUNTABILITY, TRANSPARENCY AND GOOD GOVERNANCE IN THE MANAGEMENT

FOR THE CITIZENS OF PAKISTAN

PREFACE

The Auditor-General of Pakistan conducts audit under Articles 169 and 170 of the Constitution of the Islamic Republic of Pakistan 1973, read with Sections 8 and 12 of the Auditor-General's (Functions, Powers and Terms and Conditions of Service) Ordinance, 2001 and Section 90(3) of the Punjab Local Government Act 2022. The Performance Audit of the service delivery of Street Lights Management system in Municipal Corporation Rawalpindi (MCR) was carried out accordingly.

Directorate General of Audit, Local Governments, the Punjab (North), Lahore conducted performance audit on service delivery of street lights management system in Municipal Corporation Rawalpindi (MCR) during February – March 2024 for the financial year 2022-2023 with a view to reporting significant findings to stakeholders. Audit examined the economy, efficiency, and effectiveness aspects of the street lights management system. In addition, the Audit also assessed, on test check basis, whether the management complied with applicable laws, rules, and regulations in execution of the function. The Audit report indicates specific actions that, if taken, will help the management to realize the objectives of the street lights management system. The SDAC meeting was convened on 29.05.2024 and report has been finalized in light of the replies submitted by the management and SDAC directions.

The Performance Audit Report is submitted to the Governor of Punjab in pursuance of Article 171 of the Constitution of Islamic Republic of Pakistan 1973, for causing it to be laid before the Provincial Assembly of Punjab.

Islamabad
Dated:

(Muhammad Ajmal Gondal**)**
Auditor-General of Pakistan

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ABBREVIATIONS & ACRONYMS

ADP	Annual Development Plan
AJ&K	Azad Jammu & Kashmir
CFL	Compact Fluorescent Lamps
CO	Chief Officer
GIS	Geographical Information System
HPSL	High-powered Sodium Lamp
IESCO	Islamabad Electric Supply Company
ISSAIs	International Standards of Supreme Audit Institutions
KwH	Kilowatt Hour
KP	Khyber Pakhtunkhwa
LED	Light Emitting Diode
LG&CDD	Local Governments & Community Development Department
LPSL	Low-powered Sodium Lamp
MCR	Municipal Corporation Rawalpindi
MO(I)	Municipal Officer (Infrastructure)
NCCP	National Climate Change Policy
NEPRA	National Electric Power Regulatory Authority
PLGA	Punjab Local Governments Act
SAIDI	System Average Interruption Duration Index
SDAC	Special Departmental Accounts Committee
UC	Union Council

EXECUTIVE SUMMARY

The Directorate General of Audit, Local Governments, Punjab (North), Lahore conducted performance audit of the service delivery of street lights management system in Municipal Corporation Rawalpindi during February – March 2024, for the financial year 2022-2023. The audit was conducted in accordance with the International Standards of Supreme Audit Institutions (ISSAIs). The primary objective was to evaluate the economy, efficiency, and effectiveness in the execution of Municipal Corporation Rawalpindi (MCR) street lights management system and to assess the department's success in achieving its objectives.

Section 31(1)(p)(viii) of the PLGA 2022 entrusts the MCR with the management, operation, and maintenance of street lights. The MCR manages a total of 30,672 street lights within its jurisdiction as of 30-06-2023, which includes 46 Union Councils. Street lighting management is a vital function of MCR, essential for public safety and community well-being. Proper street lighting extends the usability of public spaces after dark, enhances the quality of life, and boosts economic activity in commercial areas. Effective street lights management system demonstrates municipal commitment, responsiveness, and transparency, thereby fostering public trust in local government services besides fostering in them a sense of safety and security.

The Municipal Officer (Infrastructure) is the overall responsible officer for the street lights management system at MCR. For efficient management of street lights, MCR is divided into four divisions: City, Satellite, Cantt., and Westridge. The City Division manages 16,048 street lights, Satellite Division 11,802 street lights, Cantt. Division 1,225 street lights, and Westridge Division 1,597 street lights. These divisions are further divided into fifteen sub-divisions. Managing such a large network of street lights is a significant function of MCR, aimed at providing effective services to the local population. As street lighting management is a regular function of the MCR, as outlined in the PLGA 2022, the expenditure is incurred out of the recurring budget provisions. However, development grants under the ADP are provided for new street lighting schemes. For the FY 2022-2023, an expenditure of Rs 364.367 million was incurred by MCR for the installation of new street lights, repair and maintenance of existing infrastructure, and payment of electricity bills with a ratio of 25%, 2% and 73% respectively.

The audit observed that the Municipal Corporation Rawalpindi, in managing street lighting, disregarded principles of economy, efficiency, equity, and effectiveness, which hindered the achievement of intended targets.

Key Audit Findings & Recommendations

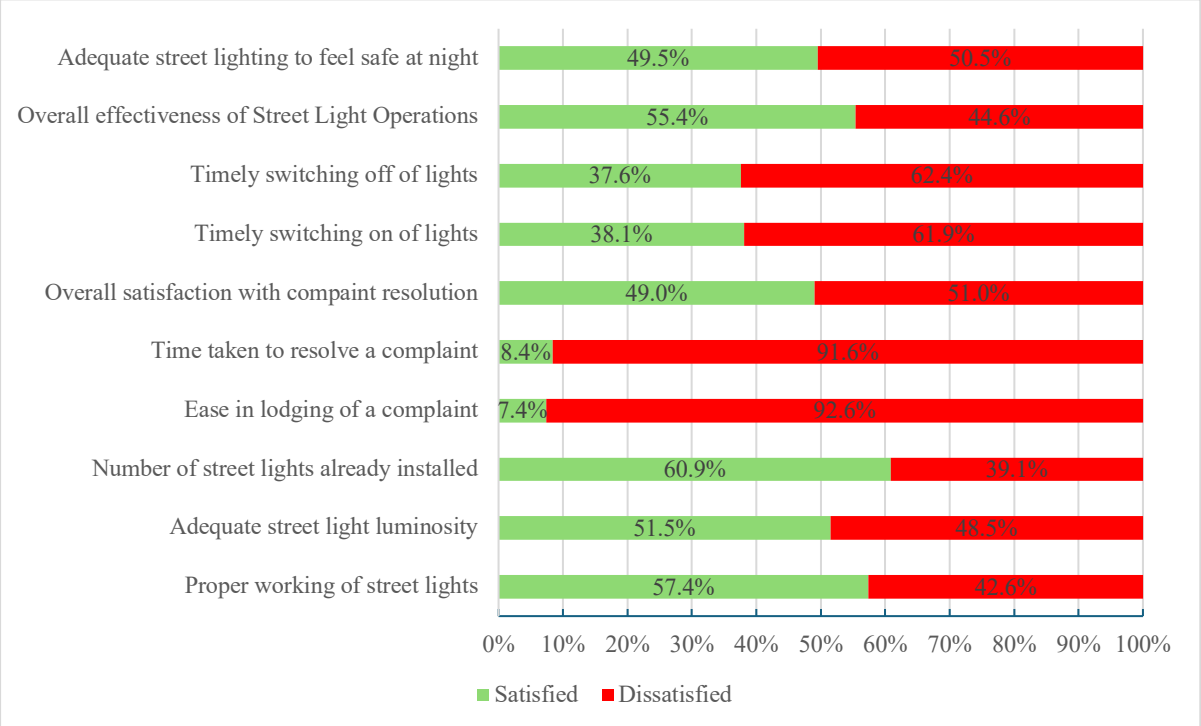
Key Audit Findings:

Audit findings categorized into Organization & Management, Financial Management, Asset Management, and Monitoring & Evaluation, are as under:

1. Ineffective management of street lights management system resulting in a significant portion of citizens being deprived of adequate street lighting in both residential and commercial areas (4.1.1).

2. Non-redressal of public complaints promptly, primarily due to the insufficient human resources available to the MCR (4.1.2).
3. Absence of clear guidelines and SOPs for street lighting operations and maintenance resulting in inconsistencies, delays, and suboptimal resource allocation, compromising service reliability (4.1.3).
4. MCR follows an uneconomical method of calculating electricity charges based on presumptive load rather than actual consumption, leading to excess and doubtful payments (4.2.1).
5. Failure to convert traditional lighting fixtures to energy-efficient LEDs, despite government instructions, has led to wasteful expenditure on electricity and higher $CO_{2\text{-}Eq}$ emissions, affecting both sustainability and cost-efficiency (4.3.1, 4.5.1).
6. The absence of sensor-based control systems for street lights and the reliance on the general public for operation without adequate checks and balances have resulted in missed opportunities for energy optimization and effective monitoring (4.3.2).
7. Lack of a current and accurate GIS-based map for street lighting hampers effective planning, monitoring, and maintenance, undermining resource allocation and decision-making processes (4.4.1).
8. Ineffective management of street lighting in commercial areas compromises public safety, urban aesthetics, economic activity, and reflects poorly on MCR's service delivery and governance standards (4.4.2).

Further, the results of the feedback survey (questionnaire at Annexure I) conducted from 202 randomly selected participants residing in 16 union councils of MCR on service delivery of street lights management system in MCR are presented in the following graph:



The results of the feedback survey reflect inefficient street lighting operations, ineffective complaint resolution mechanism, untimely redressal of complaints, difficulty in lodging of complaints, and inadequate of street lighting at night for safe commute of citizens.

Recommendations:

Audit observed that most of these audit observations were due to inadequate service delivery due to lack of focus on value addition, and weak administrative, supervisory, and financial controls. The Principal Accounting Officer of the MCR needs to strengthen the internal controls regime based on the following audit recommendations:

1. A comprehensive survey needs to be conducted to assess the adequacy of street lighting in all residential and commercial areas to plan and upgrade street lighting infrastructure for improved and equitable service delivery.
2. MCR should establish an automated complaint resolution system for street lighting function, incorporating an online portal or mobile app integrated with a GIS-based streetlight map for swift issue reporting and tracking. The system should automate the acknowledgment, assignment, and escalation of complaints, and ensure adequate human resources are available. To address the current shortage of HR in streetlight management, MCR should reallocate existing surplus staff within the organization. This will streamline issue resolution, improve service efficiency, and build public trust.
3. MCR should review and adopt the "Draft Street Lights Byelaws 2023", developed by the Punjab Municipal Development Fund Company, ensuring they meet local needs. Establishing street lighting byelaws based on these SOPs, along with stakeholder consultations and capacity-building initiatives, will enhance service reliability and governance.
4. While installing separate electric meters for each streetlight may not be feasible at present, MCR should re-survey the streetlight load and apply a load determination formula for more accurate billing. This formula should account for actual load management hours, System Interruption Time, and out-of-order streetlights. This approach will ensure economical and efficient billing until a comprehensive street mapping and metering system can be established.
5. Immediate transition to energy-efficient LED fixtures should be ensured to reduce electricity consumption, costs, and maintenance, while mitigating the environmental carbon footprint. This transition also has the potential of generating carbon credits for MCR, worth Rs 3 million per year, which – in addition to around Rs 100 million saved per year on account of electricity charges – could help offset the capital costs of converting conventional fixtures to LED lights.
6. Installation of sensor-based control systems for street lights should be prioritized to automate operations, enhance energy conservation, and ensure consistent service delivery with proper oversight mechanisms. MCR can use affordable photocell sensors to automate street light operations.
7. MCR should regularly update and maintain its GIS-based street lighting map, like the ones being maintained by MC Daska and Jhang, to ensure accurate data management, operational efficiency, and informed decision-making. The GIS-based map should also be incorporated into an online portal or mobile app to automate the streetlight complaint mechanism for easy lodging and tracking of complaints.
8. Comprehensive inspection, maintenance, and timely repair of street lighting should be ensured, with proactive maintenance schedules. MCR should prioritize the availability of adequate human resources for streetlight management by redistributing existing surplus staff within the organization.

1. Introduction

Rawalpindi, the fourth most populous city in Pakistan, is located to the north of the Punjab province, and is adjacent to the capital city, Islamabad. Historically, it has been a significant military and trade hub, with roots tracing back to ancient Gandhara, Kushan, Gupta, and Maurya civilizations. The district's economy is diverse, encompassing sectors like agriculture, manufacturing, and services, with a notable presence of the military and associated industries. Its strategic location near the capital makes it a vital administrative and commercial centre. Additionally, Rawalpindi serves as a gateway to the Khyber Pakhtunkhwa (KP) province, Northern Areas, and Azad Jammu and Kashmir (AJ&K), sharing borders with important cities like Attock, Abbottabad, Haripur, Mirpur, Chakwal, and Jhelum. The city is known for its bustling markets, historical sites, and vibrant cultural heritage. According to the Census 2023, it is the third most populous city in Punjab with a population of over six million people, consisting of about a million households.

The Municipal Corporation Rawalpindi (MCR) was established on 1st January, 2017 under the Punjab Local Government (PLG) Act, 2013, by merging Rawal and Potohar Towns. There are 46 Union Councils in the urban area of Rawalpindi, which fall under the jurisdiction of the MCR. As delineated in the PLG Act 2022, the main functions of the MCR include providing, managing, operating, maintaining, and improving municipal infrastructure and services. Section 13 (p)(viii) of PLGA 2022 specifically addresses the management, operation, and maintenance of street lights. MCR manages a network of 30,672 street lights, which is divided into four divisions for efficient management: City, Satellite, Cantt., and Westridge. The division-wise detail of the street lights managed by MCR is as under:

Sr. No.	Sub-Division	LED Watts					CFL Watts		HPS/LPS Watts		Total Lights
		24	30	60	90	120	25	42	150	250	
City Division (Number of lights)											
1	Asghar Mall	220	1,023	256	60	0	29	945	166	120	2,819
2	Zafar ulHaq	147	1,049	187	33	0	29	574	189	196	2,404
3	Committee Chock	218	898	162	66	0	53	720	44	37	2,198
4	Gang Mandi	11	886	119	0	0	17	366	88	173	1,660
5	Babra Bazar	11	328	245	0	0	11	295	30	9	929
6	GawalMandi	5	315	100	0	0	2	185	10	15	632
7	Pirwadhai	226	378	9	3	0	86	319	37	9	1,067
8	Sir Sayed	110	1,130	207	80	20	64	319	198	643	4,339
Total		**948**	**6,007**	**1,285**	**242**	**20**	**291**	**5,291**	**762**	**1,202**	**16,048**
Satellite Division (Number of lights)											
9	F-Block	29	1,098	283	49	148	96	1519	212	349	3,783
10	Chandi Chock	11	1,129	115	198	115	38	978	186	130	2,900
11	Muslim Town	14	1,131	5	6	0	23	986	58	48	2,271
12	Dhok Kala Khan	183	995	1	3	0	18	958	148	142	2,448
13	DhokGangal	0	400	0	0	0	0	0	0	0	400
Total		**237**	**4,753**	**404**	**256**	**263**	**175**	**4441**	**604**	**669**	**11,802**
Cantt. Division (Number of lights)											
14	Civil Line	11	587	10	5	142	18	383	18	51	1,225
Total		**11**	**587**	**10**	**5**	**142**	**18**	**383**	**18**	**51**	**1,225**
Westridge Division (Number of lights)											
15	Dhok Rata	17	688	47	35	0	46	703	41	20	1,597
Total		**17**	**688**	**47**	**35**	**0**	**46**	**703**	**41**	**20**	**1,597**
Grand Total (No. of Lights)		**1,213**	**12,035**	**1,746**	**538**	**425**	**530**	**10,8158**	**1,425**	**1,942**	**30,672**

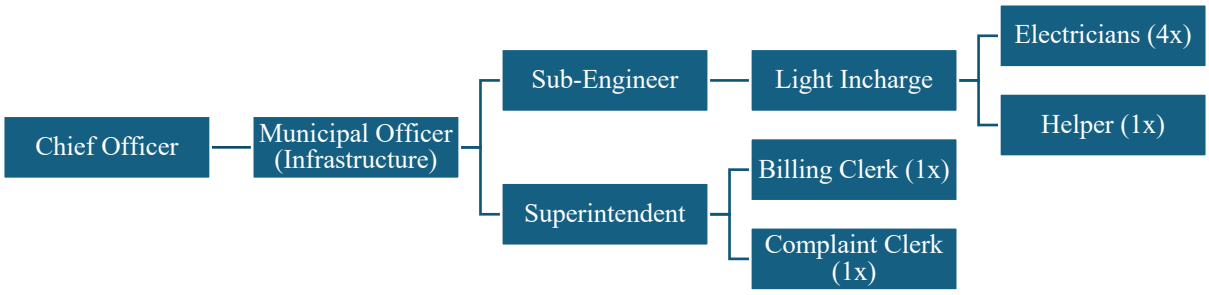
1.1. Objectives of the street lights management system:

MCR is responsible for installation, operation, and maintenance of street lighting within its jurisdiction. This is a regular function and is part of the overall operation of the MCR to provide municipal services to the people of Rawalpindi. The objectives of the street lights management system can be summarized as under:

i. To ensure proper and adequate illumination of roads, sidewalks, intersections, and common public spaces after sunset for the safety and convenience of the general public.
ii. To promote the smooth flow of traffic on roads by providing proper street lighting, enhancing safety and convenience for both pedestrians and motorists.
iii. To implement an effective complaint management system for the timely redressal of any complaints related to the street lights management system.
iv. To carry out street lights management system by upholding the principles of economy, ensuring cost-effectiveness in operations.
v. To maintain efficiency, effectiveness, and equity in the street lights management system to serve all areas and communities fairly.

1.2. Operating Procedure of Street lights Management:

The following hierarchy has been given the responsibility of managing the MCR's street lights system:



The MCR is responsible for the maintenance of existing street lights infrastructure and the planning of new street light schemes under the ADP. These schemes are designed with consideration for the boundaries of national and provincial assembly constituencies, ensuring they remain within the MCR's territorial jurisdiction.

Although supervised by the Chief Officer (CO), street lights management operations are headed by the MO(I), who is assisted by a Sub-Engineer responsible for field operations and a Superintendent who manages the office support staff. The office support staff handles all complaints, whether received through the PM Portal, CM Portal, or direct landline telephone, and maintains a record of these complaints.

Out of the total 30,672 street lights managed by MCR, 52% are LED lighting fixtures of different wattages, 37% are CFL fixtures of different wattages, and 11% are HPS/LPS fixtures of 150 or 250 watts. Despite clear and repeated government instructions being issued

since 2013 to convert inefficient conventional lighting fixtures to energy-efficient LEDs, the MCR has yet to fully undertake this conversion and is, in fact, halfway through.

The electricity utilized by the MCR to operate the street lights is procured from IESCO. However, electricity charges are paid on a presumptive basis since no electric meters have been installed to measure actual usage. This has led to doubtful and excessive payments of electricity charges. Further, the operation of the street lights i.e. turning on/off the street lights, has been delegated to general public especially in residential areas, as no automatic solution (automatic light sensor for turning on/off street lights) has been in place.

Currently, 15 officers and officials, including 3 drivers and 1 Naib Qasid (N/Q), are tasked with managing 30,672 street lights under the MCR's jurisdiction. This demonstrates a significant shortage of workforce to effectively manage such a vast operation. The lack of sufficient staff has been a major reason for the non-redressal of public complaints related to street lights, raising concerns about the proper monitoring and maintenance of MCR's extensive street lighting infrastructure. Consequently, street lights remain out of order for longer periods since the MCR lacks the manpower to promptly repair them.

1.3. Beneficiaries of the Street Lights Management System

The beneficiaries of the street lights management system of MCR are the citizens of the Rawalpindi district, who reside within the 46 urban union councils.

1.4. Summary of Budget & Expenditure

The summary of budget and expenditure for street lights management system of MCR for FYs 2021-22 & 2022-23 is as under:

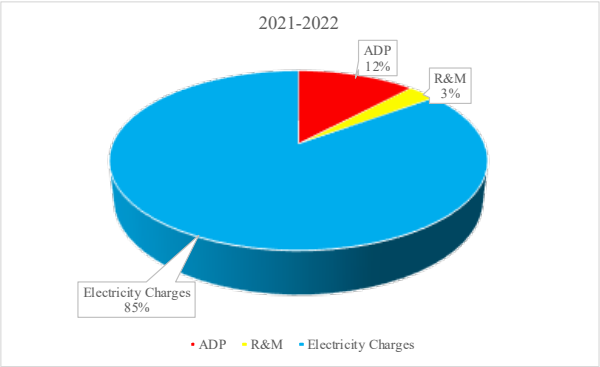
(Amount in Rs)

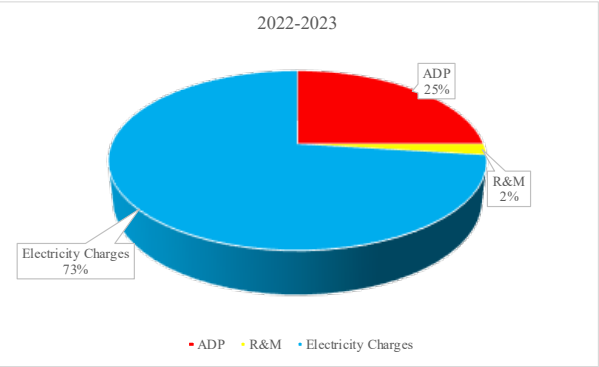
Sr. No.	Component	Financial Year	Budget	Expenditure	Saving
1	Purchase of new street lights, electrical pools etc. (ADP)	2021-22	26,770,000	26,770,000	-
		2022-23	89,610,000	89,610,000	-
Sub-Total (A)			**116,380,000**	**116,380,000**	**-**
2	Purchase of repair material for street lights	2021-22	10,000,000	8,039,076	1,960,924
		2022-23	9,560,800	6,802,200	2,758,600
Sub-Total (B)			**19,560,800**	**14,841,276**	**4,719,524**
3	Payments of electricity bills against street lights	2021-22	200,000,000	191,711,934	8,288,066
		2022-23	268,406,000	267,955,177	450,823
Sub-Total (C)			**468,406,000**	**459,667,111**	**8,738,889**
GRAND TOTAL (A+B+C)			**604,346,800**	**590,888,387**	**13,458,413**

(Source: Statement of Budget & Expenditure provided by MCR)

Street lights management system is a regular function of the MCR, as delineated by the PLGA 2022. The MCR while carrying out new installation of street lights along with replacement and repair of existing street lights utilize their regular budget allocation. For FY 2022-2023, MCR replaced a total of 5,396 lighting fixtures including CFL (energy saver bulbs), sodium lights (HPS/LPS) and LED lights, indicating a replacement rate of 17.6%. The overall details of the stock position of MCR street lights stores is given at Annexure-II.

Based on the above summary of expenditure, it is evident that MCR incurs most of its budgetary allocation for street lights management system on payment of electricity bills to IESCO, as evident from the following graphs:





2. Audit Objectives

The Performance Audit on service delivery of the street lights management system in MCR was carried out with the objective to examine the aspects of economy, efficiency, and effectiveness with special focus on the following areas:

i. To identify needs, problems, and opportunities for improvement and to estimate the energy savings and costs of different lighting control scenarios.
ii. To compare the historical maps with a list of current street lights provided by Municipal Corporation Rawalpindi.
iii. To analyse energy/cost saving options as street lighting consumes a great deal of energy.
iv. To ensure lights installed meet the standard specifications.
v. To ensure end users' satisfaction via feedback.
vi. To check the transparency and accuracy on overbilling etc.

3. Audit Scope and Methodology

a) Audit Scope

The audit scope included the examination of detailed records of MCR's street lights management system for the FY 2022-2023. The following documents were analysed in detail:

i. Details of budget and expenditure incurred on street lights management system of MCR.
ii. Complaint registers and details of faulty street lights
iii. Execution of ADP schemes for the installation of new street lights
iv. Repair & maintenance record of street lights for FY 2022-2023
v. Procurement files for material procured for repair & maintenance of street lights
vi. Human Resource details of MCR associated with management of street lights management system.

b) Audit Methodology

Audit methodology included preparation of PSR, data collection, analysis of the record, discussion with officers and officials of MCR associated with street lights management system, and numerous site visits to check the real-time performance of the street lights management system.

Further, a field survey for measuring street light luminosity in randomly selected Union Councils (UCs) of MCR was also conducted using an industrial lumens-measuring device to take lux readings from streets of residential and commercial areas of different union councils of MCR. Moreover, feedback on service delivery of street lights management system by MCR was obtained from 202 participants, who were selected using simple random sampling technique. The survey was conducted in 16 union councils of MCR. The survey was conducted using a questionnaire consisting of closed-ended statements. The questionnaire consisted of 04 measures and 10 factors.

4. Audit Findings

4.1 Organization and Management

4.1.1 Inadequate street light luminosity in residential and commercial areas of MCR

Section 65(1) of Sixth Schedule of the PLGA 2022 provides that "A local government shall take such measures as may be necessary for the proper lighting of the public streets and other public places vested in the local government". Also, Section 5.2.11 of the Accessibility Code of Pakistan, 2006 states that "all usable and accessible outdoor areas and routes shall be provided with illumination levels of a minimum of 5 foot-candle (55 lux) at all times". Further, best industry practices, as delineated by International Illumination Engineering Society (IES) and European Standards (EN 12464-2), recommend that standard average illumination in residential and commercial streets should not be less than 10 lux and 15 lux respectively.

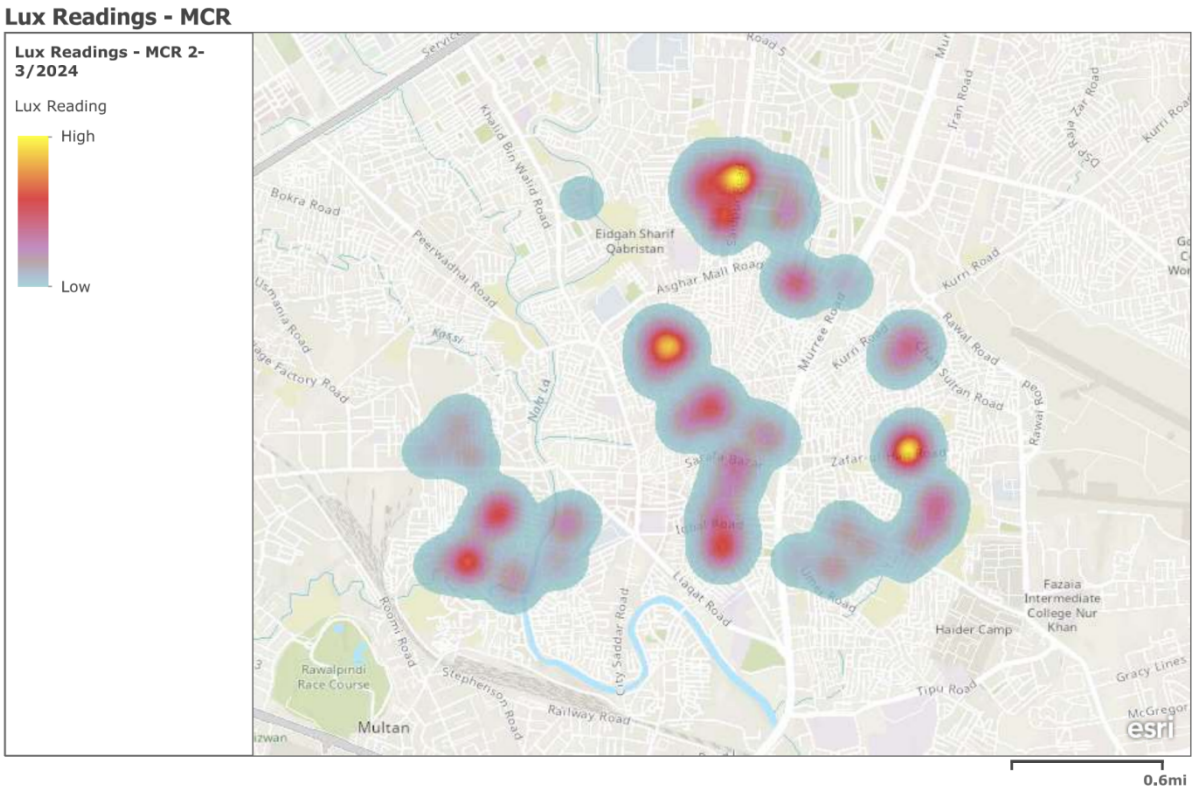
During the performance audit on service delivery of street lights management system in Municipal Corporation Rawalpindi (MCR), the audit team carried out a field survey in randomly selected areas of 16 union councils under jurisdiction of the MCR to measure the adequacy of the street lighting. To gauge the adequacy of the luminosity of the street lighting, audit team made use of a Digital Luxmeter MS6610 (Mastech) to record the Lux values and took 194 readings (70 commercial and 124 residential) across 16 Union Councils under MCR, as per the following detail **(List of all Lux readings is at Annexure III)**:

Sr. No.	Name & No. of Union Council	Comm. Readings	Resid. Readings	Total Readings	Avg. Comm. Lux Reading	Avg. Resid. Lux Reading
1.	Ratta Amral (1)	3	7	10	35.33	**6.57**
2.	Dhoke Ratta (2)	3	4	7	25.33	11.50
3.	Hazara Colony (3)	3	5	8	**9.00**	11.40
4.	Saidpur Scheme (15)	6	11	17	25.67	**8.55**
5.	Mohallah Eidgah (16)	4	10	14	25.25	16.70
6.	Asghar Mall Scheme (20)	0	11	11	-	**7.82**
7.	Chah Sultan (30)	5	3	8	**12.40**	11.67
8.	Dhoke Hukamdad (31)	3	5	8	47.67	**7.20**
9.	Mohallah Imam Barra (35)	6	10	16	22.00	**9.70**
10.	Sagri Scheme (38)	3	4	7	**8.00**	13.25
11.	Waris Khan (39)	12	25	37	**6.33**	**6.92**
12.	Shah Chan Chiragh (41)	7	4	11	**13.00**	**8.50**
13.	Millat Colony (42)	3	6	9	**5.67**	**5.83**
14.	Dhoke Khabba (43)	3	9	12	19.67	**5.56**
15.	Dhoke Farman Ali (44)	3	5	8	**9.00**	**8.40**
16.	City (46)	6	5	11	**9.17**	**8.80**
TOTAL		70	124	194	18.23	**9.27**

The analysis revealed that out of the 16 union councils surveyed, the luminosity of street lights in residential areas of 11 (69%) union councils was recorded below the acceptable average standard of 10 lux. Similarly, in 8 union councils (53%), the recorded luminosity was below the acceptable average standard of 15 lux for commercial areas. It is worth mentioning

that higher lux values in the commercial areas are because of privately installed lighting fixtures with higher luminosity.

The heat map of the luminosity of the surveyed areas indicates a sporadic and uneven distribution of street light intensity:



Ill-luminated streets in residential and commercial areas also develop to a sense of insecurity amongst the citizens. This fact has also been corroborated with the public poll results, wherein 98 (48.5%) respondents opined in negative when asked whether they think there is adequate street lighting at night in their area. Similarly, 102 (50.5%) respondents felt that adequate street lighting is not available in their area to commute safely at night time.

This resulted in an uneven distribution of resources for street lighting across residential and commercial areas in MCR, leading to inequitable service delivery among residents because no area surveyed (whether commercial or residential) in the above-mentioned union councils under MCR accommodated the accessibility needs of the persons with special needs.

Audit held that MCR has been unsuccessful to effectively manage its street lights management system and has not been able to provide equitable services of street lighting to its citizens, resulting in a significant portion of citizens being deprived of adequate street light luminosity in both residential and commercial areas.

The matter was reported to the MCR in March 2024. The MCR replied that 8th Schedule of Punjab Local Govt. Act, 2013 has an advisory nature rather than mandatory law. Moreover, the Accessibility Code of Pakistan 2006 is not obligatory under PLGA, nor is its applicability mentioned in the 8th schedule concerning the provision of street light services. The reply is not tenable as Section 148 of the PLGA 2013 clearly makes it obligatory for any

local government to perform its functions conferred by under the Act and follow procedures as are enumerated in the Eighth Schedule. Further, The Accessibility Code of Pakistan 2006 is applicable to the entire country. Moreover, the Punjab Empowerment of Persons with Disabilities Act 2022 also uses the standards set by Accessibility Code of Pakistan 2006.

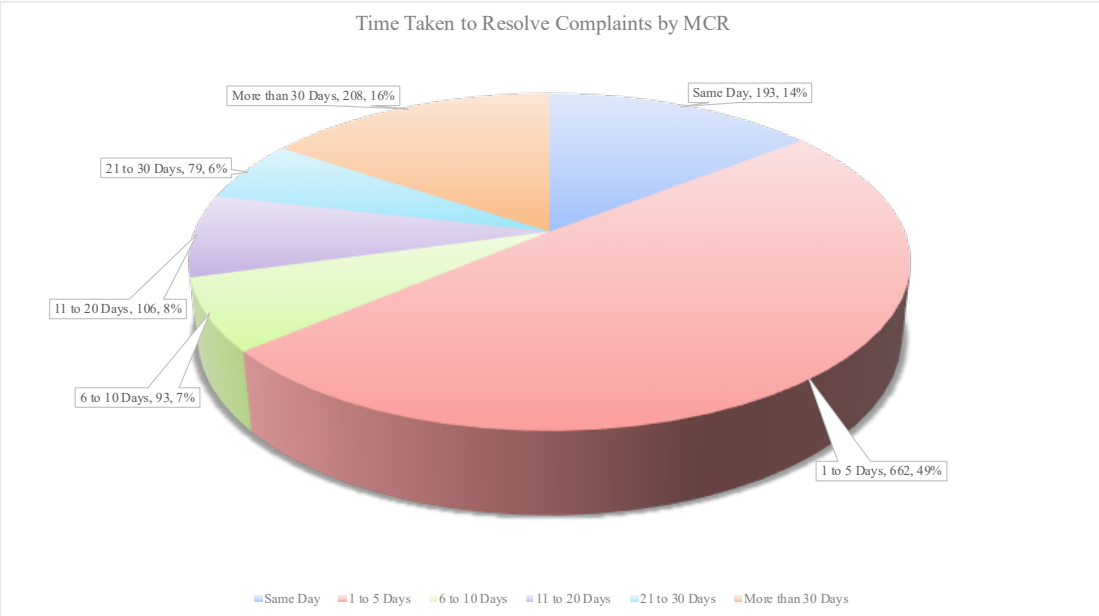
SDAC in its meeting held on 29th May 2024 directed MCR to conduct a comprehensive survey to assess street lighting adequacy in all residential and commercial areas of each union council containing number of streets & requirement of lights. The MCR was also directed to prepare and submit a comprehensive report for improvement of street lighting adequacy within 03 months.

Audit recommends that decision of the SDAC be implemented in letter and spirit. Further, the minimum standards of street light luminosity for residential, commercial, and other areas should be incorporated within the PLGA 2022.

4.1.2 Inefficient complaint resolution management system for street lighting issues resulting in prolonged unresolved complaints.

Section 146 of PLGA 2022 states that "every local government shall set up a complaint cell for redressal of grievances within the ambit of their responsibilities under this Act".

During the performance audit, it was observed that the complaint resolution management system for street lighting function has been ineffective, leading to prolonged periods without resolution for reported issues. For the period July 2022 to December 2023, a total of 1,341 complaints were lodged by citizens with regard to faulty street lights. Out of these complaints, MCR did not attend 267 (20%) complaints. Despite the receipt of numerous complaints regarding malfunctioning or inadequate street lighting, a significant portion of these complaints remained unresolved for an extended period. The scrutiny of complaint registers revealed that MCR took 25 days on average to address a complaint with a range of 0 to 426 days. This lapse in complaint resolution time indicates deficiencies in the complaint handling process, resulting in a failure to address citizens' concerns in a timely manner. The graphical representation of complaint resolution timeline is given below:



The inefficient complaint resolution mechanism of MCR has also been highlighted by the public poll carried out by the audit team, wherein 103 (51%) participants opined that they were not satisfied with the complaint resolution and management system of MCR for street lighting complaints. Similarly, 187 (92.6%) of the participants said that it was difficult to lodge a complaint with MCR for reporting street lighting issue. Moreover, 185 (91.6%) participants were dissatisfied with the time taken by MCR to repair/rectify the street light issues.

This resulted in prolonged duration of unresolved complaints indicating lack of responsiveness and efficiency within the MCR's complaint resolution mechanism.

Audit held that non-redressal of public complaints in a timely manner was primarily due to insufficient human resources available with the MCR to manage street lights management system. As per the details shared by the MCR administration, only 15 number of employees are entrusted with managing the 30,672 street lights of the MCR.

The matter was reported to the MCR in March 2024. It was replied that the Municipal Corporation Rawalpindi currently manages public complaints manually despite a shortage of technical staff and equipment. Complaints received through various portals are resolved within set time limits, though delays occasionally occur due to staff scarcity. MCR is making efforts to address these issues promptly. The reply is not tenable as this only strengthens the audit observation and shows the inability of the management to have an effective complaint resolution mechanism vis-à-vis failure to depute adequate number of staff for street lights management operations.

SDAC in its meeting held on 29th May 2024 directed MCR to improve the complaint resolution management system. The MCR was also directed to engage adequate staff to resolve the complaints in a timely and efficient manner. No further progress was reported till finalization of this report.

Audit recommends that the MCR should establish an automated complaint resolution system for street lighting, incorporating an online portal or mobile app integrated with a GIS-based streetlight map for swift issue reporting and tracking. The system should automate the acknowledgment, assignment, and escalation of complaints, and ensure adequate human resources are available. To address the current shortage of HR in streetlight management, MCR should reallocate existing surplus staff within the organization. This will streamline issue resolution, improve service efficiency, and build public trust.

4.1.3 Non-formulation of byelaws and standard operating procedures for street lights management system

Section 210 of the PLGA 2022 provides that a local government shall, in its ambit of responsibilities, make byelaws to carry out the purposes of this act.

During the performance audit, it was observed that the MCR management used to operate street lights without any approved byelaws / standard operating procedures which are essential regulatory instruments governing the planning, installation, maintenance and operation of the entrusted function. Although, in pursuance of the PLGA 2022, the Punjab Municipal Development Fund Company has prescribed Street Lights byelaws, yet MCR has not adopted these byelaws.

This resulted in a significant deficiency in governance and operational frameworks regarding the street lights management system.

Audit held that without clear guidelines and procedures, street lighting operations may suffer from inconsistencies, delays, and suboptimal resource allocation, leading to operational inefficiencies. Also, the lack of properly defined SOPs for maintenance may result in ad-hoc approaches to repairs and inspections, leading to delays in addressing faulty street lights and compromising service reliability.

The matter was reported to the MCR in March 2024. The MCR replied that formulation of byelaws for street lights is not mandatory since the formulation of byelaws for street lights management system is not included in the 6th Schedule of PLGA 2022. The reply is not tenable as the Section 210 of PLGA 2022 is a binding section which generally calls for formulation of byelaws for all functions of a local government.

SDAC in its meeting held on 29th May 2024 kept the para pending till compliance. No further progress was reported till finalization of this report.

Audit recommends that MCR should review and adopt the "Draft Street Lights Byelaws 2023", developed by the Punjab Municipal Development Fund Company, ensuring they meet local needs. Establishing street lighting byelaws based on these SOPs, along with stakeholder consultations and capacity-building initiatives, will enhance service reliability and governance.

4.2 Financial Management

4.2.1 Uneconomical and excess payment of electricity charges due to non-installation of meters for street lights

Local Government & Community Development Department vide their letter No.SO.DC&C(LG)/8-13/2023 (Misc.) dated 23.11.2023 have directed all local governments to ensure 100% connection of street lights with registered energy meters. Further, Rule 27(3) of the Punjab Local Governments (Accounts) Rules, 2017 states that in incurring or authorizing expenditure, the principles of financial proprietary shall be observed and the sanctioning authority shall (a) exercise the same vigilance in the expenditure from the local fund as a person of ordinary prudence may exercise in respect of his own money, and (b) not sanction any expenditure which is more than the occasion demands.

During the performance audit, it was observed that MCR was making payment on account of electricity charges to the relevant power distribution company i.e. IESCO, on load basis instead of installation of energy meters for each street light. The load of street lights of MCR has been calculated while assuming that 100% street lights installed within the territorial jurisdiction of MCR are functional and this calculation is based on their respective wattage. The cost of electricity paid to IESCO is thus entirely based on consumption of electricity units, which are calculated on presumptive basis. The load calculation of street lights for FY 2022-23, as agreed upon and paid by MCR, is as under:

(Amount in Rs)

Street light Fixture	Watt	No. of lights	Total Wattage	Total Wattage KW	Per Month Units (Total Wattage KW x Units per 1KW)	Per Year Units (per month units x 12)	Electricity Charges Paid (per annum) @Rs.35.95 per unit
CFL 25W	25	530	13,250	13.250	4,352.63	52,231.50	1,877,722.43
CFL 42W	42	10,818	454,356	454.356	149,255.95	1,791,071.35	64,389,015.10
LED 24W	24	1,213	29,112	29.112	9,563.29	114,759.50	4,125,604.17
LED 30W	30	12,035	361,050	361.050	118,604.93	1,423,259.10	51,166,164.65
LED 60W	60	1,746	104,760	104.760	34,413.66	412,963.92	14,846,052.92
LED 90W	90	538	48,420	48.420	15,905.97	190,871.64	6,861,835.46
LED 120W	120	425	51,000	51.000	16,753.50	201,042.00	7,227,459.90
HPS 150W	150	1,425	213,750	213.750	70,216.88	842,602.50	30,291,559.88
HPS 250W	250	1,942	485,500	485.500	159,486.75	1,913,841.00	68,802,583.95
TOTAL:		**30,672**	**1,761,198**	**1,761.198**	**578,553.543**	**6,942,642.516**	**249,587,998.450**

Calculation Notes:
Load factor = average night hours per day / 24 = 10.82 / 24% = 45%
Yearly hours = 365 x 24 = 8,760
Monthly hours = Yearly hours / 12 = 8,760 / 12 = 730
Per Month Units for 1 KW = Monthly Hours x Load Factor = 730 x 0.45 = 328.5

The payment of electricity charges on assumptive load basis is considered irrational and uneconomical, leading to doubtful payment of electricity charges, based on the following observations:

i. The MCR has not been taking into account the faulty and out-of-order street lights. Scrutiny of complaint registers of MCR had revealed that 126 complaints remained unattended during FY 2022-23, which account for 341 faulty or out-of-order street lights. However, MCR had paid electricity charges to IESCO against these faulty street lights as well.
ii. While calculating the electricity charges, the MCR also did not take into account 191 HPS/LPS street lights on major roads of MCR, which remained out-of-order for the entire year, along with many other faulty street lights in different commercial areas.
iii. The MCR has only accounted for 1 hour of per night load management in the given calculation, whereas the actual per night load management carried out by IESCO is far more than 1 hour. This fact is also supported by the Performance Evaluation Reports of DISCOs issued by NEPRA. MCR has not been able to record the actual hours of load management in the concerned sub-divisions of IESCO.
iv. In calculating the electricity charges to be paid to IESCO on load basis, MCR also failed to consider the System Average Interruption Duration Index (SAIDI) which represents the average total duration of power outages within a year. As per NEPRA, for 2022-2023, IESCO reported 1,006.34 minutes of such interruptions, yet this fact has been ignored by MCR during load assessment.
v. The last joint survey to assess actual load was carried out by MCR and IESCO in 2020 and 2021, and since then no new load survey has been carried out, which makes the whole load assessment process doubtful.

This resulted in excess and uneconomical expenditure on account of electricity charges raising serious doubts on the expenditure being incurred on this account.

Audit held that MCR was following an uneconomical regime of calculating electricity charges based on assumptive load basis without considering important aspects of actual electricity consumption.

The matter was reported to the MCR in March 2024. It was replied that MCR has begun installing electric meters on main roads but cannot extend this to streets and residential areas due to prohibitive costs. Installing meters and cable conductors for all lights would require billions of rupees from IESCO, making it unfeasible. The reply is not tenable as non-installation of electricity meters and payment of electricity bills without taking into consideration several important factors as highlighted by audit, has already resulted in excessive, doubtful, and uneconomical expenditure on account of electricity charges.

SDAC in its meeting held on 29th May 2024 refer the matter to Administrator MCR for taking up the matter for installation of meters and CO was directed to complete the installation of meters till completion of next Financial Year.

Audit recommends that MCR should re-survey the streetlight load and apply a load determination formula for more accurate billing since installing separate electric meters for each streetlight may not be feasible at present. This formula should account for actual load management hours, System Interruption Time, and out-of-order streetlights. This approach will ensure economical and efficient billing until a comprehensive street mapping and metering system can be established.

4.3 Assets Management

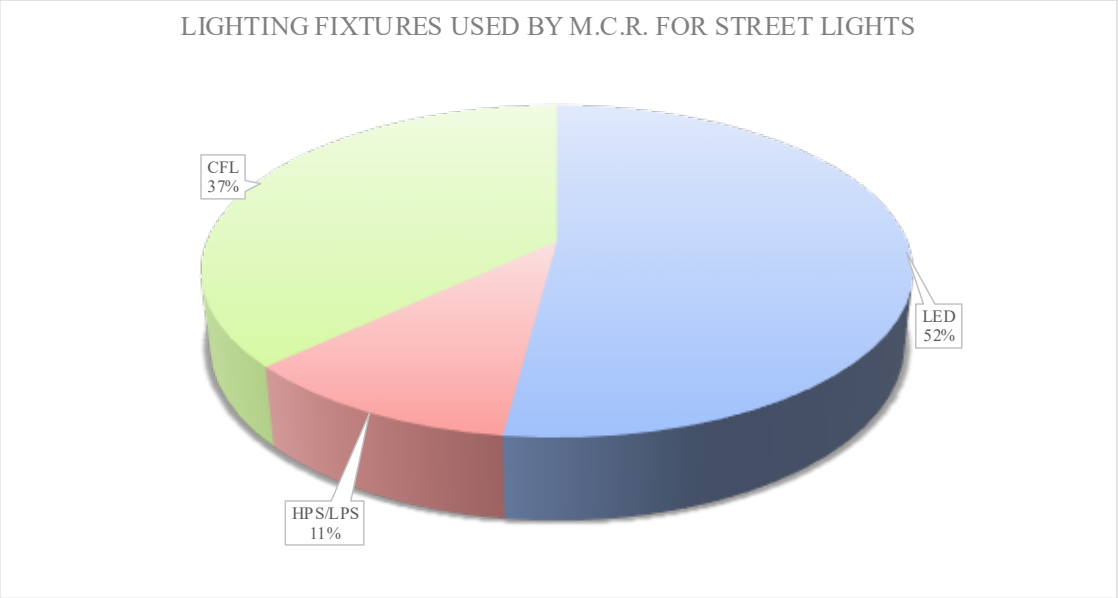
4.3.1 Usage of inefficient street lighting fixtures resulting in excessive consumption of electricity

The Local Government & Community Development Department (LG&CDD) vide their letters No. SO TMA-Dev (LG)10-15/2013 dated 20.09.2013, 03.10.2013, 30.10.2013 and 02.02.2015 directed that street lights and public lights in all districts of the province be converted to LED for conservation of energy. Furthermore, international best practices also provide that LED lights are most effective in energy conservation compared to other types of lighting lamps. Recent research in the lighting industry and the lighting industry practices provide a comprehensive table to convert CFL and Sodium lights to LEDs, as below, which was also confirmed by the Sub-Engineer MCR in his interview with the audit team:

Lumens	LED	CFL	HPS SON
800-950	12W	25W	
1100-1300	15W	42W	
6000-7500	103W		150W
10500-12000	183W		250W

During the performance audit, it was observed that despite clear instructions from the Government to convert street lights to energy-efficient LED and passing of ample time to execute the said conversion, the street lighting infrastructure of MCR still relies heavily on outdated lighting fixtures like Compact Fluorescent Lamps (CFL – Energy Saver Bulbs) and Sodium Lamps instead of energy-efficient LED lights. Out of the total 30,672 street lights

managed by MCR, only 15,957 (52%) are LEDs whereas the remaining 14,715 (48%) lights are either CFL or sodium lamps. The share of different lighting fixtures in the street lighting infrastructure of MCR is as below:



The utilization of CFL and HPS/LPS Lamps in street lights management system results in increased electricity consumption compared to LED lights, which offer superior energy efficiency. The non-conversion of conventional lighting fixtures to LED lights results in inefficient operation of street lights management system leading to excess usage of electricity and incurring of additional and uneconomical expenditure on account of electricity charges, as detailed below:

Conventional Fixtures Still in Use	**Qty (A)**	**Capacity in Watts (B)**	**Actual Wattage Consumed (C = AxB)**	**Replaceable LED Wattage (D)**	**Total Wattage if LEDs Used (E=AxD)**	**Wattage Saving (F=E-C)**
Sodium Lights 250 W	1,942	250	485,500	183	355,386	130,114
Sodium Lights 150 W	1,425	150	213,750	103	146,775	66,975
Energy Saver 42 W	10,818	42	454,356	15	162,270	292,086
Energy Saver 25 W	530	25	13,250	12	6,360	6,890
Total Watts	**14,715**		**1,166,856**		**670,791**	**490,065**
					Saving in kWh	**490.065**

The excess wattage, which could have been saved had the MCR converted the street lights to energy-efficient LED lights, led to the excess payment of Rs 70.300 million (for 1.955 million excess electricity units) on account of electricity charges for FY 2022-2023 and anticipated excess payment of Rs 102.389 million for CFY 2023-2024, as detailed below:

Description	**With Conventional Fixtures**	**With LED Fixtures**	**Difference (Saving)**
Applicable Load (KW)	1,166.856	670.791	
[1]Load Factor	45%	45%	
[2]Yearly hours	8,760	8,760	

Description	With Conventional Fixtures	With LED Fixtures	Difference (Saving)
[3]Monthly hours	730	730	
[4]Per month units Calculated for 1 KW	328.5	328.5	
Per Month Units for existing load	383,312	220,355	162,957
Per Annum Units Calculated	4,599,746	2,644,258	1,955,488
Rate Per Unit (2022-23)	35.95	35.95	
Electricity Bill Paid on Load Basis (2022-23) (Rs)	165,361,228	95,061,075	***70,300,153***
Rate Per Unit (2023-24)	52.36	52.36	
Electricity Bill Payable on Load Basis (2023-24) (Rs)	240,842,700	138,453,349	***102,389,352***

[1]Load factor = average night hours per day / 24 = 10.82 / 24% = 45%
[2]Yearly hours = 365 x 24 = 8,760
[3]Monthly hours = Yearly hours / 12 = 8,760 / 12 = 730
[4]Per Month Units for 1 KW = Monthly Hours x Load Factor = 730 x 0.45 = 328.5

This resulted in excessive consumption of electricity and straining the municipal budget through increased electricity bills.

Audit held that non-conversion of traditional and conventional lighting fixtures to energy-efficient LEDs despite clear instructions of the government has resulted in uneconomical and wasteful expenditure on account of electricity charges besides affecting the sustainability of the street lights management system of the MCR.

The matter was reported to MCR in March 2024. It was replied that the MCR maintains over 30,672 lights and has converted 52% to LED over the past six years, spending about 100 million PKR annually. Converting the remaining 14,715 lights would cost an estimated 1.030 billion PKR, which cannot be funded in a single financial year. Consequently, the conversion is being phased out yearly according to the budget. The reply was not tenable since the government has been issuing clear instructions to convert conventional lighting fixtures with energy-efficient LED lights since 2013, however, despite a lapse of considerable time, the MCR has not been able to adhere to these instructions, resulting in excessive consumption of electricity and resultant utility costs. Also, the estimate of Rs 1.030 billion to convert the conventional lights to LED lights seems inflated as the actual estimated capital cost, based on the expense incurred by MCR during FY 2022-23 on ADP schemes and purchase of stocks, is between Rs 117 million to Rs 650 million.

SDAC in its meeting held on 29th May 2024 directed MCR to make the plan to prioritize the transition to energy-efficient LED lighting fixtures for street lighting infrastructure in minimum possible time. MCR was also directed to make their best possible efforts to reduce the electricity consumption for streets lighting function by employing energy-efficient solutions, as prescribed by the government from time to time. No further progress was reported till finalization of this report.

Audit recommends that MCR should ensure immediate transition to energy-efficient fixtures to reduce electricity consumption, costs, and maintenance, while mitigating the environmental carbon footprint. This transition could also generate carbon credits for MCR, estimated at Rs 3 million per year, which – in addition to around Rs 100 million saved per year on account of electricity charges – could help offset the capital costs of converting conventional fixtures to LED lights.

4.3.2 Inefficient operations of street lights due to non-installation of automatic sensors

Section 65(1) of Sixth Schedule of the PLGA 2022 provides that "A local government shall take such measures as may be necessary for the proper lighting of the public streets and other public places vested in the local government […]".

During the performance audit, it was observed that sensors to automatically control the operation of street lights were not installed in the street lights and the responsibility for turning on or off these street lights had been delegated to the general public, resulting in a lack of oversight and accountability in the management of street lighting operations. This has also been corroborated by the fact that 125 (61.9%) and 126 (62.4%) of the participants of the public poll conducted by the performance audit team opined that the street lights in their area were neither turned on nor turned off on time, respectively, indicating operational inefficiencies in the street lights management system.

This resulted in inefficient operation of street lights leading to wasteful energy consumption.

Audit held that the absence of any sensor-based control systems for street lights represents a missed opportunity to enhance efficiency and optimize energy consumption. Furthermore, entrusting the operation of street lights to the general public without adequate checks and balances poses challenges in ensuring uniformity in lighting levels, timely response to changing lighting needs, and effective monitoring of street lighting performance.

The matter was reported to MCR in March 2024. It was replied that the MCR uses infrastructure of IESCO for street lighting, with lights scattered across streets and areas. Sensor operation is feasible only where an integrated street light system exists. Currently, sensors are maintained on roads like Rashid Minhas, Saidpur, and 6th Road, where such integrated systems are in place. The reply is not tenable as installation of light sensors for automatic turning on and turning off street lights has nothing to do with the infrastructure of the street lights but are devices that can be attached easily with the lighting fixture without the need of dedicated infrastructure.

SDAC in its meeting held on 29th May 2024 directed MCR to install sensors specifically with meters. No further progress was reported till finalization of this report.

Audit recommends installation of sensor-based control systems for street lights to automate operations, enhance energy conservation, and ensure consistent service delivery with proper oversight mechanisms. In this regard, MCR can make use of the affordable photocell sensors to automate street light operations.

4.4 Monitoring & Evaluation

4.4.1 Non-maintenance of GIS based street lighting infrastructure map leading to ineffective planning and monitoring

Section 171 of the PLGA 2022 provides that it shall be the duty of every local government to prepare and maintain detailed maps of the infrastructure relating to public services provided by it under this Act or any other law for the time being in force and from time to time modify and update such maps. Similarly, Municipal Committee Daska, a sister

organization of MCR, has not only prepared and maintained an up-to-date Geographic Information System (GIS)-based street lights map of Daska city but has also published the same on their website for wider public dissemination (https://mcdaska.lgpunjab.org.pk/map/). Likewise, Municipal Committee Jhang has also been maintaining and upgrading street lighting map of Jhang city online for information of the stakeholders (https://mcjhang.lgpunjab.org.pk/map/). Both MC Daska and MC Jhang have also made available online complaint management systems for efficient lodging of complaints and their timely resolution.

During the performance audit, it was observed that the maintenance of a GIS-based updated street lighting map is lacking. Audit team vide requisition for documents dated 06.02.2024 requested for provision of GIS-based street lighting map of MCR, however, it was informed by the MCR administration that no such map was maintained or was available. The absence of regular updates and maintenance of the GIS-based street lighting map indicates a gap in MCR's management of infrastructure data.

This resulted in MCR's failure to maintain an updated GIS-based street lighting map, which hampers the management's ability to properly plan new street lighting schemes, identify areas requiring maintenance or improvement promptly.

Audit held that a current and accurate street lighting map is crucial for effective planning, monitoring, and maintenance of street lights management system. Furthermore, it undermines the efficiency and effectiveness of resource allocation and decision-making processes related to street lighting infrastructure.

The matter was reported to the MCR in March 2024. The Municipal Corporation Rawalpindi manages over 30,672 street lights across 46 union councils, making current mapping efforts unfeasible compared to smaller jurisdictions like MC Daska and MC Jhang. However, MC Rawalpindi plans to implement a GPS-based street lighting mapping system in future financial years, depending on budget availability. The reply is not tenable since the very scale of the MCR's street light operations justifies the need of a comprehensive GIS-based map.

SDAC in its meeting held on 29th May 2024 directed MCR to take measures to generate an up-to-date GIS based map of street lights infrastructure for better planning, complaints redressal and efficient resource management. No further progress was reported till finalization of this report.

Audit recommends that MCR should regularly update and maintain its GIS-based street lighting map to ensure accurate data management, operational efficiency, and informed decision-making. The GIS-based map should also be incorporated into an online portal or mobile app to automate the streetlight complaint mechanism for easy lodging and tracking of complaints.

4.4.2 Ineffective street lighting in commercial areas due to malfunctioning lighting fixtures

Section 65(1) of Sixth Schedule of the PLGA 2022 provides that "A local government shall take such measures as may be necessary for the proper lighting of the public streets and other public places vested in the local government […]".

During the performance audit, a concerning inefficiency was identified in the management of street lights in commercially significant areas. Physical inspections were conducted on 12 commercially important roads under MCR's jurisdiction, which revealed that a significant number of street lights were faulty and out-of-order. This indicates a lack of effective maintenance and service provision. Out of a total of 1120 street lights installed along these commercially important roads, a staggering 371 were found to be out of order. This represents a deficiency rate of approximately 33.1%, highlighting a systemic failure in ensuring the operational functionality of street lighting infrastructure in crucial commercial areas.

This resulted in adversely impacting public safety, pedestrian visibility, and overall urban aesthetics, potentially deterring economic activities, and undermining the vibrancy of commercial zones.

Audit held that the ineffective management of street lighting infrastructure in commercial areas not only compromises public safety and urban aesthetics but also reflects poorly on MCR's service delivery capabilities and urban governance standards.

The matter was reported to MCR in March 2024. MCR replied that the 371 lights on 4th B Road and Rawal Road were previously non-functional due to a temporary IESCO fault, which has now been resolved. Currently, over 70% of the lights are operational, which is commendable despite occasional IESCO system faults. The reply is not tenable as MCR has not provided any documentary evidence or timeline of the said lights' malfunctioning and becoming operational again. Further, the reply presents a contradictory stance of the management, where on one hand MCR points out that no street lights remain faulty or unattended and on the other hand the management considers operationally of 70% street lights commendable.

SDAC in its meeting held on 29th May 2024 kept the para pending till compliance. No further progress was reported till finalization of this report.

Audit recommends that MCR should prioritize the comprehensive inspection, maintenance, and timely repair of street lighting infrastructure in commercially significant areas to ensure uninterrupted service delivery and enhance public safety.

4.5 Environment

4.5.1 Adverse impact on the environment due to non-installation of energy-efficient street lighting fixtures

The Local Government & Community Development Department (LG&CDD) vide their letters No. SO TMA-Dev (LG)10-15/2013 dated 20.09.2013, 03.10.2013, 30.10.2013 and 02.02.2015 directed that street lights and public lights in all districts of the province be converted to LED for conservation of energy. Further, Section 5.2 of the National Climate

Change Policy (NCCP) 2021 states that energy efficiency improvement, energy conservation and demand reduction provide excellent and cost-effective ways to ensure sufficient energy supply to achieve economic development goals, reduce carbon emissions and achieve climate change mitigation goals.

During the performance audit, it was observed that due to non-installation of energy-efficient LEDs, despite clear instructions of the Government of the Punjab, and persistent use of conventional and outdated street lighting fixtures lead to increased electricity consumption of 1,955,488 kilowatts per year. As per the report of Centre for Research on Energy and Clean Air titled: "CO_2 Emissions from Pakistan's Energy Sector (July 2021)" energy generation sector in Pakistan results in emission of 55.2 million tonnes of $CO_{2\text{-}Eq}$ due to 24,306 MW of thermal energy generation (which accounts for 63% of total energy generation of 37,781 MW). The increased electricity consumption due to non-installation of energy-efficient lighting fixtures by MCR, thus, results in excessive release of 845.5 tonnes of $CO_{2\text{-}Eq}$ in the atmosphere annually. The details are as below:

Description	With Conventional Fixtures	With LED Fixtures	Difference (Saving)
	(1)	(2)	(3)
Applicable Load (kW) - (A)	1,166.856	670.791	496.065
Load Factor[1] - (B)	45%	45%	
Yearly hours[2] - (C)	8,760	8,760	
Monthly hours[3] - (D)	730	730	
Per Month Units Calculated for 1 kWh[4] - (E=BxD)	328.5	328.5	
Per Month Units for existing load Kwh – (F=ExA)	383,312	220,355	162,957
Per Year Units Calculated Kwh – (H)	4,599,746	2,644,258	1,955,488
Per Year Units kWh (from thermal) – (I = 63% x H)	2,897,840	1,665,883	1,231,957
$CO_{2\text{-}Eq}$/Year Emissions (Tonnes)[5]	1,988.80	1,143.30	845.5

Calculation Notes:

[1]Load factor = average night hours per day / 24 = 10.82 / 24% = 45%

[2]Yearly hours = 365 x 24 = 8,760

[3]Monthly hours = Yearly hours / 12 = 8,760 / 12 = 730

[4]Per Month Units for 1 kWh = Monthly Hours x Load Factor = 730 x 0.45 = 328.5

[5]63% of Electricity in Pakistan is generated from Coal (13.6%), Oil (15.2%) and Gas (34.2%), having CO_2 intensity of 992, 961 and 495 gCO_2/kWh respectively

This resulted in adversely affecting the environment by higher $CO_{2\text{-}Eq}$ emissions and compromising the efforts of the country to improve energy efficiency, energy conservation and energy demand reduction.

Audit held that non-conversion of conventional lighting fixtures to energy-efficient LEDs despite clear instructions of the government has resulted in increased consumption of energy and leading to higher $CO_{2\text{-}Eq}$ emissions in the atmosphere.

The matter was reported to MCR in March 2024. It was replied that the MCR maintains over 30,672 lights and has converted 52% to LED over the past six years, spending about 100 million PKR annually. Converting the remaining 14,715 lights would cost an estimated 1.030 billion PKR, which cannot be funded in a single financial year. Consequently, the conversion

is being phased out yearly according to the budget. The reply was not tenable since the government has been issuing clear instructions to convert conventional lighting fixtures with energy-efficient LED lights since 2013, however, despite lapse of considerable time, the MCR has not been able to adhere to these instructions, resulting in excessive consumption of electricity and resultant $CO_{2\text{-}Eq}$ emissions adversely affecting the environment. Also, the estimate of Rs 1.030 billion to convert the conventional lights to LED lights seems inflated as the actual estimated capital cost, based on the expense incurred by MCR during FY 2022-23 on ADP schemes and purchase of stocks, is between Rs 117 million to Rs 650 million.

SDAC in its meeting held on 29th May 2024 directed MCR to make the plan to prioritize the transition to energy-efficient LED lighting fixtures for street lighting infrastructure in minimum possible time. No further progress was reported till finalization of this report.

Audit recommends that in line with the policy directions of the Government, the MCR should immediately prioritize the transition to energy-efficient LED lighting fixtures. MCR has the potential to earn and trade 845 Carbon Credits per year (accrued due to reduction in 845 tonnes of carbon emissions per year) in Carbon Market in line with the Paris Declaration and Kyoto Protocol as well as the National Climate Change Policy, which encourage energy efficient projects for carbon trading. Such carbon credit trading has the potential of earning for MCR an amount of Rs 3.065 million per year (calculated at the rate of USD 13 per carbon credit as applicable on Sindh Government's Delta Blue Carbon project). This earning along with yearly savings of Rs 100 million on account of electricity charges can offset the capital costs incurred on conversion of conventional lighting fixtures to LED lights/solar-powered lamps.

4.6 Sustainability

Based on the audit findings, the MCR's street lights management system remains sustainable, albeit at a higher operational costs, primarily because the significant portion of its budget allocated to electricity payments. The fact that MCR incurs approximately 75% to 80% of its budget on electricity, calculated presumptively without knowledge of actual consumption, raises concerns about inefficiency and potential waste. This reliance on presumptive calculations – which also does not take into account important factors like load management hours, out-of-order street lights, etc. – rather than actual usage of data not only impedes accurate budget allocation but also hampers efforts to optimize energy usage and reduce costs.

4.7 Overall Assessment

Economy:

Several examples of ineffective resource management have been brought to light, including the failure to switch to energy-efficient LED lighting and the unfeasible way of determining electricity charges. These actions result in overpayments and unnecessary spending, which shows that the street light management system's financial management is deficient.

Efficiency:

Efficiency in the street lights management system project is hampered by a number of issues, such as poor street light management in general, a backlog in complaint processing, and a lack of explicit operating rules. Overall efficiency is decreased as a result of these inefficiencies, which also cause uneven service delivery, maintenance delays, and inefficient resource allocation.

Equity:

The audit uncovered discrepancies in the availability of street lighting, with a sizeable proportion of the population lacking access to sufficient illumination in residential and commercial settings in addition to MCR's noncompliance with the minimal standards of luminosity in public areas for individuals with special needs.

Effectiveness:

Several issues found in the audit, including poor maintenance, a lack of adoption of energy-efficient technology, and the lack of sensor-based control systems, compromise the efficiency of service delivery on the street lighting management system. These shortcomings lower overall effectiveness by compromising service reliability, using energy inefficiently, and missing optimization possibilities.

Environment:

The street lights management system's continuous usage of antiquated, ineffective lighting adds to environmental deterioration. To lessen the impact on the environment, this leads to increased carbon emissions and energy waste, underscoring the need for sustainable practices and the use of eco-friendly technologies.

Compliance with Rules:

The audit observations indicate instances of non-compliance with regulations and the failure to adhere to government directives on energy efficiency. Also, there appeared a non-compliance to general financial instructions of the government.

Performance Rating: Moderately Satisfactory

Risk Rating: Medium

5. CONCLUSION

5.1 Key Issues for the Future

The street lights management system of MCR must prioritize resource efficiency, operational streamlining, and equitable service provision. Implementation of clear guidelines, transition to energy-efficient technologies, ensuring efficient and reliable complaint resolution mechanism, and adopting cost-effective measures would help improve the sustainability of this important function of MCR.

5.2 Lessons Identified

This performance audit report underscores the critical need for proactive resource management and adherence to established guidelines to ensure the efficient and effective execution of entrusted functions. Furthermore, it emphasizes the pivotal role of adopting sustainable technologies and transparent governance practices in enhancing municipal service delivery.

ACKNOWLEDGEMENT

We extend our sincere appreciation and gratitude to the Management and Staff of the Municipal Corporation, Rawalpindi, for their invaluable assistance and cooperation extended to the auditors throughout the duration of their assignment.

ANNEXURES

Annex - I

سوالنامہ برائے عوامی رائے

نام: _____

پتہ: _____

یو سی: _____

شناختی کارڈ نمبر: _____

جنس: _____

رابطہ نمبر: _____

کیاآپ کی گلی میں راولپنڈی میونسپل کارپوریشن کی جانب سے اسٹریٹ لائٹس نصب ہیں؟	ہاں	نہیں
اگر ہاں، تو کیا یہ اسٹریٹ لائٹس مناسب طریقے سے کام کرتی ہیں؟	ہاں	نہیں
اگر نہیں، تو یہ اسٹریٹ لائٹس کتنے عرصے سے خراب ہیں؟		
کیاآپ کی گلی میں رات کے وقت کافی اور مناسب روشنی موجود ہوتی ہے؟	ہاں	نہیں
کیاآپ ایم سی آر کے اسٹریٹ لائٹ شکایت مینجمنٹ سسٹم سے مطمئن ہیں؟	ہاں	نہیں
کیاآپ کو لگتا ہے کہ آپ کے لئے اپنی گلی میں اسٹریٹ لائٹ کی مرمت کے لئے شکایت درج کرنا آسان ہے؟	ہاں	نہیں
کیاآپ اسٹریٹ لائٹ کی مرمت کے لئے ایم سی آر کے جانب سے لگائے گئے وقت سے مطمئن ہیں؟	ہاں	نہیں
اسٹریٹ لائٹ کی خرابی کی صورت میں شکایت درج کرنے کے اوسطاً کتنے دن بعد خرابی دور کی جاتی ہے؟		
کیاآپ کو لگتا ہے کہ آپ کے جان و مال کو محفوظ بنانے کے لئے گلی میں رات کو مناسب روشنی ہونا ضروری ہے؟	ہاں	نہیں
کیاآپ کو لگتا ہے کہ میونسپل کارپوریشن راولپنڈی آپ کے علاقے میں اسٹریٹ لائٹنگ سسٹم کو مؤثر طریقے سے چلا رہی ہے؟	ہاں	نہیں
کیاآپ کو لگتا ہے کہ آپ کے علاقے میں اضافی اسٹریٹ لائٹس نصب کرنے کی ضرورت ہے؟	ہاں	نہیں
کیاآپ کو لگتا ہے کہ آپ کی گلی میں رات کو محفوظ آمد و رفت کے لئے مناسب اسٹریٹ لائٹنگ موجود ہے؟	ہاں	نہیں
کیاآپ کی گلی میں نصب اسٹریٹ لائٹس شام کو بروقت آن ہو جاتی ہیں؟	ہاں	نہیں
کیاپ کی گلی میں نصب اسٹریٹ لائٹس صبح کو بروقت بند ہوجاتی ہیں؟	ہاں	نہیں

(Annex - II)

STOCK POSITION OF MCR, STORE

Store Description	Opening Balance (07/2021)	Purchase	Expense	Closing Balance (06/2022)	Opening Balance (07/2022)	Purchase	Expense	Closing Balance (06/2023)
Energy Saver 25-W	109	0	0	109	109	0	0	109
Energy Saver 42-W	1052	3265	4108	209	209	3145	2807	547
Holder Porcelain 125-W	22	1600	1471	151	151	3250	1322	2079
Holder Porcelain 250-W	52	60	92	20	20	216	36	200
Switch Button 15/30-A	85	1900	1621	364	364	1730	1447	647
Tape Roll	14	2100	1111	1003	1003	1200	878	1325
Cable 7/29 2-Core Copper	36	2250	2266	20	20	1710	1199	531
Cable 7/52 2-Core Aluminium	39	4929	4915	53	53	5310	5286	77
Safety Board	34	50	58	26	26	100	79	47
Soon-T 150-W	68	75	143	0	0	137	86	51
Sodium Choke 150-W	25	36	61	0	0	58	58	0
Soon-T 250-W	10	248	258	0	0	206	205	1
Sodium Choke 250-W	18	180	198	0	0	130	117	13
Igniter 150/250-W	64	150	214	0	0	280	210	70
Main Switch-TP 30-A	3	12	13	2	2	12	13	1
Main Switch-TP 60-A	6	11	13	4	4	6	5	5
Main Switch-TP 100-A	8	10	5	13	13	2	13	2
LED Driver	44	1251	1230	65	65	1650	1280	435
Circuit Breaker (Single Way)	94	0	0	94	94	0	0	94
Flood Light 250-W	6	0	0	6	6	0	0	6
Conductor 7/122 (Single Core)	3245	0	0	3245	3245	0	0	3245
Conductor 95-MM (Single Core)	2935	6300	0	9235	9235	0	0	9235
D-Sheckel / Insulator	257	0	0	257	257	0	0	257
Murcery Bulb 125-W	46	0	0	46	46	0	0	46
Murcery Choke 125-W	136	0	0	136	136	0	0	136
Complete Light 42-W	17	0	17	0	0	0	0	0
LED Bulb 24-W	0	0	0	0	0	1500	798	702

(Annex – III)

SURVEY RESULTS TO ASCERTAIN STREET LIGHTING ADEQUACY IN RANDOMLY SELECTED UNION COUNCILS OF M.C.R.

UC No.	NameofUC	Address	Latitude	Longitude	LuxReading	AreaType	Commercial Readings	Residential Readings	Total Readings	AvgCommercialLux Reading	AvgResidentialLux Reading
1	RattaAmral	MainRattaRoadMiladNagarChowkPoint-1	33.611420	73.043857	41	Commercial	3	7	10	35.33	6.57
1	RattaAmral	MainRattaRoadMiladNagarChowkPoint-2	33.611567	73.043712	37	Commercial			0		
1	RattaAmral	MainRattaRoadMiladNagarChowkPoint-3	33.611601	73.043870	28	Commercial			0		
1	RattaAmral	StreetNo.31,MilladNagarPoint-1	33.61015	73.047346	2	Residential			0		
1	RattaAmral	StreetNo.31,MilladNagarPoint-2	33.610407	73.047041	12	Residential			0		
1	RattaAmral	StreetNo.31,MilladNagarPoint-3	33.610691	73.047466	1	Residential			0		
1	RattaAmral	StreetNo.27,MilladNagarPoint-1	33.610734	73.046709	6	Residential			0		
1	RattaAmral	StreetNo.27,MilladNagarPoint-2	33.610421	73.046652	4	Residential			0		
1	RattaAmral	StreetNo.27,MilladNagarPoint-3	33.610037	73.046641	9	Residential			0		
1	RattaAmral	StreetNo.27,MilladNagarPoint-4	33.611353	73.046810	12	Residential			0		
2	DhokeRatta	BabuLalHussainRoad,Point-1	33.614042	73.045852	12	Commercial	3	4	7	25.33	11.50
2	DhokeRatta	BabuLalHussainRoad,Point-2	33.614384	73.046029	46	Commercial			0		
2	DhokeRatta	BabuLalHussainRoad,Point-3	33.614632	73.045982	18	Commercial			0		
2	DhokeRatta	StreetNo.90,MilladNagarPoint-1	33.613915	73.045545	14	Residential			0		
2	DhokeRatta	StreetNo.90,MilladNagarPoint-2	33.613911	73.045657	12	Residential			0		
2	DhokeRatta	StreetNo.49,MilladNagarPoint-1	33.613536	73.044770	7	Residential			0		
2	DhokeRatta	StreetNo.49,MilladNagarPoint-2	33.613288	73.044814	13	Residential			0		
3	HazaraColony	StreetNo.10Commercial7No.SchemePoint-1	33.611346	73.041937	16	Commercial	3	5	8	9.00	11.40
3	HazaraColony	StreetNo.10Commercial7No.SchemePoint-2	33.618	73.042602	9	Commercial			0		
3	HazaraColony	StreetNo.10Commercial7No.SchemePoint-3	33.611116	73.041800	2	Commercial			0		
3	HazaraColony	StreetNo.9MohallaMazharAbadPoint-1	33.619014	73.042874	5	Residential			0		
3	HazaraColony	StreetNo.9MohallaMazharAbadPoint-2	33.619311	73.042846	10	Residential			0		
3	HazaraColony	StreetNo.9MohallaMazharAbadPoint-3	33.619565	73.043571	13	Residential			0		
3	HazaraColony	StreetNo.1MohallaMazharAbadPoint-1	33.61781	73.041108	16	Residential			0		
3	HazaraColony	StreetNo.1MohallaMazharAbadPoint-2	33.617618	73.044091	13	Residential			0		
15	SaidpurScheme	MainSaidpurRdMinsaMedicalstoretoRehmanDentalPoint-1	33.632906	73.06231	32	Commercial	6	11	17	25.67	8.55
15	SaidpurScheme	MainSaidpurRdMinsaMedicalstoretoRehmanDentalPoint-2	33.633095	73.062353	31	Commercial			0		
15	SaidpurScheme	MainSaidpurRdMinsaMedicalstoretoRehmanDentalPoint-3	33.633430	73.062334	22	Commercial			0		
15	SaidpurScheme	MainSaidpurRdMinsaMedicalstoretoRehmanDentalPoint-4	33.633560	73.062356	24	Commercial			0		
15	SaidpurScheme	MainSaidpurRdMinsaMedicalstoretoRehmanDentalPoint-5	33.633747	73.062383	25	Commercial			0		
15	SaidpurScheme	MainSaidpurRdMinsaMedicalstoretoRehmanDentalPoint-6	33.633772	73.062389	20	Commercial			0		
15	SaidpurScheme	St.H\NW571toNW661Scheme1SaidpurPoint-1	33.631802	73.060025	4	Residential			0		
15	SaidpurScheme	St.H\NW571toNW661Scheme1SaidpurPoint-2	33.632109	73.060047	13	Residential			0		
15	SaidpurScheme	St.H\NW571toNW661Scheme1SaidpurPoint-3	33.633443	73.060207	2	Residential			0		
15	SaidpurScheme	St.H\NW571toNW661Scheme1SaidpurPoint-4	33.633211	73.060203	12	Residential			0		
15	SaidpurScheme	St.H\NW571toNW661Scheme1SaidpurPoint-5	33.633816	73.060244	9	Residential			0		
15	SaidpurScheme	St.H.NW679toChittiTankiMohallaRajaSultanPoint-1	33.634153	73.060274	10	Residential			0		

15	SaidpurScheme	St.H.NW679toChittiTankiMohallaRajaSultanPoint-2	33.633425	73.060314	8	Residential			0		
15	SaidpurScheme	St.H.NW679toChittiTankiMohallaRajaSultanPoint-3	33.633409	73.061147	11	Residential			0		
15	SaidpurScheme	St.H.NW679toChittiTankiMohallaRajaSultanPoint-4	33.633254	73.061227	9	Residential			0		
15	SaidpurScheme	St.H.NW679toChittiTankiMohallaRajaSultanPoint-5	33.633391	73.061627	3	Residential			0		
15	SaidpurScheme	St.H.NW679toChittiTankiMohallaRajaSultanPoint-6	33.633390	73.061634	13	Residential			0		
16	MohallahEidgah	MainAsgharMallRoadPoint-1	33.627580	73.065776	26	Commercial	4	10	14	25.25	16.70
16	MohallahEidgah	MainAsgharMallRoadPoint-2	33.627438	73.06956	20	Commercial			0		
16	MohallahEidgah	MainAsgharMallRoadPoint-3	33.627149	73.066672	19	Commercial			0		
16	MohallahEidgah	MainAsgharMallRoadPoint-4	33.627341	73.066233	36	Commercial			0		
16	MohallahEidgah	PublicParkStreetMohallaRajaSultanPoint-1	33.630696	73.061266	31	Residential			0		
16	MohallahEidgah	PublicParkStreetMohallaRajaSultanPoint-2	33.631120	73.061392	24	Residential			0		
16	MohallahEidgah	PublicParkStreetMohallaRajaSultanPoint-3	33.631369	73.061426	36	Residential			0		
16	MohallahEidgah	PublicParkStreetMohallaRajaSultanPoint-4	33.631524	73.061452	15	Residential			0		
16	MohallahEidgah	PublicParkStreetMohallaRajaSultanPoint-5	33.631945	73.061525	1	Residential			0		
16	MohallahEidgah	PublicParkStreetMohallaRajaSultanPoint-6	33.632208	73.051566	8	Residential			0		
16	MohallahEidgah	StreetNo.2 to4Mohalla SultanPoint-1	33.632185	73.059761	9	Residential			0		
16	MohallahEidgah	StreetNo.2 to4Mohalla SultanPoint-2	33.632544	73.059705	16	Residential			0		
16	MohallahEidgah	StreetNo.2 to4Mohalla SultanPoint-3	33.632908	73.05971	11	Residential			0		
16	MohallahEidgah	StreetNo.2 to4Mohalla SultanPoint-4	33.633027	73.059716	16	Residential			0		
20	AsgharMall Scheme	StreetB-1313to1331SatelliteTownPoint-1	33.633327	73.062743	1	Residential	0	11	11		7.82
20	AsgharMall Scheme	StreetB-1313to1331SatelliteTownPoint-2	33.633348	73.063024	5	Residential			0		
20	AsgharMall Scheme	StreetB-1313to1331SatelliteTownPoint-3	33.633276	73.063734	4	Residential			0		
20	AsgharMall Scheme	StreetB-1313to1331SatelliteTownPoint-4	33.633232	73.064269	1	Residential			0		
20	AsgharMall Scheme	StreetB-1313to1331SatelliteTownPoint-5	33.633215	73.064586	4	Residential			0		
20	AsgharMall Scheme	StreetB-1313to1331SatelliteTownPoint-6	33.633087	73.065426	18	Residential			0		
20	AsgharMall Scheme	StreetB-1214to38AsgharMallschemeSatelliteTownPoint-1	33.631481	73.065706	1	Residential			0		
20	AsgharMall Scheme	StreetB-1214to38AsgharMallschemeSatelliteTownPoint-2	33.632081	73.066068	1	Residential			0		
20	AsgharMall Scheme	StreetB-1214to38AsgharMallschemeSatelliteTownPoint-3	33.631662	73.065848	25	Residential			0		
20	AsgharMall Scheme	StreetB-1214to38AsgharMallschemeSatelliteTownPoint-4	33.631500	73.065734	7	Residential			0		
20	AsgharMall Scheme	StreetB-1214to38AsgharMallschemesatelliteTownPoint-5	33.630860	73.065248	19	Residential			0		
30	ChahSultan	MainBazarChahSultantoRawalRoadPoint-1	33.623857	73.074280	33	Commercial	5	3	8	12.40	11.67
30	ChahSultan	MainBazarChahSultantoRawalRoadPoint-2	33.624082	73.074009	13	Commercial			0		
30	ChahSultan	MainBazarChahSultantoAmarpuraRoadPoint-1	33.624179	73.073637	4	Commercial			0		
30	ChahSultan	MainBazarChahSultantoAmarpuraRoadPoint-2	33.624096	73.073625	7	Commercial			0		
30	ChahSultan	MainBazarChahSultantoAmarpuraRoadPoint-3	33.624208	73.073610	5	Commercial			0		
30	ChahSultan	Street66AmarpuraPoint-1	33.623224	73.073155	11	Residential			0		

UC No.	NameofUC	Address	Latitude	Longitude	LuxReading	AreaType	Commercial Readings	Residential Readings	Total Readings	AvgCommercialLux Reading	AvgResidentialLux Reading
30	ChahSultan	Street66AmarpuraPoint-2	33.623028	73.073239	15	Residential			0		
30	ChahSultan	Street66AmarpuraPoint-3	33.623057	73.072870	9	Residential			0		
31	DhokeHukamdad	HaqNawazRoadmainGlassFactoryRdPoint-1	33.617921	73.073962	59	Commercial	3	5	8	47.67	7.20
31	DhokeHukamdad	HaqNawazRoadmainGlassFactoryRdPoint-2	33.617782	73.073829	65	Commercial			0		
31	DhokeHukamdad	HaqNawazRoadmainGlassFactoryRdPoint-3	33.617504	73.07357*	19	Commercial			0		
31	DhokeHukamdad	Street37MohallaHukhumdadPoint-1	33.617952	73.074108	4	Residential			0		
31	DhokeHukamdad	Street37MohallaHukhumdadPoint-2	33.617992	73.074108	9	Residential			0		
31	DhokeHukamdad	Street14,NewAmarpuramohallaPoint-1	33.618802	73.074152	3	Residential			0		
31	DhokeHukamdad	Street14,NewAmarpuramohallaPoint-2	33.618722	73.074505	5	Residential			0		
31	DhokeHukamdad	Street14,NewAmarpuramohallaPoint-3	33.618563	73.074107	15	Residential			0		
35	MohallahImam Barra	MainRoadPirchoaPoint-1	33.624274	73.057331	23	Commercial	6	10	16	22.00	9.70
35	MohallahImam Barra	MainRoadPirchoaPoint-2	33.624084	73.0576	1	Commercial			0		
35	MohallahImam Barra	MainRoadPirchoaPoint-3	33.623562	73.057448	33	Commercial			0		
35	MohallahImam Barra	PirChoaGraveyardtoChowkPoint-1	33.623627	73.058208	18	Commercial			0		
35	MohallahImam Barra	PirChoaGraveyardtoChowkPoint-2	33.623722	73.058114	31	Commercial			0		
35	MohallahImam Barra	PirChoaGraveyardtoChowkPoint-3	33.623912	73.057867	26	Commercial			0		
35	MohallahImam Barra	StreetNo.1KirishanpuraPoint-1	33.622961	73.05654	11	Residential			0		
35	MohallahImam Barra	StreetNo.1KirishanpuraPoint-2	33.624469	73.056885	17	Residential			0		
35	MohallahImam Barra	StreetNo.1KirishanpuraPoint-3	33.623954	73.056512	15	Residential			0		
35	MohallahImam Barra	StreetNo.1KirishanpuraPoint-4	33.623875	73.056589	14	Residential			0		
35	MohallahImam Barra	StreetNo.1KirishanpuraPoint-5	33.623772	73.056605	4	Residential			0		
35	MohallahImam Barra	StreetNo.6KareempuraPoint-1	33622598	73.5679	2	Residential			0		
35	MohallahImam Barra	StreetNo.6KareempuraPoint-2	33.622327	73.056739	13	Residential			0		
35	MohallahImam Barra	StreetNo.6KareempuraPoint-3	33.622484	73.05678	5	Residential			0		
35	MohallahImam Barra	StreetNo.6KareempuraPoint-4	33.622912	73.056745	5	Residential			0		
35	MohallahImam Barra	StreetNo.6KareempuraPoint-5	33.622761	73.056854	11	Residential			0		
38	SagriScheme	Sagrischeme	33.611389	73.049174	3	Commercial	3	4	7	8.00	13.25
38	SagriScheme	Sagrischeme	33.61148	73.04951	6	Commercial			0		
38	SagriScheme	Sagrischeme	33.611592	73.050204	15	Commercial			0		
38	SagriScheme	St.No.2,SagriScheme	33.61348	73.050174	20	Residential			0		
38	SagriScheme	GaliMasjidIsmail,ChirstianStreet	33.614011	73.051034	15	Residential			0		

UC No.	NameofUC	Address	Latitude	Longitude	LuxReading	AreaType	Commercial Readings	Residential Readings	Total Readings	AvgCommercialLux Reading	AvgResidentialLux Reading
38	SagriScheme	GaliMasjidIsmail,ChirstianStreet	33.613989	73.050783	1	Residential			0		
38	SagriScheme	GaliMasjidIsmail,ChirstianStreet	33.6137	73.05056	17	Residential			0		
39	WarisKhan	UrduBazar MainRoadMasjidKelewali Point1	33.614079	73.060649	6	Commercial	12	25	37	6.33	6.92
39	WarisKhan	UrduBazar MainRoadMasjidKelewali Point2	33.614107	73.060638	7	Commercial			0		
39	WarisKhan	UrduBazar MainRoadMasjidKelewali Point3	33.614093	73.060642	6	Commercial			0		
39	WarisKhan	ChitianHattianStreetNo.2(Point1)	33.615434	73.061676	6	Commercial			0		
39	WarisKhan	ChitianHattianStreetNo.2(Point2)	33.615444	73.061704	4	Commercial			0		
39	WarisKhan	BazarJamanWaliGaliPoint1	33.617191	73.062470	11	Commercial			0		
39	WarisKhan	BazarJamanWaliGaliPoint2	33.617197	73.062217	12	Commercial			0		
39	WarisKhan	MohalaJhangiHouseQureshiManziltoWariskhanStopPoint-1	33.618588	73.064076	8	Commercial			0		
39	WarisKhan	MohalaJhangiHouseQureshiManziltoWariskhanStopPoint-2	33.6196	73.06449	1	Commercial			0		
39	WarisKhan	MohalaJhangiHouseQureshiManziltoWariskhanStopPoint-3	33.619281	73.063337	4	Commercial			0		
39	WarisKhan	MohalaJhangiHouseQureshiManziltoWariskhanStopPoint-4	33.619199	73.063185	11	Commercial			0		
39	WarisKhan	5	33.619753	73.064654	0	Commercial			0		
39	WarisKhan	ChitianHattianStreetNo.1(Point1)	33.613936	73.061205	6	Residential			0		
39	WarisKhan	ChitianHattianStreetNo.1(Point2)	33.613939	73.061355	6	Residential			0		
39	WarisKhan	ChitianHattianStreetNo.1(Point3)	33.613976	73.061385	2	Residential			0		
39	WarisKhan	GaliMalyaranwaliMasjidPoint1	33.615418	73.061631	4	Residential			0		
39	WarisKhan	GaliMalyaranwaliMasjidPoint2	33.615396	73.061085	14	Residential			0		
39	WarisKhan	GaliAounRizwiHouse(Point-1)	33.616408	73.062163	6	Residential			0		
39	WarisKhan	GaliAounRizwiHouse(Point-2)	33.616285	73.062306	6	Residential			0		
39	WarisKhan	GaliAounRizwiHouse(Point-3)	33.616225	73.062099	10	Residential			0		
39	WarisKhan	StreetAmirFidaPirachaPoint-1	33.617376	73.044007	11	Residential			0		
39	WarisKhan	StreetAmirFidaPirachaPoint-2	33.618552	73.064814	9	Residential			0		
39	WarisKhan	StreetAmirFidaPirachaPoint-3	33.618618	73.064094	10	Residential			0		
39	WarisKhan	StreetAmirFidaPirachaPoint-4	33.618576	73.064336	8	Residential			0		
39	WarisKhan	StreetAmirFidaPirachaPoint-5	33.618543	73.064509	2	Residential			0		
39	WarisKhan	SillaiMarkazstreetSaidpuriGatemohallaPoint-3	33.619818	73.060914	18	Residential			0		
40	PuranaQilla	MainRoadBhabraBazarPoint-1	33.612108	73.061098	5	Residential			0		
40	PuranaQilla	MainRoadBhabraBazarPoint-2	33.612012	73.061011	4	Residential			0		
40	PuranaQilla	MadruseywaliGaliBabarabazarPoint1	33.617194	73.061834	11	Residential			0		
40	PuranaQilla	MadruseywaliGaliBabarabazarPoint2	33.617217	73.061874	8	Residential			0		
40	PuranaQilla	MadruseywaliGaliBabarabazarPoint3	33.617385	73.061973	4	Residential			0		
40	PuranaQilla	MuchiGaliHNo.325 nearLondaBazaarP-1	33.614079	73.060649	6	Residential			0		
40	PuranaQilla	MuchiGaliHNo.325 nearLondaBazaarP-2	33.613936	73.061205	6	Residential			0		
40	PuranaQilla	MuchiGaliHNo.325 nearLondaBazaarP-3	33.613939	73.061355	6	Residential			0		
40	PuranaQilla	GaliNo.2HousenearRizwanAnsariPoint-1	33.616464	73.061080	2	Residential			0		
40	PuranaQilla	GaliNo.2HousenearRizwanAnsariPoint-2	33.613783	73.060642	5	Residential			0		
40	PuranaQilla	GaliNo.2HousenearRizwanAnsariPoint-3	33.612058	73.061058	4	Residential			0		
41	ShahChanChiragh	ChanBazartoImambargahChowkPoint-1	33.619510	73.058716	16	Commercial	7	4	11	13.00	8.50
41	ShahChanChiragh	ChanBazartoImambargahChowkPoint-2	33.619227	73.058557	8	Commercial			0		
41	ShahChanChiragh	ChanBazartoImambargahChowkPoint-3	33.619994	73.058905	16	Commercial			0		

UC No.	NameofUC	Address	Latitude	Longitude	LuxReading	AreaType	Commercial Readings	Residential Readings	Total Readings	AvgCommercialLux Reading	AvgResidentialLux Reading
41	ShahChanChiragh	MeranNiarianMohallaStreetPoint-1	33.62019	73.060446	2	Commercial			0		
41	ShahChanChiragh	MeranNiarianMohallaStreetPoint-2	33.620253	73.060451	17	Commercial			0		
41	ShahChanChiragh	MeranNiarianMohallaStreetPoint-3	33.620760	73.06064	18	Commercial			0		
41	ShahChanChiragh	MeranNiarianMohallaStreetPoint-4	33.620900	73.06011	14	Commercial			0		
41	ShahChanChiragh	StreetGolianWaliMusjidMohallaNiarianPoint-1	33.620253	73.060484	17	Residential			0		
41	ShahChanChiragh	StreetGolianWaliMusjidMohallaNiarianPoint-2	33.620005	73.060033	9	Residential			0		
41	ShahChanChiragh	StreetGolianWaliMusjidMohallaNiarianPoint-3	33.619988	73.059683	3	Residential			0		
41	ShahChanChiragh	Street15MehmoodShahQadri	33.619779	73.058958	5	Residential			0		
42	MillatColony	MainRoadKehkashanColonyDujmobazarPoint-1	33.61174	73.066655	5	Commercial	3	6	9	5.67	5.83
42	MillatColony	MainRoadKehkashanColonyDujmobazarPoint-2	33.611572	73.066277	12	Commercial			0		
42	MillatColony	MainRoadKehkashanColonyDujmobazarPoint-3	33.611499	73.068817	0	Commercial			0		
42	MillatColony	Street8,DhokElahiBukhashPoint-1	33.611038	73.069035	2	Residential			0		
42	MillatColony	Street8 ChokDhokElahiBukhashPoint-2	33.611118	73.068779	6	Residential			0		
42	MillatColony	Street8,DhokElahiBukhashPoint-3	33.611173	73.068511	8	Residential			0		
42	MillatColony	Street7 ChokDhokElahiBukhashpoint-1	33.611118	73.068779	16	Residential			0		
42	MillatColony	Street7,DhokElahiBukhashPoint-2	33.611151	73.068792	2	Residential			0		
42	MillatColony	Street7,DhokElahiBukhashPoint-3	33.611841	73.068841	1	Residential			0		
43	DhokeKhabba	FerozRoadmarketPoint-1	33.614626	73.075789	12	Commercial	3	9	12	19.67	5.56
43	DhokeKhabba	FerozRoadmarketPoint-2	33.614861	73.075787	24	Commercial			0		
43	DhokeKhabba	FerozRoadmarketPoint-3	33.615124	73.075813	23	Commercial			0		
43	DhokeKhabba	NationalTownBandGaliPoint-1	33.612392	73.071543	3	Residential			0		
43	DhokeKhabba	NationalTownBandGaliPoint-2	33.612328	73.074318	2	Residential			0		
43	DhokeKhabba	NationalTownBandGaliPoint-3	33.612664	73.074399	10	Residential			0		
43	DhokeKhabba	StreetNo.1,NationalTownPoint-1	33.613682	73.075073	3	Residential			0		
43	DhokeKhabba	StreetNo.1,NationalTownPoint-2	33.613713	73.075465	8	Residential			0		
43	DhokeKhabba	StreetNo.1,NationalTownPoint-3	33.613765	73.075795	8	Residential			0		
43	DhokeKhabba	StreetNo.3,NationalTownPoint-1	33.613609	73.075778	11	Residential			0		
43	DhokeKhabba	StreetNo.3,NationalTownPoint-2	33.613602	73.075675	3	Residential			0		
43	DhokeKhabba	StreetNo.3,NationalTownPoint-3	33.613679	73.075646	2	Residential			0		
44	DhokeFarmanAli	MainRoadDhokKhabbaBazarPoint-1	33.613299	73.069668	1	Commercial	3	5	8	9.00	8.40
44	DhokeFarmanAli	MainRoadDhokKhabbaBazarPoint-2	33.613324	73.069626	16	Commercial			0		
44	DhokeFarmanAli	MainRoadDhokKhabbaBazarPoint-3	33.613437	73.069332	10	Commercial			0		
44	DhokeFarmanAli	Street3 KomiRdDhokKhabba Point-1	33.612289	73.070987	18	Residential			0		
44	DhokeFarmanAli	Street3 KomiRdDhokKhabba Point-2	33.612392	73.071543	3	Residential			0		
44	DhokeFarmanAli	Street No. 22DhokKhabbaPoint-1	33.611377	73.073633	4	Residential			0		
44	DhokeFarmanAli	Street No. 22DhokKhabbaPoint-2	33.611763	73.073686	1	Residential			0		
44	DhokeFarmanAli	Street No. 22DhokKhabbaPoint-3	33.612817	73.074519	16	Residential			0		
46	City	BismillahElectricStoreChowkLundaBazar	33.612956	73.060924	8	Commercial	6	5	11	9.17	8.80
46	City	LundaBazartoCollegeRoad(Point1)	33.612407	73.061129	6	Commercial			0		
46	City	LundaBazartocollegeRoad(point2)	33.612311	73.061101	15	Commercial			0		
46	City	LundaBazartocollegeRoad(point3)	33.612289	73.061012	14	Commercial			0		
46	City	JunaidTraderShop E27CollegeRd	33.612356	73.061262	6	Commercial			0		

UC No.	NameofUC	Address	Latitude	Longitude	LuxReading	AreaType	Commercial Readings	Residential Readings	Total Readings	AvgCommercialLux Reading	AvgResidentialLux Reading
46	City	Point2 Near Junaid Trader CollegeRd	33.612238	73.061203	6	Commercial			0		
46	City	H.ofHakeemTariq mainStreet NayaMohalla	33.613083	73.061956	6	Residential			0		
46	City	H.ofSafdarMainStreet,NayaMohalla	33.613076	73.061984	6	Residential			0		
46	City	HofMr.KhalidmainstreetNayaMohallah	33.612955	73.061963	2	Residential			0		
46	City	HouseMalik WaqasGundaNala Street	33.612435	73.061653	6	Residential			0		
46	City	SufianHouseGanda NalaStreet	33.612201	73.061121	24	Residential			0		
							70	124	194	18.23	9.27