



Ministry of
Planning,
Development &
Special Initiatives



RASTA

LOCAL RESEARCH LOCAL SOLUTIONS

VOL - XXIII

SLUDGE AND DEVELOPMENT

Edited by Nadeem Javed & Faheem Jehangir Khan

RASTA: LOCAL RESEARCH LOCAL SOLUTIONS

SLUDGE AND DEVELOPMENT (Volume XXIII)

Edited by Nadeem Javaid & Faheem Jehangir Khan



Ministry of
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PART I

SLUDGE AND DEVELOPMENT

Research Papers



DIGITALISATION AND AUTOMATION OF ADMINISTRATIVE PROCEDURES: SOLUTIONS FOR REDUCING SLUDGE IN SETTING-UP RESTAURANT BUSINESSES

Yasir Zada Khan¹

ABSTRACT

This study examines the regulatory challenges faced by restaurant owners in Lahore and proposes a digitised, integrated system to streamline registration, licensing, and approvals. Based on a survey of 242 restaurants, the analysis reveals high costs, excessive paperwork, delays, and frequent departmental interventions, often involving bribes or free services. On average, owners spent PKR 641,562 per restaurant—including official fees, consultancy charges, travel expenses, and recurring payments to authorities—while making 34 departmental visits and waiting 133 days for registration and an additional 30 for certificates. Notified government charges were far lower, indicating significant hidden costs. For small and medium-sized restaurants, one-time regulatory charges typically ranged between PKR 150,000–300,000, with recurring annual costs of PKR 20,000–100,000, depending on size and location. Regulatory “sludge” was found to account for about 9.5% of restaurant setup costs, averaging PKR 641,562 per establishment. As a share of Punjab’s hotel and restaurant sector GNP, sludge was 3.77% in 2020, 4.39% in 2021, and dropped sharply to 0.50% in 2022, largely due to changes in registration methodology that reduced the number of registered restaurants. These findings highlight the economic burden of compliance and the urgent need for policy reform. To address these challenges, the study proposes a user-friendly web application that integrates departmental functions, enabling online registration, licensing, payments, grievance redressal, and one-time inspections, while reducing paperwork and physical visits. Digital

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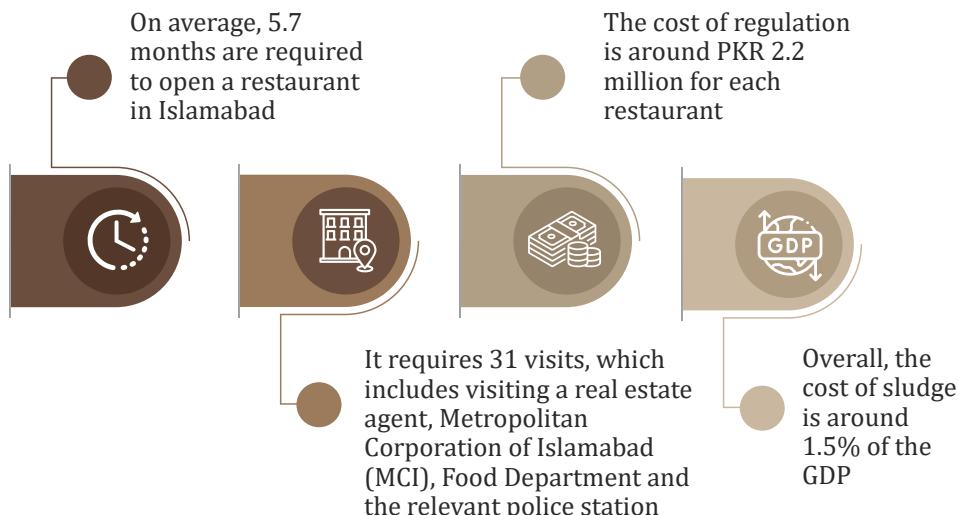
record integration would ensure transparency and security. The study carries important public policy implications: reducing bureaucratic inefficiencies, enhancing transparency, and fostering a business-friendly environment. By supporting digital transformation, the proposed system could also strengthen Pakistan's ease-of-doing-business ranking.



1. INTRODUCTION

The world is steering rapidly towards digitalisation, with major economies focusing on automation and integration of processes to streamline business processes. This shift eliminates unnecessary efforts for investors and businesses, allowing them to concentrate on providing quality services (Polova, 2022). In Pakistan, the process of opening a restaurant is particularly burdensome due to outdated, inefficient procedures that waste both time and money. According to PIDE's Sludge Series, it takes an average of 5.7 months to open a restaurant in Islamabad, requiring one license and four permissions through a tedious, time-consuming, and costly procedure (Haque et al., 2023).

Figure 1: Sludge in Opening a Restaurant in Islamabad, Pakistan



Source: Haque et al. (2023).

Digitalising the restaurant business, including online information access, digital payments, real-time status checks, and automation of various processes, is highly beneficial and can attract international chains, while digital technologies enhance the transparency, accountability, and efficiency of public administrations, thereby increasing citizen trust (Janssen, 2011; Polova, 2022). The utilisation of digital technologies in official food safety control inspections also helps in detecting non-compliances and ensures the recording of consistent and analyzable data during inspections (Griffith, 2006; Kahneman et al., 2021; Zhe & Lee, 2014). Given the current economic landscape of Pakistan, these changes are not only inevitable but also crucial.

Traditional permit methods are time-consuming and costly, creating significant administrative burdens (Haque et al., 2011; Goldsmith & Hendrix, 2018). The study aims to centralise information online, integrate department functionalities, streamline approvals with online submissions, and implement digital payments. Features like real-time status checks and digitised documentation simplify the process, reducing operational costs and inefficiencies (Janssen, 2011; Polova, 2022). These changes can benefit business owners and enhance Pakistan's economic standing.

Despite the significant advantages of digital technologies, their adoption in the public sector remains slow and their potential underutilised, while the hesitation to adapt digital technologies in the public sector can be attributed to behavioural, practical, and economic factors (Bertot et al., 2010; El-Haddadeh et al., 2013; Maiti & Awasthi, 2020; Meijer, 2015).

The intended audience is restaurant business owners who want to register their business in Punjab, Pakistan. This report will give them a solution and explain how exactly we intend to solve the problem of unnecessary sludge they face.

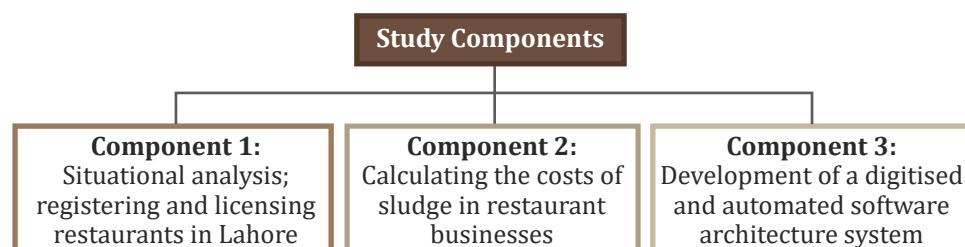
Problem Statement

Restaurant registration and licensing in Pakistan face significant challenges due to a lack of digitalisation and outdated regulatory frameworks, leading to excessive visits, long approval waits, and high costs for food business operators. The system's administrative burdens, or "sludge," cause unnecessary delays, paperwork, and inefficiencies.

Components & Research Objectives

The study is divided into three components, with objectives categorised as follows:

Figure 2: Study Design



Source: Authors' illustration.



Component 1: Situational Analysis; Registering and Licensing Restaurants in Lahore

This component aims to investigate the regulatory challenges faced by restaurant owners in Lahore. By conducting a situational analysis, the study will gather insights into current registration processes, the perceptions of restaurant owners, and areas for improvement.

Primary Goals and Objectives

- 1) Comprehend the regulatory challenges and obstacles faced by restaurant owners during the registration process across various departments and authorities in Lahore.
- 2) Gather detailed insights on the current registration processes across various departments and authorities in Lahore, analyse perceptions of restaurant owners, and identify areas for improvement.
- 3) Gauge and estimate the total costs incurred by restaurant owners during the registration, licensing, and approval procedures across various departments and authorities in Lahore.

Component 2: Calculating the Costs of Sludge in Restaurant Businesses

The objective of this analysis is to quantify the proportion of regulatory burden—referred to as the sludge cost—in setting up a restaurant, expressed as a percentage of the total setup cost and, later, calculated as a percentage of the overall gross national product (GNP) share of hotels and restaurants in the services sector of Punjab, respectively. The sludge cost in this context refers to the extra financial and administrative burden imposed by compliance requirements that restaurateurs must fulfil to begin operations. By determining its percentage relative to total setup expenses, the study aims to highlight the impact of such burdens on restaurant businesses in Punjab, Pakistan.

Primary Goals and Objectives:

- 1) To calculate the regulatory and sludge cost incurred during the setup of a restaurant in Punjab, expressed as a percentage of the total setup cost.



- 2) To calculate the regulatory and sludge cost as a proportion of the GNP contribution of the hotels and restaurants sector within the services industry of Punjab and Pakistan.

Component 3: Development of a Digitalised and Automated Software Architecture System

The goal of this component is to develop a user-friendly digitalised registration system (web application) for restaurant businesses in Lahore. The system aims to simplify the registration procedure, reduce waiting periods, eliminate the need for physical visits, and provide online status checks for applications. It will integrate digital records of inspection reports accessible to all relevant departments and streamline the overall efficiency of the existing system. Key functionalities include online status checks, license acquisition, payment processing, and centralised information access from various regulatory bodies.

Primary Goals and Objectives:

- 1) Develop a process flow mechanism for the web application based on a comprehensive regulatory review to ensure compliance and efficiency.
- 2) Create an easy-to-navigate user interface (UI) and integrate all relevant departments and authorities involved in restaurant businesses into a one-window solution web application system using blockchain.
- 3) Digitalise and automate restaurant registration procedures, including the acquisition of licenses, approvals, certificates, and no objection certificates (NOCs) from relevant departments and authorities. Integrate digital records of inspection reports with access for all relevant departments.
 - a. Reduce complex paperwork by implementing a one-time application process and a one-time fee payment system.
 - b. Decrease the waiting period for restaurant business owners by streamlining processes and reducing bureaucratic delays.
 - c. Eliminate the need for physical visits and waiting in queues by developing an online mechanism for tracking the status of applications.



- 4) Introduce an online grievance redressal mechanism that allows for anonymous complaints without compromising the demographic details of the business owner to other departments.
- 5) Ensure enhanced security and transparency of the registration process by leveraging blockchain technology to create immutable records and prevent tampering or corruption.
 - a. Establish a feedback loop for continuous improvement of the system based on user feedback and evolving regulatory requirements.

Relevance to Public Policy

This research on digitalising and automating administrative procedures for business setups, particularly restaurants, is crucial for public policy in Pakistan. The current system is plagued by bureaucratic inefficiencies, causing delays and increased costs (Hull, 2012). Streamlining procedures through digitalisation aims to reduce this burden, fostering a business-friendly environment and encouraging entrepreneurship (Haque et al., 2023). The manual system's prevalence of corrupt practices, such as bribery and delays, further underscores the need for a digital platform to enhance transparency and accountability, aligning with public policy goals of good governance (Ullah, 2012).

Addressing regulatory barriers identified in the government's "Framework for Economic Growth," such as acquiring electricity, paying taxes, and enforcing contracts, is vital for improving productivity and ease of doing business. This research evaluates these barriers and proposes targeted policy efforts (Kularatne & Lopez-Calix, 2012). The automated system ensures compliance with regulations, improving service and safety standards, particularly in the food industry.

The study's insights can be scaled across sectors and regions, with the digitised registration system for restaurants serving as a model for broader administrative reforms. It supports national initiatives for digital transformation and aligns with policies promoting a Digital Pakistan, enhancing public service delivery and fostering an innovation-driven economy.

2. LITERATURE REVIEW

Digitalisation, automation, and integration aim to streamline administrative processes, thereby reducing bureaucratic inefficiencies and associated costs (Hull, 2012). The shift from paper-based to digital systems standardises data collection and recording, minimising inconsistencies and errors during inspections (Kahneman et al., 2021; Labrique et al., 2013). This efficiency fosters a business-friendly environment, encouraging more entrepreneurs to enter the market (Haque et al., 2023).

Foundational theories in e-governance and public sector innovation highlight that digital technologies can enhance public value by improving service delivery, promoting transparency, and reducing corruption. Studies emphasise that platform-based governance, smart urban governance, and digital-era governance can significantly improve government efficiency, citizen satisfaction, and civic engagement by leveraging real-time data and integrating service delivery channels. The use of advanced technologies such as artificial intelligence, the Internet of Things, robotisation, voice technologies, and blockchain can ensure consistency, reliability, and transparency in regulatory frameworks, ultimately creating a more formal and efficient economic environment (Cordella & Bonina, 2012; Janssen & Estevez, 2013; Meijer & Bolívar, 2016; Margetts & Dunleavy, 2013; Nestorenko, 2022).

E-governance involves the use of information and communication technologies in public administration to enhance information dissemination, improve public services, and foster citizen participation in decision-making, thereby making governments more accountable, transparent, and effective (Linhartova, 2022). Its objectives include improving governmental internal processes, better service provision, increasing transparency to prevent corruption, reinforcing political accountability, and promoting democratic activities through public engagement. It further emphasises democratic processes, involving interactions between government institutions and citizens, enabling participants to express their interests and engage in civic activism through tools like interactive statements, online forums, and mobile services (Margolis & Moreno-Riaño, 2010).

Government procedures often entangle citizens in complex, costly, and time-consuming processes that prioritise bureaucratic needs over public service. For instance, in Chicago, Mayor Rahm Emanuel's 2011 initiative to reform the city's regulatory system revealed a burdensome and outdated permitting process, hindering business growth. The Innovation Delivery Team



identified inefficiencies such as the excessive number of business licenses and prolonged startup times for new restaurants. Technological advancements like electronic permit processing and online portals can transform public sector operations, as seen in Phoenix, Arizona. Phoenix's self-certification program for professionals and the use of electronic plan reviews have significantly streamlined the permitting process. These reforms demonstrate the potential of digitising government procedures to enhance efficiency and service delivery, signalling a need for more widespread adoption of such measures (Goldsmith & Hendrix, 2018).

Implementing digital systems enhances transparency and accountability, reducing opportunities for corruption and improving public service integrity (Ullah, 2012). Digital technologies ensure consistent assessment criteria during inspections, aligning with good governance practices. Using algorithm- and rule-based instructions in digital environments reduces human judgment variability, achieving decision hygiene (Kahneman et al., 2021). This consistency is crucial for regulatory enforcement, ensuring fair and uniform application of laws.

Automated systems help businesses comply with necessary regulations without navigating complex bureaucratic procedures, leading to better regulation and higher service standards, particularly in sensitive sectors like food safety. The primary challenge for economic growth in Pakistan is to address the 'software' issues, which include economic governance, institutions, incentives, and human resources. These elements are seen as more critical than the 'hardware' of physical infrastructure. (Kularatne & Lopez-Calix, 2012).

Research highlights a direct link between streamlined business registration procedures and a reduction in the informal sector, emphasising the need for efficient regulatory frameworks (Djankov et al., 2002). Lawrence Lessig's "dual presence" concept illustrates how software, while operating in virtual spaces, significantly impacts real-world behaviour, akin to physical architecture's regulatory role. Software enforces consistency and fairness by applying predetermined, rule-based decisions automatically, thus minimising human discretion and error. This automation ensures uniformity and efficiency, essential for regulatory purposes where predictability is crucial. However, it also underscores the importance of balancing this rigidity with the flexibility needed for complex, nuanced decisions. The effective design and implementation of software in regulatory frameworks can significantly enhance efficiency, transparency, and accountability while fostering a more formal economic environment (Grimmelmann, 2004).



A multi-country survey study revealed that many Competent Authorities (CAs) in EU countries use digital environments for inspections at retail establishments. This adoption standardises data collection, reduces documentation inconsistencies, and enhances the efficiency of official controls (Grau-Noguer et al., 2023).

Information and Communication Technologies (ICTs) can mitigate corruption by fostering good governance, supporting reform initiatives, minimising corrupt behaviour, improving government-citizen relationships, and enabling citizen tracking and monitoring of government activities (Shim & Eom, 2008). Countries across the Americas, Asia, and Europe have reported success in reducing corruption through e-government (Bhatnagar, 2003; Shim & Eom, 2008). In Fiji, e-government initiatives have positively shifted public perception of government corruption and enhanced the responsiveness of officials to citizen needs (Pathak et al., 2009).

Digital documentation decreases the time required for paperwork and reduces errors linked to manual data entry. In India, putting rural property records online has greatly increased the speed at which the records are accessed and updated, while simultaneously removing opportunities for local officials to accept bribes as had previously been rampant (Bhatnagar, 2003). Furthermore, digital environments enable the automatic generation of inspection reports, immediate sharing with Food Business Operators (FBOs), and secure data storage and access. This automation improves consistency and prevents the loss or misplacement of reports (Grau-Noguer et al., 2023). Additionally, blockchain technology will enhance the reliability and security of orders, bookings, and payments, creating a trusted digital environment, thereby fostering a more efficient and business-friendly regulatory framework (Nestorenko, 2022).

International Best Practices

The following digital portals provide valuable insights and models that align perfectly with our goal of creating a web application for the digitalisation, automation, and integration of relevant authorities and departments in registering and licensing restaurants in Pakistan.



Table 1: International Best Practices

Digital Portal	Description	Key Features
<i>Ministry of Economy's eServices, UAE (MOEC, UAE, 2024)</i>	Comprehensive range of eServices for individuals, businesses, and government entities. Includes trademark registration, consumer protection, commercial control, auditing accounts, etc.	Regulates foreign company branches, applies for patents, handles consumer complaints, renews audit licenses, registers copyright, manages commercial agencies, issues certificates of origin and trade remedy permits, and offers trademark services. Streamlines processes, ensures regulatory compliance, and enhances the business environment.
<i>Basher, UAE's Business Registration Platform (Basher UAE, 2023)</i>	<i>Basher</i> simplifies the business establishment process, allowing investors to set up companies within 15 minutes. Connects with over 60 federal and local government entities to provide commercial license services.	<i>Basher</i> integrates blockchain for security and transparency, offering 14 key services from 18 government entities and private partners. Features include digital signatures, a one-time application, efficient procedures, global accessibility, and strong cybersecurity. No documents are needed during the application. UAE claims <i>Basher</i> can register a business in 15 minutes, compared to 4 days in the UAE's economic department and 10 days in high-income countries (MOEC, UAE, 2024).
<i>Invest-in-Dubai, Dubai's online business registration portal¹</i>	Efficient online service for business registration and trade license acquisition in Dubai. Guides users through selecting the company's legal form, economic activities, partners, trade name reservation, and obtaining initial approval.	Multiple trade license types (normal, instant, trader), blockchain technology for security and transparency, clear fee structure, user-friendly interface, streamlined process ensuring quick completion, facilitates booking and amending trade names, issuing and renewing trade licenses, and amendments or cancellations.
<i>Food Safety Compliance System (FoSCoS), India³</i>	An upgraded version of the Food Licensing and Registration System (FLRS) ⁴ , built	Integrates with other FSSAI IT platforms, like FoSCoRIS ⁵ , Food Safety Connect, and others, aiming to evolve into a unified compliance platform, offering various

² Invest-in-Dubai web application can be accessed from <https://app.invest.dubai.ae/>

³ The Food Safety Compliance System (FoSCoS) can be accessed from <https://foscos.fssai.gov.in/about-foscos>

⁴ FLRS (Food Licensing and Registration system) is an online system launched by FSSAI to facilitate FBO in India to apply for License/ Registration certificate and can track their applications. 35 States/UTs have been issuing License/ Registration certificate online. Can be accessed from <https://foodregulatory.fssai.gov.in/flrs>



Digital Portal	Description	Key Features
	with modern technology for a pan-India platform for food safety regulatory needs.	licenses based on turnover and nature of operations ⁶ , online filing of annual returns, integration with inspection reports, rationalisation of required documents, online declarations, clear business category segregation, and streamlined process, minimising physical documentation. ⁷
<i>Provision of Food Permits, New York City⁸</i>	Food service establishments must obtain a permit from the Department of Health and Mental Hygiene (DOHMH). Requires a Food Protection Certificate (FPC) for supervisory managers.	User-friendly design, online payment option, emphasis on food safety through qualified management, unannounced inspections, clear fee disclosure, flexible scheduling mechanism, temporary licenses with certification deadlines, simplifies permit application process, and ensures convenience for business owners.
<i>Online web-application portal for food business premises, Prince Edward Island, Canada⁹</i>	Requires a license for any site where food is prepared and/or served to the public. Quick and user-friendly application process.	Accepts multiple payment methods, detailed guidance and resources, clear cost clarification based on food service type, real-time application status tracking, issuance of printed license copy within two weeks of inspection, streamlined process reducing administrative barriers, and focus on enhancing user convenience.

⁵ Food Safety Compliance through Regular Inspections and Sampling (FoSCoRIS) is a system to verify compliance of food safety and hygiene standards. <https://foodregulatory.fssai.gov.in/foscris>

⁶ Eligibility criteria are found to be diverse, based on the turnover of the business. Can be accessed from <https://foscos.fssai.gov.in/assets/docs/KindofBusinessEligibilityLatest.pdf>

⁷ [How to apply for License_registration_certificate.pdf](https://fssai.gov.in/) (fssai.gov.in)

⁸ <https://nyc-business.nyc.gov/nycbusiness/description/food-service-establishment-permit>

⁹ Prince Edward Island, Canada; We-application to operate a Food Premises available at <https://services.princeedwardisland.ca/en/service/application-operate-food-premise#/service/GenericWebformSubmission/GenericWebformGenerateTransactionID>



Digital Portal	Description	Key Features
EduBlock (Haveri et al., 2020)	Uses blockchain technology (Ethereum) and IPFS storage to securely store and verify student documents. Addresses authenticity concerns with hashed IDs.	Performance analysis of Ethereum blockchain, proof-of-stake consensus mechanisms, secure document storage and verification, cross-referencing with blockchain hashes, a model for integrating blockchain technologies, and insights for enhancing a website's functionality and security.
SPROOF ¹⁰	Issues and verifies documents on a public blockchain, ensuring security and transparency. Uses distributed hash tables (DHT) and public/private channels for document issuance and sensitive information transfer.	Prevents malicious attacks, maintains data integrity through blockchain technology and Web of Trust framework, strategies for handling data size restrictions, secure channels for document handling, and relevant insights for managing and authenticating digital documents efficiently.
LEAP Platform ¹¹ by Securities and Exchange Commission of Pakistan (SECP) ¹²	Seamless and efficient platform for registering companies and Limited Liability Partnerships (LLPs). Simplifies the registration process and ensures security.	User-friendly interface, facilitates company or Limited Liability Partnerships (LLP) incorporation, file compliance, manages business needs efficiently, streamlined process, integrated services from multiple authorities, reduces administrative burdens, saves time, enhances transparency and security, digital signature implementation, and one-time application for multiple services.

¹⁰ SPROOF: A platform for issuing and verifying documents in a public blockchain." Available: <https://www.scitepress.org/Papers/2019/72456/72456.pdf>

¹¹ eZfile Can be accessed from <https://leap.secp.gov.pk/#/profile/dashboard/overview>

¹² Can be accessed from <https://eservices.secp.gov.pk/eServices/>



3. REGULATORY REVIEW

In this section, regulations and policies governing restaurant registration and operations in Lahore are discussed. It analyses laws of various regulatory bodies, identifying key requirements, penalties, and constraints faced by restaurant owners.

Department of Tourist Services (DTS)

The Department of Tourist Services was established in 1976 as an attached department of the Federal Ministry of Tourism, to cater for the different requirements of the tourism industry and to ensure the quality of services provided by hotels, restaurants and travel agents. It does so through the implementation of the following three acts formulated to regulate and control certain aspects of the tourism industry in the Country, as (i) The Travel Agencies Act, 1976 and Rules 1977, (ii) The Hotels and Restaurants Act, 1976 and Rules 1977, and (iii) The Tourist Guides Act, 1976 and Rules 1996.

Table 2: Processes, Requirements, & Fees for Restaurant Registration/Licensing by DTS ¹³

Process	Documents Required	Fee	Frequency
Registration	Prescribed application form duly filled in (download prescribed application form) ¹⁴	PKR 1,600 - PKR 20,000 depending on air-conditioning status and seating capacity, and city ¹⁵	One-time
	Building Map		
	Rules of establishment		
	Medical fitness certificate of staff		
	Qualification and experience certificates of the GM, manager and other staff		
Grant of License	Building map	PKR 1,600 - PKR 10,000	Annual
	Rules of establishment	depending on air-conditioning status and seating capacity and city	
	Medical fitness certificate of staff		
	Qualification and experience certificates of the GM, manager and other staff		

¹³ This summary represents only the registering and licensing processes of the restaurants, while the department also deals with the registration and licenses of the Hotels and Travel Agencies respectively. The details can be accessed from <https://tourism.punjab.gov.pk/services#restaurant-registration>

¹⁴ Application form can be accessed from <https://tourism.punjab.gov.pk/system/files/Form%20G%20%28Restaurants%29%206.pdf>

¹⁵ Refer to Schedule III under Rule 8(2) in Pakistan Hotels and Restaurants Rules 1977



Process	Documents Required	Fee	Frequency
License Renewal	Paid the challan for the renewal fee and original license, along with a request letter, before the expiry date of the license	PKR 1,600 - PKR 10,000 depending on air-conditioning status	Annual
Spot Checking of Services	Conducted to ensure compliance with parameters and benchmarks provided in the Act and rules.	N/A	Random
Imposition of Fines and Penalties	Upon defaulters based on spot-check findings.	Varies based on the violation	As needed

Source: Authors' compilation.

Pakistan Hotels and Restaurants Act 1976

The Pakistan Hotels and Restaurants Act, 1976 (Act No. LXXXI of 1976) regulates the standards of service and amenities for tourists in hotels and restaurants. In the case of Punjab and other provinces, the application for registration has to be submitted to the controller appointed by the Federal Government for this Act. The application is processed and approved by the controller or the designated authority. The owner must apply to the controller within two months of the Act becoming applicable to the restaurant. The application should include a request for registration and determination of fair rates. The controller or an authorised officer may inspect the premises and call for any necessary information, plans, or data. They may also conduct tests on articles, appliances, or foodstuffs at the cost of the owner.

Table 3: Pakistan Hotels and Restaurants Act, 1976

Section	Statement
5(1)	The owner of every hotel and restaurant shall apply to the Controller for registration of his hotel or restaurant and for the determination of fair rates.
5(2)(a)	No hotel or restaurant shall be registered unless it conforms to the prescribed standard of health, hygiene, and comfort.
5(3)	The Controller may inspect the premises of a hotel or restaurant at any time.
5(2)(a)	The Controller may allow provisional registration of a hotel or restaurant under certain conditions.
7(1)	Every owner shall obtain a license from the Controller after registration of their hotel or restaurant.
7(2)	No owner shall carry on his business without first obtaining a license.



Section	Statement
7(3)	A license shall remain in force for one year and may be renewed annually.
8(1)	The Controller may refuse to register a hotel or restaurant if it does not conform to the minimum prescribed criteria.
8(2)	The registration and license of a hotel or restaurant may be cancelled or suspended if certain conditions are violated.
9	Upon transfer or assignment of a registered restaurant, the new owner shall report to the Controller and obtain a fresh license.
10(1)	The Controller may fix fair rates for services provided in a hotel.
10(5)	The Controller may revise fair rates from time to time.
13	Fair rates and rules of the establishment shall be displayed in a hotel.
25(1)	Any person aggrieved by an order under this Act may prefer an appeal to the Deputy Controller, Controller, or prescribed appellate authority.
25(2)	The Federal Government may, on its own motion or on application, pass orders in relation to appeals.

Source: Pakistan Hotels and Restaurants Act, 1976.

Pakistan Hotels and Restaurants Rules 1977

The Pakistan Hotels and Restaurants Rules, 1977, regulate hotels and restaurants in Pakistan. The rules establish a committee to advise the Federal Government on classification, fair rates, and related matters. They also set procedures for registration and licensing, and standards for health, hygiene, and comfort.

Table 4: Pakistan Hotels and Restaurants Rules, 1977

Regulatory Aspect	Existing Rule
Application Form	Form G for restaurant registration, to be submitted in a hard copy original file and can be downloaded.
Submission	Submit the form physically to the controller.
Payment	Payment of registration and license fees as specified in Schedules III and IV to be deposited in a scheduled bank.
Processing Time	The controller makes inquiries and conducts inspections, directs the owner to deposit fees, and submits bank receipts within fifteen days.
Documentation	Certificate of medical fitness in Form I required from a registered medical practitioner
Registration License	The controller grants a registration certificate in Form L for a restaurant and issues a license in Form N.



Regulatory Aspect	Existing Rule
<i>Compliance</i>	If the hotel or restaurant does not conform to the standard, the controller may refuse registration.
<i>Renewal of Licenses</i>	The owner may apply for license renewal at least fifteen days before expiry, failing which the license stands cancelled.
<i>Appeals and Revisions</i>	Any person aggrieved by an order passed by the controller may appeal to the Joint Secretary of the Tourism Division, Islamabad.

Source: Pakistan Hotels and Restaurants Rules, 1977.

The process of registering a restaurant in Pakistan, as outlined in the Hotels and Restaurants Act, 1976, involves a detailed application process with specific requirements and documentation. The process of registration is found to be bureaucratic, and as per the rules, the documents are required to be furnished to the controller's office, and later, the approval is made by the controller.¹⁶ This process is traditional and requires the physical submission of documents to government authorities. The approval process may also involve multiple visits and approvals from various departments. The application form can be downloaded, filled manually and has to be submitted to the controller's office along with the prescribed challan form (Form G- Rule 7, Hotels and Restaurants Act 1976).

The Punjab Food Authority

The Punjab Food Authority (PFA) is a government agency in Punjab, Pakistan, established under the Punjab Food Authority Act of 2011 to oversee food safety and hygiene across the province. Operational since July 2012 in Lahore, it enforces food quality standards through a team of qualified food safety officers and is supervised at the district level by a Deputy Director of Operations. Additionally, the PFA offers an online portal for food business operators to conveniently obtain licenses and register their products.¹⁷

¹⁶ According to Hotels and Restaurants Act of 1976, 2(c), means a controller appointed under Section 3 and includes a deputy controller and an assistant controller and such other person as may be authorised by the Federal Government by notification in the official Gazette to perform all or any of the functions of the controller

¹⁷ PFA online portal can be accessed from <https://cell.pfa.gop.pk/>

Punjab Food Authority Act, 2011

The Punjab Food Authority Act, enacted in 2011, establishes the Punjab Food Authority (PFA) with the mandate to regulate and monitor the food business to ensure the provision of safe food. The Act empowers the PFA to formulate standards, procedures, and guidelines related to food, including licensing, recall procedures, and enforcement systems.

Table 5: Punjab Food Authority Act 2011

Section	Statement
7(2)(d)	Specify licensing, prohibition orders, recall procedures, improvement notices or prosecution.
7(2)(k)	Levy fee for registration, licensing, and other services.
12(1)	The Food Authority may, by notification, appoint Food Safety Officers for such areas as it may assign to them.
13(1)(c)	Enter or seal any premises where he believes any food is prepared, preserved, packaged, stored, conveyed, distributed or sold, examine any such food and...
15(1)	A person shall not use any place for a food business except under the prescribed registration or license.
16(1)	If a Food Safety Officer has reasons to believe that any food operator has failed to comply with any provisions of this Act, the rules or the regulations...
18(1)	If the Food Safety Officer is satisfied that the health risk condition exists with respect to any food business, he may, after serving a notice on the food operator and for reasons to be recorded in writing, restrain him from carrying on the food business...

Source: Punjab Food Authority Act 2011.

The Food Authority (Product Registration & Display of PFA Logo) Regulations, 2017

The Food Authority (Product Registration & Display of PFA Logo) Regulations, 2017 were enacted under the Punjab Food Authority Act, 2011. Food Business Operators (FBOs) must register all food products with the Food Authority, obtain a Certificate of Product Registration (CPR), and display the PFA logo. The CPR, issued within three weeks if standards are met, requires an application, a non-refundable fee, and product details. Non-compliant products can prompt reviews, and CPRs may be revoked for violations. Use of the PFA logo, obtained for a marking fee, is mandatory, ensuring adherence to food safety, quality, and hygiene standards.



Table 6: The Food Authority (Product Registration & Display of PFA Logo) Regulations, 2017

Section	Statement
6	Certificate of Product Registration (CPR) shall be issued once the Food Authority is satisfied that the product conforms to the food safety, quality, and other standards as laid down in the rules or regulations.
8	Every food business operator shall submit an application for the CPR on the prescribed format, supported with the following...
10	Upon receipt of an application for product registration, the competent authority may issue the Certificate of Product Registration within three weeks if the product conforms to the food safety and quality standards. After issuance of the CPR, the sampling of the products may be carried out periodically for analysis.
15	If the CPR is issued for the food product, the usage of the logo of the Punjab Food Authority (PFA) on the food product may be provided to Food Business Operators on the payment of a marking fee as prescribed by the Competent Authority.

Source: The Food Authority (Product Registration & Display of PFA Logo) Regulations, 2017.

Metropolitan Corporation of Lahore (MCL)

Metropolitan corporations serve as essential governing bodies responsible for ensuring the smooth functioning of urban areas. The metropolitan corporation is a local government body functioning under the Punjab Local Government Act of 2022 (Act XIII of 2022). The Municipal corporation oversees infrastructure, public utilities, and law enforcement, playing a key role in restaurant registration, operation, and compliance. It enforces regulations on hygiene, waste management, zoning, and public safety to safeguard public health. Under the Punjab Local Government Act of 2019, Lahore's district falls under the Metropolitan Corporation Lahore (MCL).

Punjab Local Government Act 2022

The table below summarises key sections and sub-sections of the Punjab Local Government Act of 2022 (XIII of 2022) that are relevant and applicable to restaurant registration, operation, and compliance through a metropolitan corporation.



Table 7: Functions of MCL Prescribed under the Punjab Local Government Act, 2013

Section	Function and Applicability to Restaurants
30(1)(a)	Enforce municipal laws, rules, and by-laws: Restaurants must comply with food safety regulations, hygiene standards, and local by-laws.
30(1)(b)	Approve and collect taxes, fees, and rents: Restaurants are required to pay local taxes, licensing fees, and other applicable charges.
30(1)(d)	Prepare budgets and development plans: Affects property tax assessment and allocation of municipal resources for commercial areas.
30(1)(f)	Prosecute violators of municipal laws: Ensures compliance with food safety, zoning, and waste management standards; legal action for violations.
30(1)(h)	Maintain public records and provide access to information: Facilitates transparency in restaurant registrations and permits.
30(1)(j)	Create awareness about health and social issues: Municipal campaigns on food safety and hygiene benefit restaurants by fostering compliance and customer trust.
30(1)(k-l)	Prepare and enforce zoning and land-use plans; control land use for commercial markets: Regulates restaurant locations, ensuring compliance with zoning policies.
30(1)(m)	Exercise building control: Ensures restaurants meet structural and safety standards during construction and renovations.
30(1)(o)(i-iv)	Provide water supply, sewage, sanitation, and waste disposal services: Essential utilities like clean water, drainage, and waste management impact operations.
30(1)(p)	Manage traffic planning and public transport: Facilitates customer access and parking for restaurants in commercial areas.
30(1)(q)	Provide firefighting services: Restaurants must meet fire safety standards and benefit from quick emergency responses.
30(1)(r)	Assist in disaster relief: Offers support during health emergencies or natural calamities affecting restaurant operations.
30(1)(t-u)	Manage and lease municipal properties: Regulates public spaces leased to restaurants and ensures adherence to leasing rules.
30(1)(v)	Establish incubation centres for small businesses: Supports small-scale restaurant startups with municipal resources.
30(3)	Develop an Economic Development Strategy: Promotes restaurant growth, attracts investment, and fosters local economic development.

Source: Authors' compilation.



Applicable Taxes and Fees for a Restaurant Business

The following table gives relevant taxes and fees from the Fourth Schedule of the Punjab Local Government Act of 2022 that apply to the registration, operation, and functioning of a restaurant within a metropolitan corporation or other local government domains.

Table 8: Taxes and Fees Applicable to Restaurant Businesses

Category	Applicable Taxes and Fees
<i>Property and Land</i>	Tax on urban immovable property
	Tax on transfer of immovable property
	Fee for the change of land use of a land or building
<i>Utility Services</i>	Water use charges/fee
	Drainage rate
	Conservancy rate
<i>Licensing and Permits</i>	Fee for licenses, sanctions, and permits
	Fee for approval of building plans, erection, and re-erection of buildings
	Fee for compounding of offences and violations governing its functioning
<i>Advertising</i>	Fee for regulation of advertisements through signs, banners, billboards, or electronic display systems (LED/SMD)
<i>Parking and Facilities</i>	Toll fee on roads, bridges, and ferries maintained by local governments
	Parking fee
<i>Other Services</i>	Fee for specific services rendered by the office of the local government or any of its authorities, agencies, or companies
	Fee for installation of base transceiver station/tower
	Any other tax, fee, or levy authorised by the government

Source: Authors' compilation.

Below is a compilation of fines from the Eighth Schedule of the Punjab Local Government Act of 2022 (Act XIII of 2022) that apply to restaurants for their operation and functioning:

Table 9: List of Offences and Fines under MCL Applicable to Restaurant Businesses

Sr. No.	Offence	Fine Amount
1	Fixing of wooden khokhas or temporary shops/extension on footpaths or beyond the street line.	PKR 4,000
4	Slaughtering animals for the sale of meat at a place other than designated by the local government.	PKR 4,000
5	Allowing sink, sewer, cesspool, or offensive matter to flow into unauthorised areas.	PKR 5,000 (commercial concerns)
19	Throwing or placing refuse, litter, or garbage in unauthorised areas.	PKR 1,000
20	Failure to provide for the proper disposal of litter or garbage inside/outside a shop.	PKR 1,000
21	Failure to maintain the clean premises of the shop area up to the adjoining public street or road.	PKR 2,000
24	Failure to maintain or clean latrines, drains, cesspools, or other refuse receptacles.	PKR 3,000 (commercial concerns)
26	Damaging or polluting the physical environment endangering public health.	PKR 4,000 (public premises)
29	Failure to repair leaks in water pipes or fittings causing water pools and mosquito breeding.	PKR 2,000
30	Failure to maintain water troughs/pipes in good condition for receiving or carrying sullage.	PKR 2,000
32	Unauthorised advertisement on public or private buildings.	PKR 10,000
33	Displaying obscene advertisements.	PKR 20,000
34	Loud music, horns, or drums in violation of local prohibitions near hospitals or schools.	PKR 5,000
35	Loud shouting or abusive language causing public distress.	PKR 2,000
42	Contravention of any prohibition or direction issued by the local government.	PKR 1,000

Source: Authors' compilation.

Chapter VIII of the PLGA 2022 grants metropolitan corporations administrative and financial oversight of municipal services delivered by entities like parks and horticulture authorities, development authorities, WASA, TEPA, and waste management companies. They can approve policies, taxes, and fees, ensuring coordinated service delivery.



Lahore Development Authority

The Lahore Development Authority (LDA) was created under the Lahore Development Authority Act of 1975, duly approved by the Punjab Legislative Assembly. Previously, it was the Lahore Improvement Trust. LDA functions as a regulatory body for land-use, infrastructure and other urban development affairs, having a diverse range of functionalities.

Restaurant registration with the LDA begins with submitting a written application confirming the property's commercial designation. The LDA forwards the application to departments like Town Planning, EPA, TEPA, and WASA for NOCs. Restaurant owners provide required documents, pay fees, and undergo inspections to ensure compliance. Once inspections are complete, NOCs are issued, enabling the LDA to grant the completion certificate and commercialisation certificate.

For commercialisation approval, several documents are mandatory. Table 10 provides the listing of the required documents for each certificate.

Table 10: List of Documents Required for Commercialisation Certificates and Building Plans

Certificate	Required Documents
<i>Commercial Completion Certificate</i>	<ul style="list-style-type: none"> - Application to DIRECTOR TOWN PLANNING signed by all Owners - BR-15 Form signed by all Owners - ID Card copies of all Owners - Approved building plan copy
<i>Approval of Building Plans (LDA Scheme)</i>	<ul style="list-style-type: none"> - Copy of CNIC (attested copy) - Possession Letter (Issued by the LDA) - Transfer/allotment letter (Issued by LDA) - Sub-division/amalgamation letter (if applicable) - Forms A & B - Affidavit on a PKR 100 stamp paper - Basement affidavit on a PKR 100 stamp paper (if applicable) - Undertaking for damages on PKR 1,000 stamp paper - Building plans (03 ammonia prints and 01 cloth-mounted copy) - Valid NOC and building period from the LDA - In case of frame structure: vetted structure drawings and Certificate from Structural Engineer on LDA Panel



Certificate	Required Documents
<i>Completion Certificate</i>	<ul style="list-style-type: none">- Application to the Director of Town Planning signed by all Owners- BR-15 Form signed by all owners- ID Card copies of all owners- Approved building plan copy- Original LESCO bill with connection date- Ownership documents- PT-1 Form- Civil defence certificate- For buildings above 48 feet high:<ul style="list-style-type: none">- FBR Certificate- 6-A Form- Evacuation plan drawing vetted by the Civil Defence Authority- NOC from TEPA

Source: Lahore Development Authority.

The processing fee for commercialisation approval is generally calculated using the formula:

$$DC \text{ Rate} \times 20\% \times \text{Area (sq ft)}$$

The challan generated from this calculation can be paid through a pay order or directly at the bank. Upon submission of all required documents and payment, the applicant receives the commercialisation certificate, complete with necessary stamps to confirm approval.

Traffic Engineering & Transport Planning Agency

The Traffic Engineering and Planning Agency (TEPA), functioning under the Lahore Development Authority (LDA), plays a vital role in regulating land utilisation for parking in commercial, industrial, public, and apartment buildings. TEPA was created in accordance with Section 7(2)(xvi) of the Punjab Development of Cities Act of 1976 (Act XIX of 1976). It ensures that sufficient parking facilities are available to facilitate better traffic management and customer convenience. The Chief Engineer of TEPA oversees these processes, including issuing the essential NOC required for using spaces for parking as part of any commercial activity.



To execute a parking agreement, particularly for E-Khidmat cases (an online facilitation platform), applicants must submit the necessary documents following a comprehensive checklist. This process ensures compliance with TEPA's standards, aiding in urban planning and reducing congestion. Below is the detailed checklist for executing a parking agreement for buildings with fewer than five storeys or plot areas smaller than four kanals.

Table 11. Checklist for Execution of Parking Agreement (E-Khidmat Cases), TEPA

Required Document	Details
Application addressed to Chief Engineer TEPA	A formal application for the execution of a parking agreement.
Ownership documents	Copy of the ownership documents of the property.
Commercialisation letter	Issued by the concerned department or authority, if applicable.
Copy of the CNIC	Attested copies of the CNIC of the owner(s).
Power of attorney	Original power of attorney and attested copy of the CNIC of the authorised representative (if applicable).
Architectural drawings	Three sets of drawings (plotter size), signed and stamped by the owner(s) and architect.
Parking agreement on a stamp paper	Minimum PKR 3,000 value, including signatures and thumb impressions of the owner(s), authorised representative, and witness as per the provided format.
Attested CNIC of witness	Attested copies of CNICs of witnesses signing the parking agreement.
Affidavit on PKR 300 stamp paper	To be provided by the owner(s) and/or authorised representative, as per the provided format.
Contact details	For correspondence and site visit.
Copy of E-Khidmat slip	Proof of submission via the E-Khidmat portal.
Fee for processing and executing the NOC	PKR 100,000 for all types of buildings.

Source: Traffic Engineering & Transport Planning Agency (TEPA).

Environmental Protection Authority

The Environmental Protection Authority (EPA) is a vital regulatory body under the Government of Punjab, formulated under the Punjab Environmental Protection Act, 1997 (as amended up to 2017). Its mandate is to oversee and ensure environmentally responsible practices across diverse industries, including the hospitality sector. For restaurants, compliance with environmental regulations is a critical step toward lawful operation, safeguarding public health and environmental sustainability.

EPA conducts an Initial Environmental Examination (IEE) for restaurants and other businesses. This process evaluates potential environmental impacts before approving the functioning and operation of establishments. This ensures that businesses align with Punjab's environmental standards, thereby fostering a sustainable ecosystem.

The process of obtaining a No Objection Certificate (NOC) from the Environmental Protection Department (EPD) is a structured approach to ensure that businesses, including restaurants, comply with environmental regulations before commencing operations. It begins with the submission of essential documents, including proof of land ownership, a detailed business budget, and an approved map from the Lahore Development Authority (LDA). Following this, the Punjab Environmental Protection Agency (EPA) conducts a site visit and performs an Initial Environmental Examination (IEE) to evaluate the environmental impact of the proposed establishment. Upon satisfactory clearance of the IEE, the EPA issues the NOC, allowing the business to operate legally. The issuance of the NOC involves a processing fee of PKR 15,000. Once the NOC is obtained, the business can commence operations, with EPD intervening during the operational phase only if complaints or violations are reported.



Punjab Environmental Protection (Administrative Penalty and Compounding of Offences) Rules, 2020

Under the Punjab Environmental Protection (Administrative Penalty and Compounding of Offences) Rules, 2020, non-compliance with Section 12 of the Act, i.e., the failure to conduct an IEE or obtain an NOC, results in penalties.

Penalty Computation Formula (Base Penalty for Non-compliance)¹⁸

For contraventions lasting less than a year:

$$\text{Base Penalty} = [\text{Minimum Penalty}] + \left(\frac{Y \times D}{365} \right)$$

For contraventions over multiple years:

$$\text{Base Penalty} = [\text{Minimum Penalty}] + \left(\frac{Y \times D}{365} \right) + (\text{Yearly Hazard Factors}) + \left(\frac{Y' \times D'}{365} \right)$$

Restaurants are classified under Hazard Level 2, with a Minimum Penalty of PKR 40,000.¹⁹

Labour and Human Resource Department, Punjab

The Labour & Human Resource Department, Punjab, established under the Punjab Government Rules of Business, 1974, is dedicated to promoting the welfare and protecting the rights of the province's labour force.

Punjab Domestic Workers Act, 2019

The Punjab Domestic Workers Act, 2019, primarily governs domestic workers but contains provisions indirectly applicable to restaurant businesses employing workers, especially regarding labour rights, wages, and working conditions. Below is a table summarising the relevant sections and sub-sections:

¹⁸ Penalty components in the formula include: Hazard Factor, indicating project risk level; Duration of Contravention, the total non-compliance period; Base Fine, derived from tables in the Rules; D, days of contravention in the initial year; D', days in the final year; Y, value from Table 3 (Schedule II) for the initial year; and Y', value from Table 3 for the resolution year.

¹⁹ See Schedule II (j)(ii) Commercial Buildings, Restaurants, Marriage Halls. of the Punjab Environmental Protection (Administrative Penalty and Compounding of Offences) Rules, 2020.



Table 12: Punjab Domestic Workers Act of 2019 – Relevant laws

Section	Provision
3	Prohibition on employment of children under 15 and restrictions on work for those under 18
4(1)	Prohibition of bonded or forced labour
4(2)	Non-discrimination in employment, wages, and benefits
5(1)	Issuance of an employment letter specifying terms, wages, and the nature of work
5(5-6)	Working hours limited to 8 hours/day or 48 hours/week; overtime compensation required
6	Entitlement to weekly holidays, sick leave, and festival holidays
7	Wages during leave or holidays
8	Minimum wage requirement
9	Maternity benefits for female workers
11	Annual medical examination and vaccination
12	Notice of accidents leading to death or injury
13	Termination notice or compensation
18	Timely wage payments
19	Prohibition of wages below the minimum rate
21	Employer registration
25-27	Dispute resolution and appellate mechanisms
35-36	Powers of labour inspectors

Source: Punjab Domestic Workers Act of 2019.

Punjab Occupational Safety and Health Act, 2019

The Punjab Occupational Safety and Health Act, 2019, establishes regulations to ensure safe working conditions and promote health at workplaces, including restaurants. Below is a summary of applicable sections and sub-sections relevant to the functioning, operation, and employment practices of restaurant businesses:



Table 13: Punjab Occupational Safety and Health Act of 2019 – Key Provisions

Section	Provision and Relevance to Restaurants
3(1)(a-n)	Employers must ensure safety, health, hazard control, training, and emergency measures to provide a safe, clean environment with adequate safety and training for employees.
4(a-e)	Employees must follow safety protocols and report hazardous conditions to ensure personal and workplace safety.
8(a-t)	Restaurants must comply with guidelines for structural safety, ventilation, hygiene, fire safety, and emergency preparedness.
9(a-b)	Establishments must have a documented safety policy, approved by the Chief Inspector, addressing workplace hazards.
10(a-b)	Restaurants with over five employees must elect safety representatives and appoint a competent safety officer.
11(1-2)	Hygiene cards and regular medical exams are required to prevent disease outbreaks among employees.
12	Sites, buildings, and alterations must be registered and approved before operation.
13(1-7)	Restaurants must record accidents and notify authorities within 24 hours for severe incidents.
15(a-k)	The Occupational Safety and Health Council oversees inspections, complaints, and advisory services to ensure compliance.
24(1-2)	Key safety information and emergency contact details must be prominently displayed in English and Urdu.
25	Safety-related records and documents must be preserved for at least five years for inspection purposes.
19(1-8)	Violations may result in fines up to PKR 100,000, depending on severity and recurrence.
28	Restaurants must transition to compliance with the Act within one year of its enforcement.

Punjab Police (Local Police)

The Punjab Police, functioning under the Government of Punjab, is entrusted with ensuring public safety, maintaining law and order, and supporting government authorities in the enforcement of regulations.

Police Order, 2002

The Police Order, 2002, serves as the foundational document outlining the duties, powers, and responsibilities of the police. It empowers them to protect life and property, enforce laws, assist in emergencies, and support regulatory bodies in executing their mandates, ensuring smooth governance and public welfare. The table below summarises the applicable sections and their relevance.



Table 14: The Police Order of 2002 – Key Provisions

Section	Provision and Relevance to Restaurants
4(a-b, d)	Police must protect life, property, and liberty, preserve public peace, and prevent offences, ensuring public safety and law compliance in restaurant operations.
4(l, n)	Police can inspect restaurants for compliance with municipal, health, and labour regulations and enforce relevant laws.
4(o)	Facilitates collaboration with agencies like labour welfare and municipal authorities to ensure safety and order in restaurants.
5	Police can enforce regulations during emergencies affecting restaurant operations, such as health crises or labour disputes.
34	Police assist municipal bodies, labour departments, and health authorities in enforcing regulations on restaurants.
119	Police can issue directives for restaurants to comply with public safety or emergency protocols.
120	Enables police to mandate actions, such as temporary closures for health or safety violations.
124	Police can address disturbances or non-compliance at restaurants classified as public entertainment venues.
126	Allows police to search restaurants if there are credible concerns about illegal activities, such as the storage of illicit materials.
127-128	Additional police can be deployed to maintain order during large events or disturbances involving restaurant premises.

Provision of Police Character Certificate

The Punjab Police, through PKM, has simplified obtaining Police Character Certificates and registering employees. Citizens can apply for certificates at any PKM Centre in Punjab with basic documents, a fee of PKR 350, and a three-day processing time. Employee registration, required for hiring domestic workers, is free and takes 15–20 minutes. These initiatives improve convenience and enhance police record-keeping and community safety.

Defence Housing Authority (DHA)

DHA Lahore is a regulated residential and commercial area in Lahore, with its own administrative framework. It operates with limited external government involvement. The rules and regulations for business establishment, registration, and operation in DHA Lahore differ according to the DHA's Construction & Development Regulations, 2014. The specific regulations for restaurant businesses are compiled in a table.



Table 15: General Regulations for Restaurant Establishment and Operation in DHA

Rule/Regulation	Description
General Requirements for Restaurant Establishment and Operation	
<i>Definition (26)</i>	Defines restaurants as part of commercial buildings.
<i>Building Plan (Section 15)</i>	Approval of building plans and drawings by the DHA Building Control Branch, signed by a registered architect.
<i>Construction Approval (13)</i>	Approval required for construction, additions, alterations, or renovations.
<i>Use of Land (14)</i>	Land use must match the approved purpose specified in the allotment letter.
<i>Completion Certificate (45)</i>	A completion certificate issued after inspection ensures construction matches approved plans.
Specific Construction Guidelines	
<i>Covered Areas (24b)</i>	Allows 100% covered area for ground floor commercial buildings, with mezzanine covering 70%.
<i>Clear Spaces (22)</i>	Minimum clear spaces and setbacks required for specific plot sizes.
<i>Basement Use (35a)</i>	Basements in commercial buildings may be used for parking or other approved purposes.
<i>Height Restrictions (23)</i>	Maximum permissible height for commercial buildings varies based on the plot size and location in DHA phases.
<i>Grease Trap (35j)</i>	Layout must include a grease trap and proper sewerage management.
Operational Requirements	
<i>Safety Features (35t)</i>	Commercial buildings must install fire alarms, fire extinguishers, and safety systems.
<i>Gas Cylinder Placement (35t-3)</i>	Gas cylinders must be placed on the rooftop and sourced from OGRA-approved vendors.
<i>CCTV Installation (35t-2)</i>	Mandatory CCTV cameras with at least two weeks of recording covering inside and outside premises.
Approval and Inspection	
<i>Drawing Scrutiny (16)</i>	DHA scrutinises drawings for conformity within 30 days.
<i>Inspection (19)</i>	DHA officials can inspect premises during construction or operation without notice.
<i>Stage Verification (18)</i>	Construction must be verified by DHA at key stages, including layout, roof pouring, and completion.



Rule/Regulation	Description
Penalties and Offences	
Offense	Penalty/Fine
<i>Demolition without Permission (13c-ii)</i>	PKR 300,000 fine for unauthorised demolition.
<i>Construction Violations (43)</i>	Violations may result in fines, demolition, or restoration costs imposed by DHA.
<i>Unauthorised Sewerage Connection (12c)</i>	Fine as prescribed by DHA.
<i>Unauthorised Ramp Construction (35m)</i>	<i>Ramps not permitted in commercial buildings; violators are fined.</i>

Moreover, there are several steps to obtain a completion certificate, an alternative to the commercialisation completion certificate as issued by LDA. The following are the details of the certificate acquisition, along with the procedure to obtain the certificate.

Table 16: Instructions for Obtaining a Completion Certificate in DHA Lahore

Service	Timeline	Charges	Delivery
<i>Completion Certificate</i>	21 working days (subject to no violations)	PKR 7,000	Certificate will be delivered to the applicant's address.
Procedure			
Step	Description		
1	Fill out the Building Completion Performa (downloadable from DHA E-Services Portal).		
2	Submit an application addressed to the Director of Building Control on plain paper.		
3	Attach the following documents: <ul style="list-style-type: none"> - 2 identical colored photographs (6" x 4" size) of the front elevation of the house/building. - For corner plots: 2 additional side elevation photographs (6" x 4" size). - 2 sets of approved drawings (ammonia Prints). - Original paid challan for completion certificate fee. - Photocopy of paid challan for late completion charges (if applicable). - Photocopy of paid challan for water & sewerage connection. - Photocopy of DHA sewerage opening letter or last paid water & sewerage bill (if in Phase VIII). - Photocopy of paid challan for sewer tempering charges (if applicable). 		



Procedure	
Step	Description
	- Photocopy of the CNIC of the owner or DHA special power of attorney holder.
4	If changes or deviations from the approved drawings exist, submit revised drawings for regularisation.
5	DHA field staff will inspect the property to confirm adherence to approved drawings and check for violations.
6	If no violations are found, the completion certificate will be issued. If violations exist, observations will be communicated.
7	Failure to obtain the certificate within the prescribed time will result in a fine as per DHA regulations.
8	Transfer of property (even via <i>hiba</i>) will not be processed without a completion certificate.
9	A completion certificate can also be applied for via the DHA E-Services Portal.

Summarising the Relevance of Authorities

While the primary focus of restaurant registration and licensing involves ensuring that the restaurant operates legally and safely, several functions of the various authorities are compiled, which can be integrated using a single digital platform. Here is how each function relates to the registration, licensing and functioning of restaurants:

Table 17: Relevance of Integration of Various Departments

Function	Relevance to Restaurant Registration/Licensing/Approval and Operation
DEPARTMENT OF TOURIST SERVICES (DTS)	
<i>Registration of restaurants</i>	(Directly relevant) Initial registration of restaurants is handled by DTS.
<i>Licensing of restaurants</i>	(Directly relevant) Annual licensing is managed by DTS.
<i>Spot checking and quality assurance</i>	(Directly relevant) Ensures that registered restaurants maintain quality standards.
<i>Imposition of fines and penalties</i>	(Directly relevant) DTS ensures compliance through enforcement actions.
<i>Classification of Restaurants</i>	(Indirectly relevant) Helps in categorising restaurants based on quality and services provided.



Function	Relevance to Restaurant Registration/Licensing/Approval and Operation
PUNJAB FOOD AUTHORITY (PFA)	
<i>Food product quality and safety</i>	(Directly relevant) Restaurants must comply with food safety regulations and obtain food safety certificates.
<i>Inspections</i>	(Directly relevant) PFA inspections ensure compliance with food safety standards, critical for licensing.
<i>Issuance of food safety certificates</i>	(Directly relevant) Required for restaurant operations and part of the licensing process.
METROPOLITAN CORPORATION OF LAHORE (MCL)	
<i>Approval of building plans</i>	(Indirectly relevant) Necessary for ensuring the restaurant building complies with safety and zoning regulations.
<i>Change of land use</i>	(Indirectly relevant) Ensures the land is zoned for restaurant use.
<i>Issuance of licenses, sanctions, and permits</i>	(Directly relevant) Required for the legal operation of the restaurant.
<i>Tax on advertisements and billboards</i>	(Indirectly relevant) Relevant for restaurants that use advertisements.
LAHORE DEVELOPMENT AUTHORITY (LDA)	
<i>Commercialisation Approval</i>	(Directly relevant) Ensures the land is commercially approved for restaurant use.
<i>Issuance Of Completion Certificate</i>	(Directly relevant) Confirms that the restaurant building complies with approved construction plans and is ready for operation.
<i>Building Plan Approval</i>	(Directly relevant) Ensures that the building layout adheres to municipal regulations.
TRAFFIC ENGINEERING AND PLANNING AGENCY (TEPA)	
<i>Parking Facility Compliance</i>	(Directly relevant) TEPA ensures the availability of adequate parking spaces as per zoning requirements.
<i>NOC for Traffic and Parking Impact</i>	(Directly relevant) Ensures restaurants do not contribute to congestion and meet urban planning standards.
<i>Urban Traffic Management</i>	(Indirectly relevant) Helps regulate traffic flow around commercial areas with heavy restaurant activity.
ENVIRONMENTAL PROTECTION AUTHORITY (EPA)	
<i>Environmental Impact Assessment (IEE)</i>	(Directly relevant) Ensures restaurants meet environmental standards and obtain the necessary NOC before operation.
<i>Waste Management Compliance</i>	(Directly relevant) Restaurants must adhere to waste disposal regulations.
<i>Issuance Of Environmental Clearance</i>	(Directly relevant) NOC from EPA is mandatory for restaurant operations.



Function	Relevance to Restaurant Registration/Licensing/Approval and Operation
LABOUR AND HUMAN RESOURCE DEPARTMENT	
<i>Worker Registration</i>	(Directly relevant) Employers must register restaurant employees to comply with labour laws.
<i>Minimum Wage Enforcement</i>	(Directly relevant) Restaurants must pay workers according to legal wage standards.
<i>Workplace Safety Standards</i>	(Directly relevant) Restaurants must adhere to safety requirements for employees as mandated by labour laws.
<i>Maternity Benefits and Leave Policies</i>	(Indirectly relevant) Applicable if the restaurant employs female staff.
<i>Site Approval</i>	(Indirectly relevant) Ensures workplace design complies with safety standards.
<i>Safety Inspections</i>	(Directly relevant) Ensures that the restaurant premises meet safety, hygiene, and emergency preparedness requirements.
<i>Reporting And Record-Keeping</i>	(Directly relevant) Restaurants must maintain safety records for inspections and regulatory compliance.
PUNJAB POLICE (LOCAL POLICE)	
<i>Inspections And Compliance Support</i>	(Indirectly relevant) Police assist regulatory bodies during inspections or enforcement of laws.
<i>Employee Registration</i>	(Directly relevant) Mandatory for hiring and verifying non-local or domestic workers.
<i>Issuance Of Character Certificates</i>	(Directly relevant) Required for background checks of restaurant employees.
DEFENCE HOUSING AUTHORITY (DHA)	
<i>Approval Of Building Plans</i>	(Directly relevant) Necessary for restaurants operating in DHA to ensure compliance with structural and zoning regulations.
<i>Completion Certificate Issuance</i>	(Directly relevant) Confirms construction and operational readiness in DHA.
<i>Safety And Operational Requirements</i>	(Indirectly relevant) Includes fire safety, waste management, and CCTV installation for restaurants.

Source: Authors' compilation.

Compiling Identified Registration, License and Approval Costs

The information compiled in the table below provides a comprehensive breakdown of the costs and fees involved in registering, licensing, and obtaining necessary approvals (NOCs) for a restaurant in Lahore, formulated based on an in-depth regulatory review of key departments and authorities governing the hospitality sector. Drawing from the processes outlined in regulations by various authorities, the table categorises these costs by department and purpose, specifying their frequency and variability based on factors such as location, restaurant size, and compliance requirements.

Table 18: Summary of Registration, Licensing, and Approval Costs for Restaurant Establishment

Department	Process	Fees (PKR)	Frequency
DTS	Registration	1,600 - 20,000 (varies by status)	One-time
	Grant of License	1,600 - 10,000 (varies by status)	Annual
	License Renewal	1,600 - 10,000	Annual
PFA	License Issuance	5,000 - 15,000 (depending on size)	Annual
MCL	Land Use Conversion Approval	Varies (based on area & use)	One-time
	Building Plan Approval	20,000 - 50,000	One-time
	Advertisement Permissions	10,000 - 50,000	Annual
LDA	Waste Management Fee	2,000 - 5,000	Monthly
	Commercialisation Certificate	Calculated on the property valuation	One-time
	Completion Certificate	7,000	One-time
EPA	IEE and NOC Issuance	15,000	One-time
TEPA	Parking NOC	100,000	One-time
Labour Department	Employee Registration	1,500 to 3,000 per employee	One-time
	Inspection Compliance	Varies	As needed
Punjab Police	Character Certificate	350	One-time
Estimated Total Cost	The total cost will vary significantly depending on the restaurant's size, location, and services. For a small to medium-sized restaurant, the total one-time costs could range between PKR 150,000 and PKR 300,000 , with annual recurring costs for licenses and services being around PKR 20,000 to PKR 100,000 .		

Source: Authors' compilation.



4. METHODOLOGY

Component 1: Situational Analysis; Registering and Licensing Restaurants in Lahore

This section of the study explains the methodology designed to survey restaurants in Lahore.

Survey Design and Data Collection

A stratified random sampling methodology was employed to ensure proportional representation of single-branch, multi-branch, and multinational restaurants in Lahore, based on the Punjab Development Statistics Report 2023 (Government of Punjab, 2023). From a population of 650 registered restaurants, a statistically reliable sample of 242 was drawn. Face-to-face interviews with restaurant owners were conducted using digital forms on tablets or smartphones, ensuring accurate data entry, reducing transcription errors, and enabling real-time validation. Enumerators underwent a one-day training to align with survey objectives and ethical considerations. Data were analysed using SPSS and STATA, following rigorous cleaning and validation processes to identify trends and challenges faced by restaurant owners.

Sampling Methodology

According to the Punjab Development Statistics Report 2023, the number of restaurants registered in Lahore District in 2022 is given in the table below. The total number of restaurants registered represents the population size.

Table 19: Number of Registered Restaurants in Lahore, 2022

District	Restaurants (Single Branch)	Restaurants (Multiple Branches)	Restaurants (Multinational)	Total
Lahore	522	109	19	650

Source: Government of Punjab (2023).

To determine the sample size for the number of restaurants (single branch, multiple branches, and multinational) across the selected sites in Lahore, we used a stratified random sampling methodology. The following is the formula used for the calculation of sample size:

$$n = \frac{N \cdot z^2 \cdot p \cdot (1 - p)}{E^2 \cdot (N - 1) + z^2 \cdot p \cdot (1 - p)}$$

n = Sample size

N = Population size (650)

z = z-value (i.e. 1.96 for 95% confidence level)

p = estimated proportion (i.e. 0.5 for maximum variability)

E = margin of error (i.e. 5% or 0.05)

Thus, the sample size turned out to be 242 restaurants in the Lahore district.

Table 20: Population and Sample Size Allocation

Category	Population Size	Sample Size
Single Branch	522	194
Multiple Branches	109	41
Multinational	19	7
Total	650	242

Source: Authors' calculations.

The sampling method ensures proportional representation of restaurant categories while reducing bias and increasing precision by accounting for variability within each stratum. Restaurants were selected based on their concentration, as identified through Google Maps, online sources, and personal observations.²⁰ The survey focused on areas with a high density of restaurants, including historic zones, capturing a diverse spectrum of dining establishments across Lahore.

²⁰ Number of restaurants selected at zones are based on observations from Google Maps (to capture concentration), and other websites which includes <https://guidegrab.pk/rs/lahore>, <https://www.citysearch.pk/lahore/eat-and-drink/> restaurants and from listed restaurants on Punjab Food Authority website <https://starrating.pfa.gop.pk/StarRating>List?city=15&rating=0>



Table 21: Sample Size Allocation by Zones in Lahore

Zone Number	Zone Location	Estimated no. of Restaurants	Population Proportion	Sample Size
1	MM Alam Road, Gulberg III	35	0.1094	26
2	Main Boulevard, Gulberg	25	0.0781	19
3	DHA Phase 1	15	0.0469	11
4	Johar Town	25	0.0781	19
5	Model Town	15	0.0469	11
6	Cantonment Board	15	0.0469	12
7	Jail Road, Shadman	21	0.0656	15
8	Iqbal Town	18	0.0563	14
9	Mall Road	15	0.0469	11
10	Anarkali Old Food Street	13	0.0406	10
11	Wahdat Road	15	0.0469	11
12	Lahore Fort, New Food Street	9	0.0281	7
13	DHA Phase 3	19	0.0594	14
14	Bahria Town	19	0.0594	14
15	Shalamar Link Road, and Mughalpura, GT Road	10	0.0313	8
16	Samnabad	18	0.0563	14
17	Township/Faisal Town	11	0.0344	9
18	Mozang	9	0.0281	7
19	Wapda Town	13	0.0406	10
TOTAL		320	1	242

Source: Authors' calculations.

Enumerators Selection and Sample Allocation Plan

Eight enumerators were selected based on specific criteria to ensure efficient and high-quality data collection. Candidates were required to have at least an undergraduate degree, preferably in social sciences, to align with the survey's objectives. A balanced gender representation was prioritised, and all enumerators were residents of Lahore to leverage their familiarity with local cultural and regional contexts. Each enumerator was assigned a specific zone, enabling a focused and streamlined approach. The survey spanned five days, with flexible eight-hour daily shifts, ensuring sufficient time for meaningful engagement with restaurant owners in their respective areas.



Table 22: Assigned Number of Restaurants Per Enumerator
and Allocation of Zones

Enumerator	Zones Assigned	Total Restaurants
1	Zone 1 (MM Alam Road, Gulberg III) Zone 3 (DHA Phase 1)	$(26 + 11) = 37$
2	Zone 2 (Main Boulevard, Gulberg) Zone 13 (DHA Phase 3)	$(19 + 14) = 33$
3	Zone 5 (Model Town) Zone 14 (Bahria Town)	$(11 + 14) = 25$
4	Zone 7 (Jail Road, Shadman) Zone 8 (Iqbal Town)	$(15 + 14) = 29$
5	Zone 9 (Mall Road) Zone 10 (Anarkali Old Food Street) Zone 11 (Wahdat Road)	$(11 + 10 + 11) = 32$
6	Zone 4 (Johar Town) Zone 19 (Wapda Town)	$(19 + 10) = 29$
7	Zone 15 (Shalamar Link Road, Mughalpura, GT Road) Zone 6 (Cantonment Board) Zone 12 (Lahore Fort, New Food Street)	$(8 + 12 + 7) = 27$
8	Zone 17 (Township) Zone 16 (Samnabad) Zone 18 (Mozang)	$(9 + 14 + 7) = 30$

Source: Authors' calculations.

For privacy reasons, the survey participants were assured that their names, the names of their restaurants, and their contact information would be kept confidential and would not be disclosed in any component of the study or anywhere else.

Component 2: Calculating the Costs of Sludge in Restaurant Businesses

To quantify the sludge cost as a percentage of both the total setup cost and the share of restaurants in Punjab's GNP, the study adopted a multi-step approach. First, data on restaurant setup costs were gathered through a survey of local restaurateurs, who provided input on their total setup expenses. Using a predetermined value of sludge, derived from regulatory burden estimates from component 1, the proportion of sludge in total setup costs was calculated. This step aimed to capture the direct financial impact of compliance requirements on new restaurant businesses in the region.



Next, to calculate the sludge cost as a percentage of the GNP, the study utilised official GNP figures for the services sector, including hotels and restaurants, from multiple Punjab Development Statistics Reports. Since specific GNP data for restaurants alone was unavailable, the restaurant sector's GNP was estimated based on the proportion of registered restaurants to total registered establishments. Sludge costs were then aggregated across all registered restaurants for the years 2020, 2021, and 2022, and compared to the restaurant GNP for each year. This method allowed the study to quantify the economic burden of regulatory costs on the sector and assess its implications for the broader economy of Punjab.

Component 3: Development of a Digitised and Automated Software Architecture System

This component focuses on developing a user-friendly, secure, and compliant web application to streamline restaurant business registration. Built with the MERN stack (ReactJS, ExpressJS, NodeJS, and MongoDB), the platform offers intuitive navigation, real-time application tracking, and step-by-step guidance. Key features include blockchain/IPFS integration for data integrity and transparency, decentralised cloud storage for secure document handling, and an online payment gateway for efficient transactions. The system enables a one-time application linked to all relevant departments, digitising regulatory processes and replacing manual paperwork. A centralised grievance redressal system and feedback loop address user concerns and support continuous improvement. By reducing physical visits, minimising delays, and enhancing user experience, the application modernises the restaurant registration process while ensuring regulatory compliance.



5. COMPONENT 1: SURVEY-BASED RESULTS OF SITUATIONAL ANALYSIS

Key Insights from Field Visits by Enumerators

The survey of Lahore's restaurants highlighted critical challenges faced by owners in navigating the administrative and regulatory landscape. While owners and staff were cooperative, they expressed apprehension about discussing licensing and registration costs due to fear of departmental repercussions. Bribery and unwarranted fines by regulatory bodies like the Punjab Food Authority and the Punjab Police were frequently reported. Licensing costs varied depending on factors such as registration timing, location, seating capacity, ambience, and cuisine. Some owners admitted using influential contacts or offering bribes to expedite the registration process, reflecting systemic corruption.

Corruption was pervasive, with the Punjab Food Authority and Punjab Police often cited for bribes, unwarranted disturbances, and unjustified fines. Challenges included demands from local police for bribes, free meals, drinks, or cash to allow restaurants to operate past 11 pm. In Samnabad, owners reported navigating tens of departments for licensing, leading to complaints of blackmail and extortion. This complex process confused new restaurant owners regarding timelines and required approvals. Desi restaurant owners were vocal about their grievances, while those offering continental cuisine were hesitant, fearing departmental negligence.

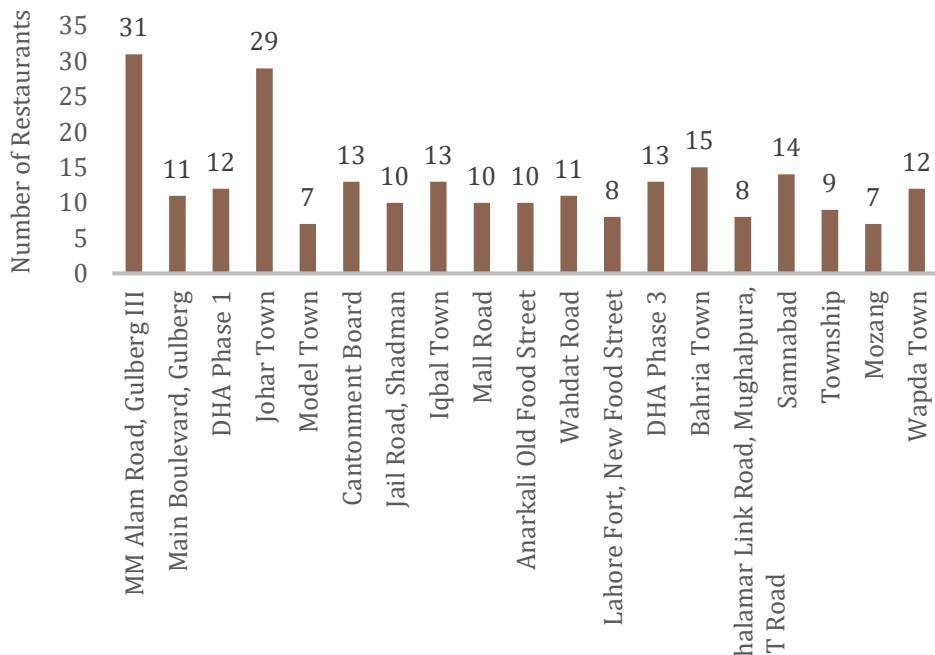
Specific incidents included daily demands for free food by police, excessive payments to departments, and simplified regulations for restaurants owned by influential individuals. One owner likened regulatory bodies to "snakes," while another noted that financial capacity could eliminate obstacles. Some expressed frustration, questioning the survey's purpose. In Samnabad, owners highlighted high license fees and routine bribery demands, including providing free meals to police for providing "protection." In Mozang, traffic police compounded challenges by demanding bribes, while Township saw widespread non-compliance with zoning laws as commercial activities thrived in residential areas. A recurring theme was restaurant owners' apprehension about participation, driven by fear of administrative repercussions. High licensing costs, bribery demands, and local authority pressures hindered ease of doing business, stifling small enterprise growth.



Descriptive Analysis

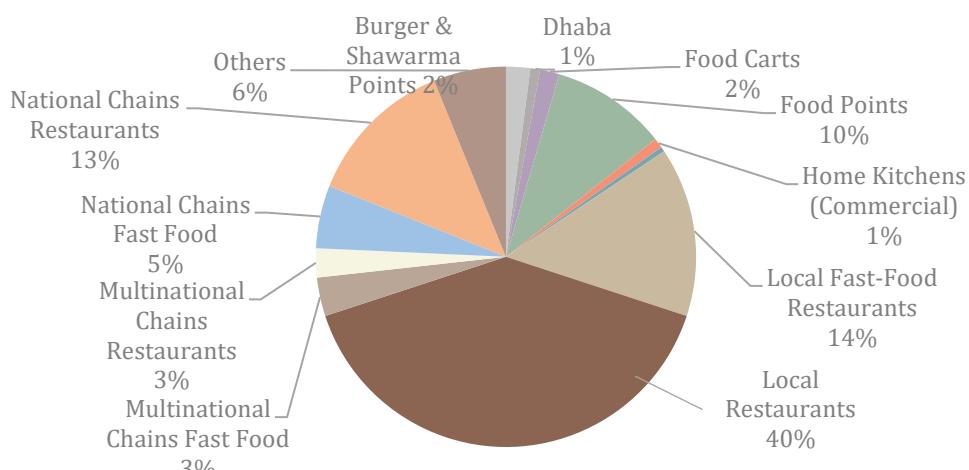
The following descriptive analysis provides the preliminary findings of the research.

Figure 3: Restaurant Distribution by Zone



Source: Authors' calculations.

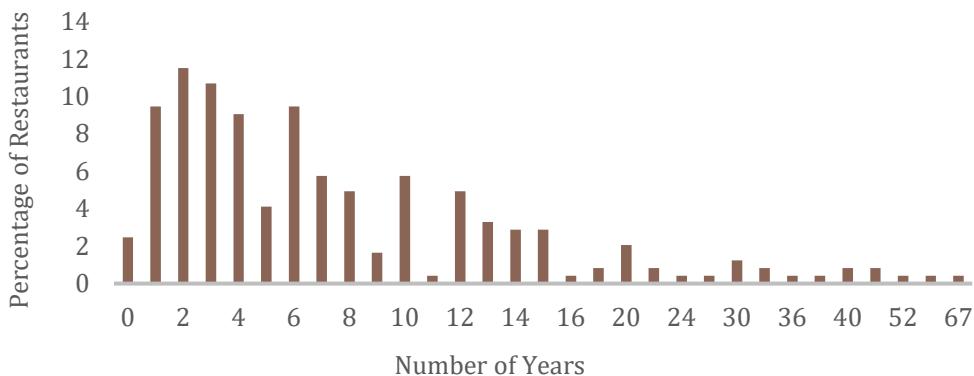
Figure 4: Type of Restaurants covered



Source: Authors' calculations.

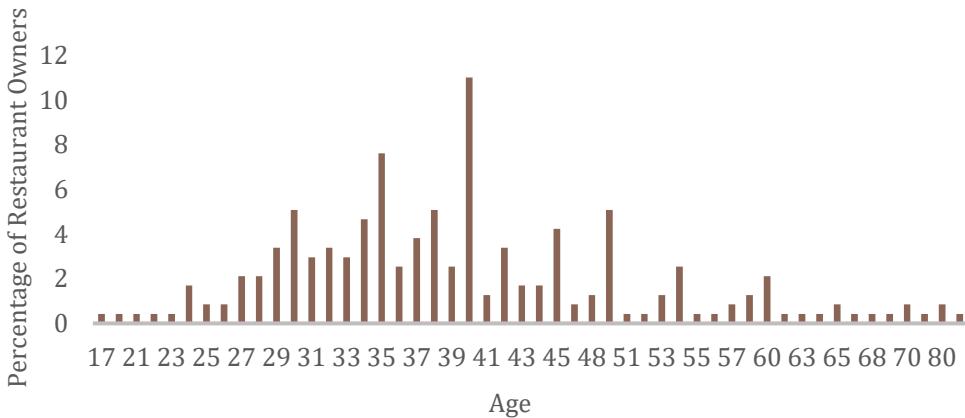


Figure 5: Number of Years in Operation



Source: Authors' calculations.

Figure 6: Age of Owners



Source: Authors' calculations.

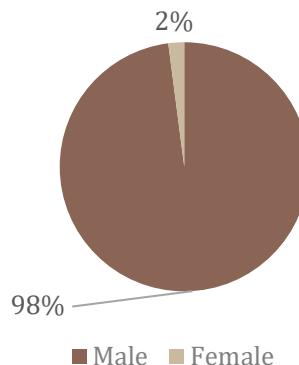
Figure 7: Number of Employees in a Restaurant



Source: Authors' calculations.

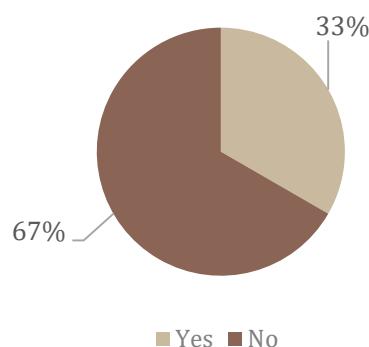


Figure 8: Gender of Owners



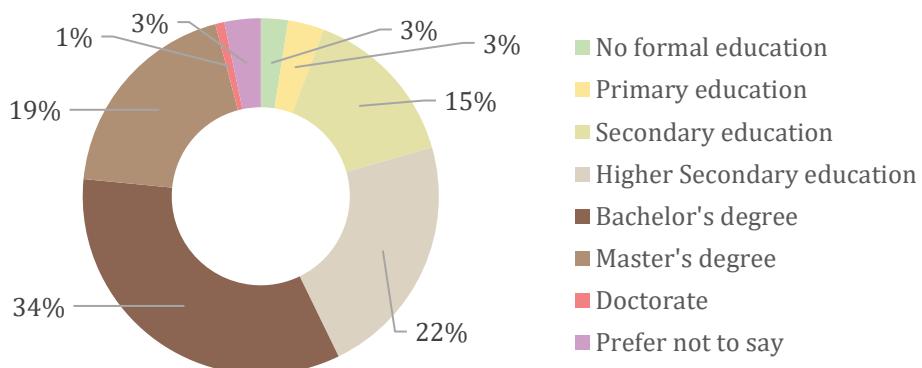
Source: Authors' calculations.

Figure 9: Previous Business Experience



Source: Authors' calculations.

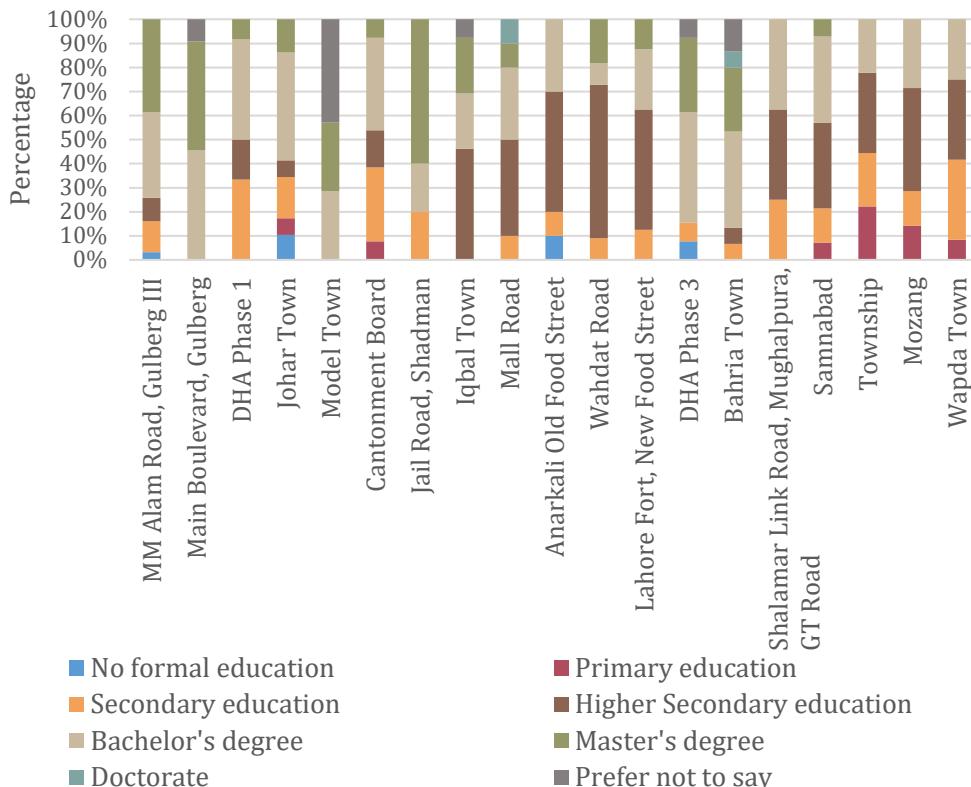
Figure 10: Owners' Education Level



Source: Authors' calculations.

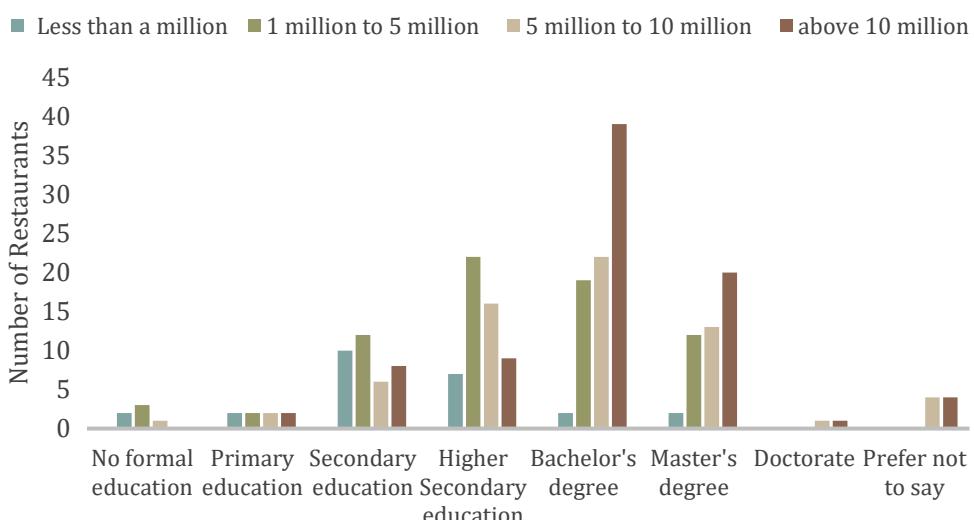


Figure 11: Education Level by Zone



Source: Authors' calculations.

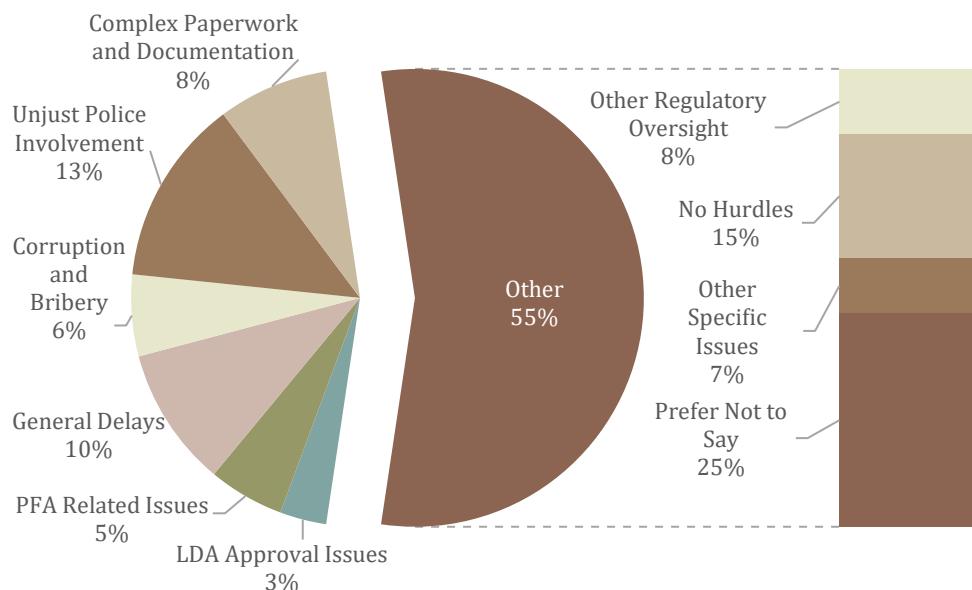
Figure 12: Education Level vs. Startup Costs



Source: Authors' calculations.

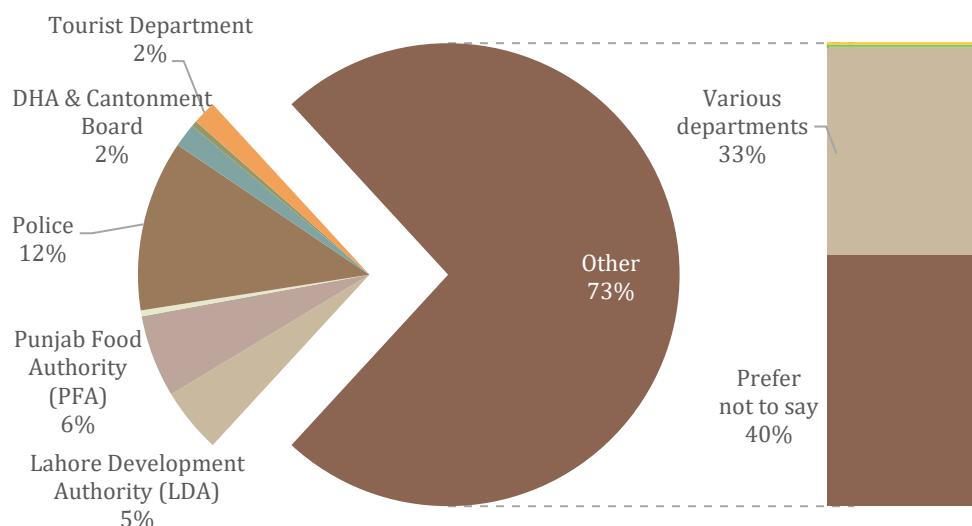


Figure 13: Major Challenges Faced By Owners



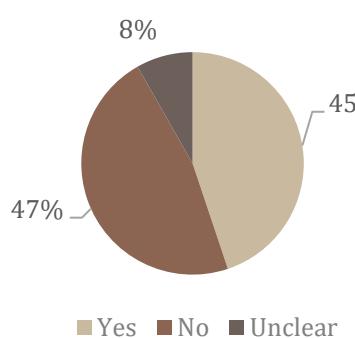
Source: Authors' calculations.

Figure 14: Departments Causing the Most Troubles



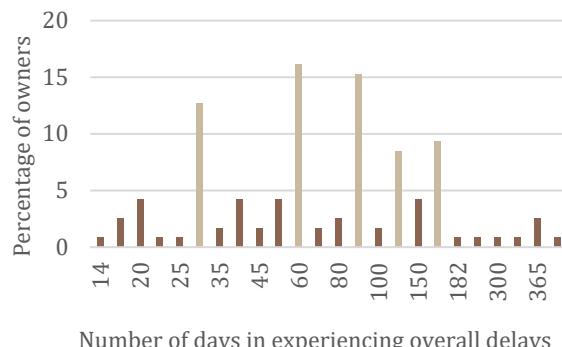
Source: Authors' calculations.

Figure 15: Delays in Approvals



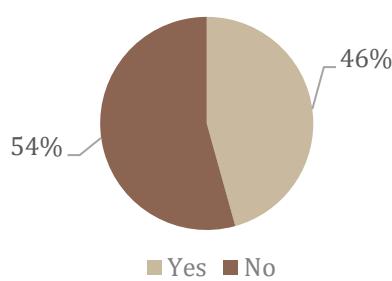
Source: Authors' calculations.

Figure 16: Duration of Delays



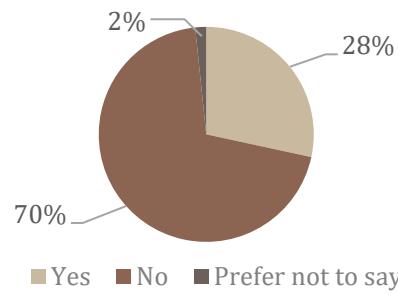
Source: Authors' calculations.

Figure 17: Percentage of Owners Who Hired a Legal Advisor Or Consultant



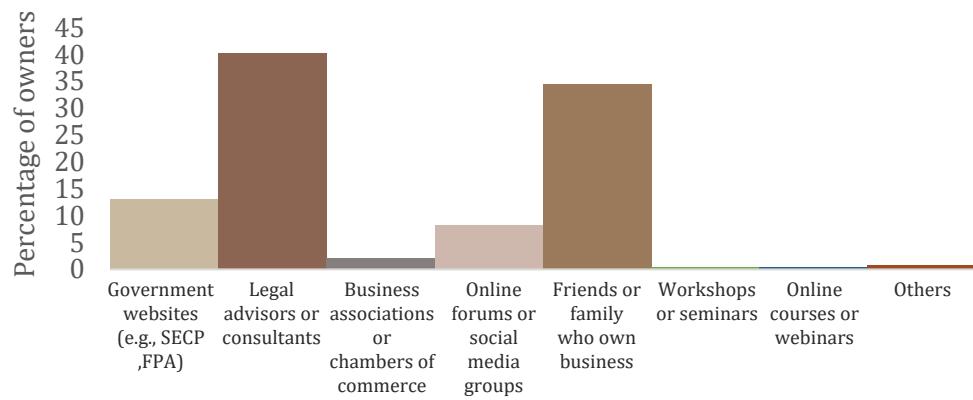
Source: Authors' calculations.

Figure 18: Percentage of Owners Who Ever Approached an Influential Individual



Source: Authors' calculations.

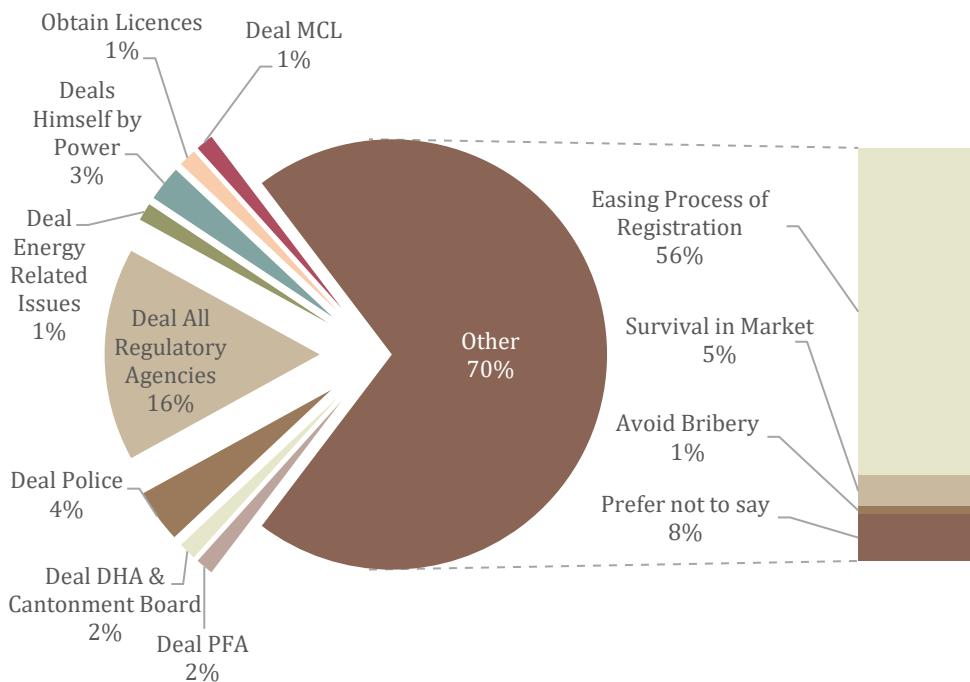
Figure 19: Information Sources for Registration



Source: Authors' calculations.



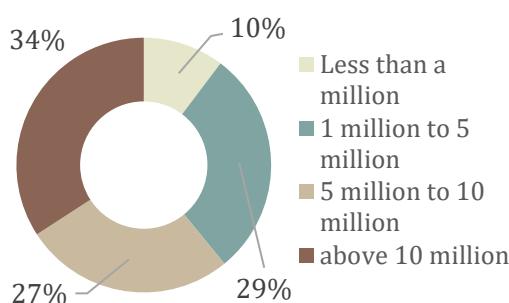
Figure 20: Reasons for Approaching Influential Individuals



Source: Authors' calculations.

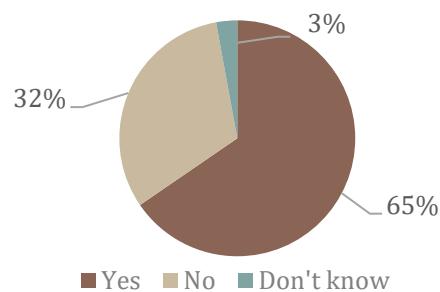
The figure highlights why restaurant owners sought assistance, revealing systemic complexities and burdensome regulatory compliance. Key reasons include navigating multiple regulatory agencies, managing police and PFA interactions, avoiding bribery, and coping with market pressures.

Figure 21: Startup Costs Distribution



Source: Authors' calculations.

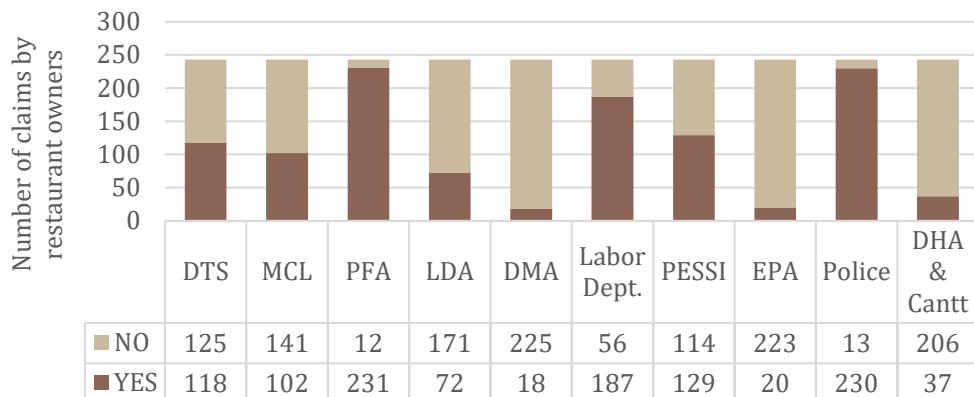
Figure 22: Recurring License Costs



Source: Authors' calculations.



Figure 23: Owners Claiming Involvement of Selected Departments in Business



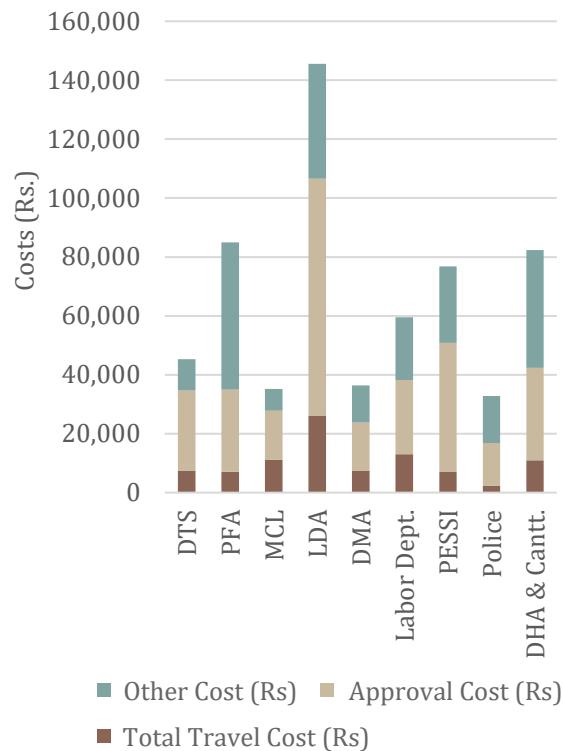
Source: Authors' calculations.

Figure 24: Time Taken for Approvals



Source: Authors' calculations.

Figure 25: Registration/License/Approval Costs by Department



Source: Authors' calculations.



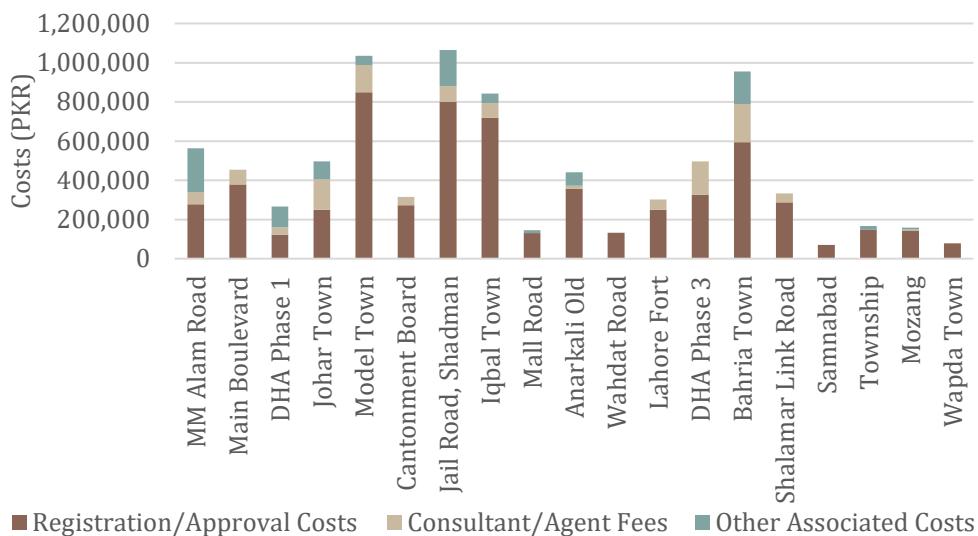
The findings reveal significant variation in the time, number of visits, travel costs, and additional expenses associated with obtaining licenses and approvals from different departments. Statistics of these figures are given in Annexure.

Figure 26: Estimated Total Costs of Registration/License/Approval²¹



Source: Authors' calculations.

Figure 27: Estimated Total Costs of Registration/License/Approval Across Zones²²



Source: Authors' calculations.

²¹ Total Travel Costs: Calculated as the number of visits multiplied by costs per visit for selected departments. Total Registration/Approval Costs: Average value from Q_5_2. Consultant/Agent Fees: Average value from Q_5_4.

Other Associated Costs: Average value from Q_5_5 (e.g., bribes, miscellaneous expenses).

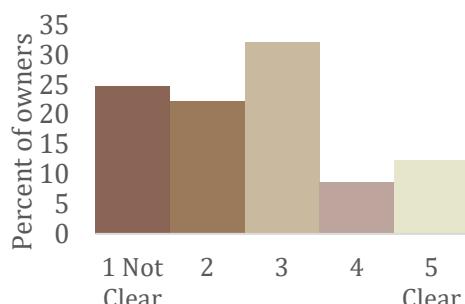
Refer to Annexure for statistics.

²² The values for other associated costs have been excluded for some zones due to low observations. However, inputs were still collected as per Q_5_5. Refer to Annexure for statistics.



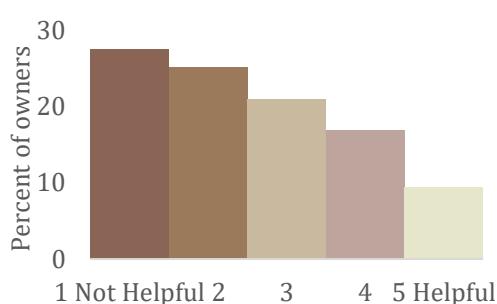
The figure shows that Model Town, Jail Road, Shadman, and Bahria Town have the highest total costs, primarily driven by high estimated total costs and consultancy costs, respectively. In contrast, locations like Wahdat Road, Mozang, Township, and Wapda Town show significantly lower overall expenses. Green, blue, and yellow bars highlight the contribution of each cost type to the total expenses across various locations. The detailed statistics for this graph are given in Annexure.

Figure 28: Ranking Clarity of Regulations



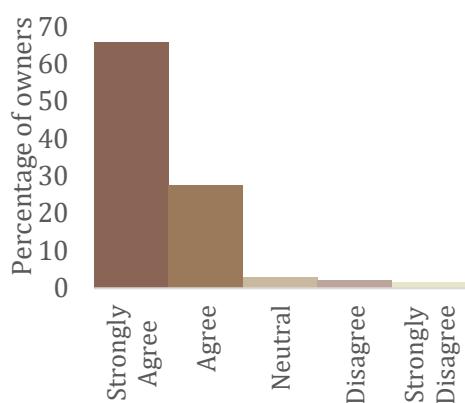
Source: Authors' calculations.

Figure 29: Regulation Impact on Growth



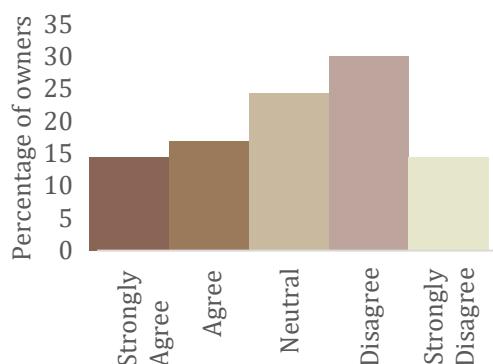
Source: Authors' calculations.

Figure 30: Online Registration Portal to be Useful



Source: Authors' calculations.

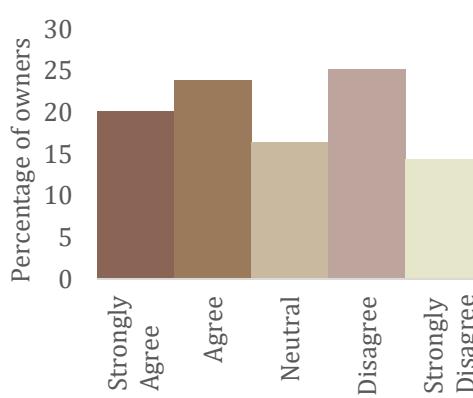
Figure 31: Honesty in Approvals by Officers



Source: Authors' calculations.

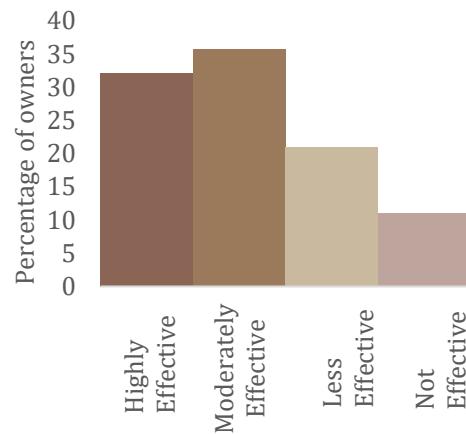


Figure 32: Fairness of Inspectors
in Preparing Reports



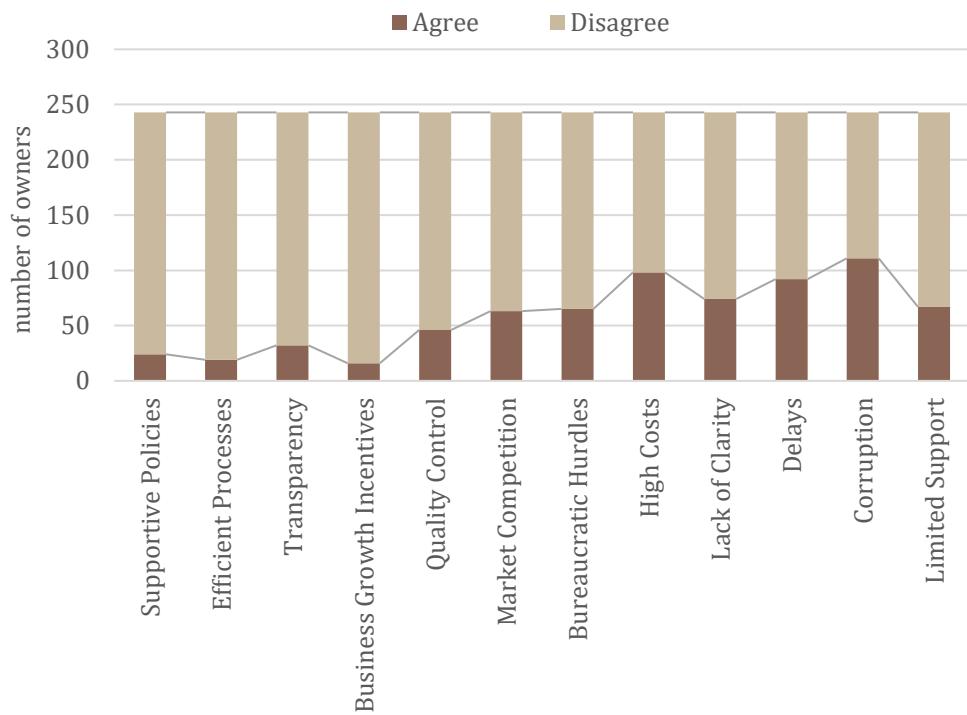
Source: Authors' calculations.

Figure 33: Effectiveness of Penalties
in Ensuring Compliance



Source: Authors' calculations.

Figure 34: Regulatory Environment Perception²³

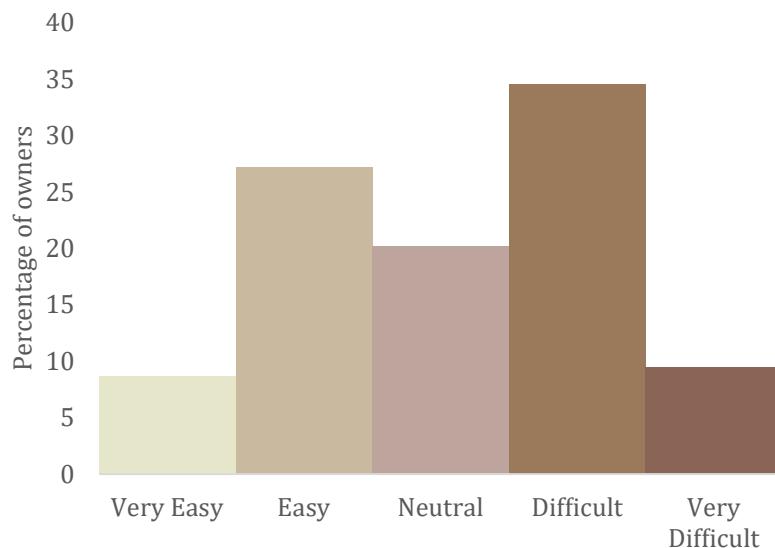


Perception of the owners moving from Left representing positive perceptions to Right representing negative perceptions

Source: Authors' calculations.



Figure 35. Perception About the Overall Registration Process in Lahore



Source: Authors' calculations.

²³ Following are the description of the variables discussed.

Supportive Policies: The regulations provide clear guidelines and support for restaurant businesses.

Efficient Processes: The regulatory processes are streamlined and efficient, reducing time and costs.

Transparency: The regulations are transparent and easy to understand.

Business Growth Incentives: The regulations offer incentives for business growth and expansion.

Quality Control: The regulations ensure high standards of hygiene and food safety, enhancing customer trust.

Market Competition: The regulations create a fair and competitive market environment.

Bureaucratic Hurdles: The regulations involve excessive paperwork and bureaucratic procedures.

High Costs: The regulatory costs and fees are too high, burdening business owners.

Lack of Clarity: The regulations are unclear and inconsistent, causing confusion.

Delays: The approval and licensing processes are slow and cause delays.

Corruption: There is corruption and the need for unofficial payments to expedite processes.

Limited Support: There is insufficient support and guidance from regulatory authorities.



6. COMPONENT 2: CALCULATING THE COSTS OF SLUDGE IN RESTAURANT BUSINESSES

This study analysed sludge costs through a two-step approach. First, the regulatory burden on restaurant setup was calculated as a proportion of the estimated total investment in setting up a restaurant, using data from restaurant owners to quantify the financial impact of compliance requirements on new businesses in Punjab. Second, sludge costs are evaluated as a percentage of the restaurant sector's estimated Gross National Product (GNP) in Punjab. Using official GNP data and the proportion of registered restaurants, the study aggregated sludge costs for 2020–22 to assess the broader economic burden of regulatory compliance on Punjab's service sector.

Calculating the Proportion of Regulatory Burden (Sludge Cost) for Restaurant Setup

To estimate the sludge cost percentage for each restaurant, the study gathered data on the setup costs of various restaurants through a structured survey. The restaurants were asked to categorise their initial setup expenses into one of four predefined ranges:

1. PKR 1 million or less
2. PKR 1 million to 5 million
3. PKR 5 million to 10 million
4. PKR 10 million or more

The average input value of 2.84, derived from restaurant responses, indicates most fall between the second and third categories. To estimate the average setup cost, linear interpolation was applied using category midpoints. This method provides a straightforward way to approximate values between ranges, improving the reliability of numerical estimates from categorical data and enabling more accurate percentage calculations (Wedeen et al., 2015).

The midpoint values for the four categories were estimated as follows:

- **Category 1:** Less than PKR 1 million (upper limit assumed to be PKR 1 million)
- **Category 2:** PKR 3 million (midpoint of PKR 1 to 5 million)
- **Category 3:** 7 PKR.5 million (midpoint of PKR 5 to 10 million)
- **Category 4:** Above PKR 10 million (left as open-ended)

Given the average response of 2.84, which falls between Categories 2 and 3, we calculated the estimated setup cost using interpolation between these midpoints.

$$\text{Estimated Setup Cost} = 3 + (7.5 - 3) \times \frac{2.84 - 2}{3 - 2} = \text{PKR } 6.78 \text{ million}$$

This yielded a value of 6.78 million PKR as the estimated average setup cost of a restaurant in Lahore.

Next, the sludge cost was calculated as a percentage of this estimated setup cost using the formula:

$$\text{Sludge Cost Percentage of total setup cost} = \left(\frac{\text{Sludge Cost}}{\text{Estimated Setup Cost}} \right) \times 100$$

Substituting the values for our study:

$$\text{Sludge Cost Percentage of total setup cost} = \left(\frac{641,562}{6,780,000} \right) \times 100 \approx 9.46\%$$

This result indicates that, on average, nearly 9.5% of the total setup cost for a restaurant is attributable to regulatory burdens, under the specific assumptions as discussed above.

Estimating the Sludge Cost as a Proportion of GNP for Hotels and Restaurants in Punjab and Pakistan

This section aims to calculate the total regulatory burden (sludge cost) paid by hotels & restaurants in Pakistan and assess its proportion relative to the GNP of restaurants and hotels in Punjab. Using data from the multiple Punjab Development Statistics Reports 2020-21 to 2022-23, the analysis focuses on determining the sludge cost borne by the restaurant industry as a percentage



of GNP. To calculate the sludge cost as a percentage of GNP, both at the Pakistan level and Punjab level, the discrepancy in the scope of GNP data must be addressed (Pakistan-wide) and the restaurant data (Punjab-specific). The sludge cost per restaurant, as calculated in this study, is PKR 641,562, and the calculated sludge cost percentage of the total setup cost for restaurants is 9.46%.

(GNP²⁴ values for hotels and restaurants under the services sector in Pakistan, as retrieved from the Punjab Development Statistics Reports, are as follows:

- **2020-21:** PKR 726,385 million
- **2021-22:** PKR 822,966 million
- **2022-23:** PKR 1,180,653 million

The total number of registered hotels and restaurants in Punjab:

- **2020-21:** 23,156 hotels and restaurants (11,436 restaurants)
- **2021-22:** 30,459 hotels and restaurants (12,999 restaurants)
- **2022-23:** 4,987 hotels and restaurants (1,870 restaurants)

Given that the calculated regulatory burden (sludge) for each restaurant is PKR 641,562, we can now estimate the total sludge cost for all registered establishments (i.e. hotels and restaurants) in Punjab as:

$$\text{Total Sludge Cost} = \text{total no.of establishments (i.e.hotels and restaurants)} \times \\ \text{sludge cost estimated per restaurant (i.e.641,562)}$$

With the information that Punjab contributes 54.2% to the National Income (Government of Punjab, 2022), we can assume and estimate Punjab's Gross National Product (GNP) for establishments using this percentage.

$$\text{Punjab GNP} = \text{National GNP} \times 54.2\%$$

To assess the impact of regulatory burden on the overall economy, we can calculate the proportion of the total sludge cost in relation to the contribution of establishments in GNP Punjab as:

$$\text{Sludge as a percentage of Punjab GNP} = \left(\frac{\text{Total Sludge Cost for establishments}}{\text{Punjab GNP}} \right) \times 100$$

²⁴ Values represent GNP at current factor cost

Since the number of establishments is only for Punjab, using Punjab-specific sludge costs as a direct percentage of National GNP (which represents all of Pakistan) could lead to an over- or under-estimation of the sludge cost at the national level. To address this, we must logically extrapolate from Punjab data to estimate the sludge cost for the entire country while ensuring consistency. Using Punjab's share of the national income (54.2%) to infer the number of establishments nationwide, the study estimates the total number of establishments in Pakistan as:

$$\text{Estimated no. of Establishments nationwide} = \frac{\text{Number of Establishments in Punjab}}{54.2\%}$$

Thus,

$$\text{Sludge as a percentage of National GNP} = \left(\frac{\text{Total Sludge Cost for establishments}}{\text{National GNP}} \right) \times 100$$

So, the values have been used for 2020-21, 2021-22 and 2022-23 respectively, and the results are compiled in the table below.

Table 23: Total Cost of Sludge as a Percentage of National and Punjab GNPs

Year	National GNP (Hotels & Restaurants, PKR Million)	Punjab GNP (Hotels & Restaurants, PKR Million)	Total Hotels & Restaurants in Punjab	Total Sludge Cost in Punjab (PKR Million)	Sludge % of Punjab GNP	Sludge % of National GNP
2020-21	726,385	~ 393,676	23,156	~ 14,856	~ 3.77%	~ 2.04%
2021-22	822,966	~ 445,060	30,459	~ 19,541	~ 4.39%	~ 2.37%
2022-23	1,180,653	~ 639,993	4,987	~ 3,199	~ 0.50%	~ 0.27%

Source: Authors' calculations.

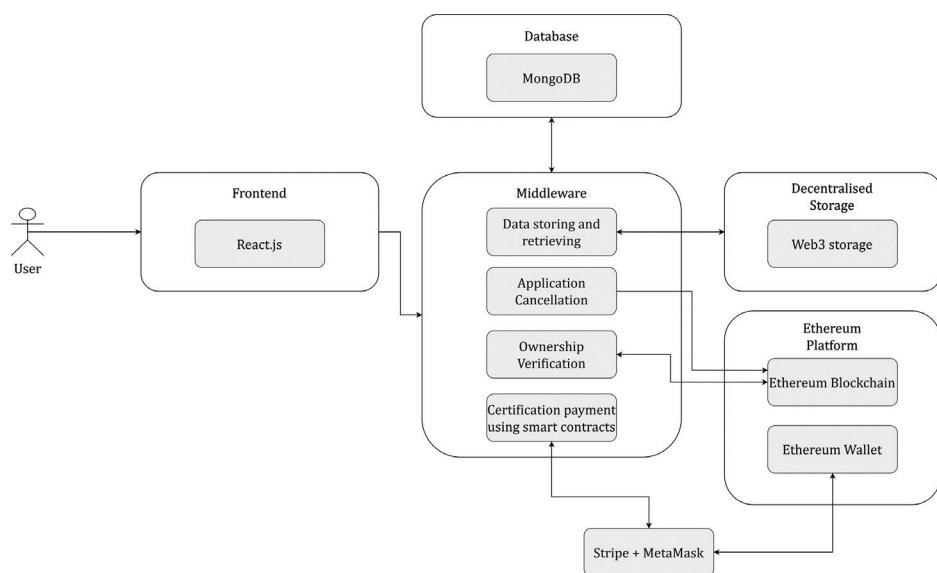
A sharp decline in registered establishments in 2022 (from 30,459 to 4,987) significantly reduced the sludge cost, likely due to stricter criteria or reclassification.

7. COMPONENT 3: DEVELOPMENT OF SOFTWARE ARCHITECTURE SYSTEM

An easy-to-understand and easy-to-navigate front-end is developed. The design of the user interface will allow the user to effortlessly browse through the website. The interface will provide all necessary steps for the whole procedure and for even the small functionalities of login and sign-up. MERN stack will be used to implement the front-end and the backend. Where ReactJS will be used for the front-end, whereas ExpressJS and NodeJS will be implemented for the backend. Finally, for the database, MongoDB will be used. The Ethereum Blockchain will be implemented to ensure data integrity and immutability.

To streamline restaurant business registration, a web application will include key features such as digitised document submission, stored securely on a blockchain/IPFS-based decentralised cloud system for enhanced privacy and immutable records. Business owners can track application status online, reducing physical visits and wait times. Online payments will simplify transactions, eliminating manual cash handling. A user-friendly interface will integrate all departments, enabling a centralised, compliant process flow for licenses, approvals, and NOCs via a one-time digital application. Licenses will be electronically delivered, minimising paperwork. An anonymous grievance redressal system will protect users' details, while continuous improvement will adapt the system to feedback and regulatory changes.

Figure 36: Software Architecture Overview

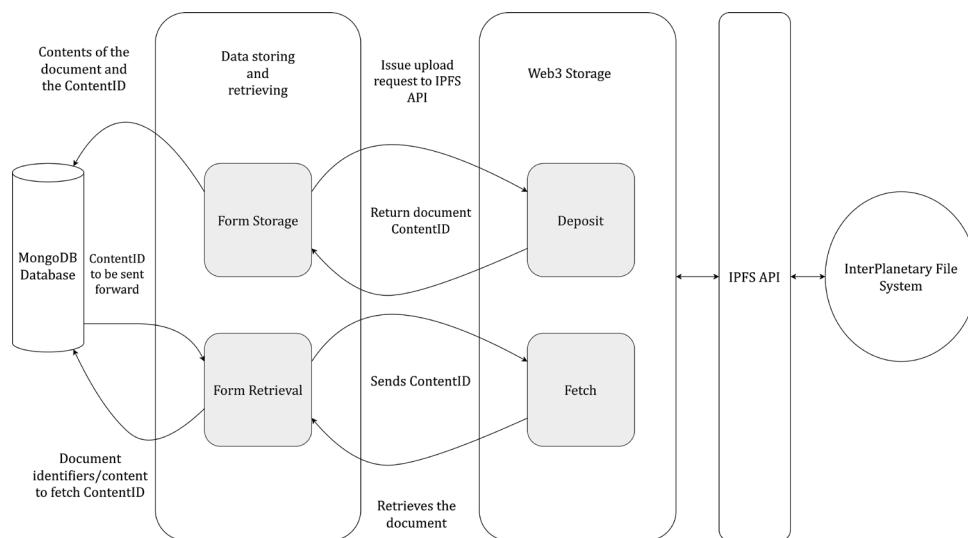


Source: Authors' illustration.

System Architecture

The program's main functionalities depend on storing and retrieving form data. To apply this, the system will perform verification and smart contracts using an InterPlanetary File System (IPFS) based decentralised storage. The figure below shows a low-level diagram of how storing and retrieval are performed by the devised system. To summarise the system flow, when the data storing and retrieving module is triggered, it will initiate a series of ID calls, and by using those IDs received by both the database and IPFS, it will fetch or store the appropriate documents sent by the business owner.

Figure 37.: Low-Level Diagram of Storage and Retrieval of Data using IPFS

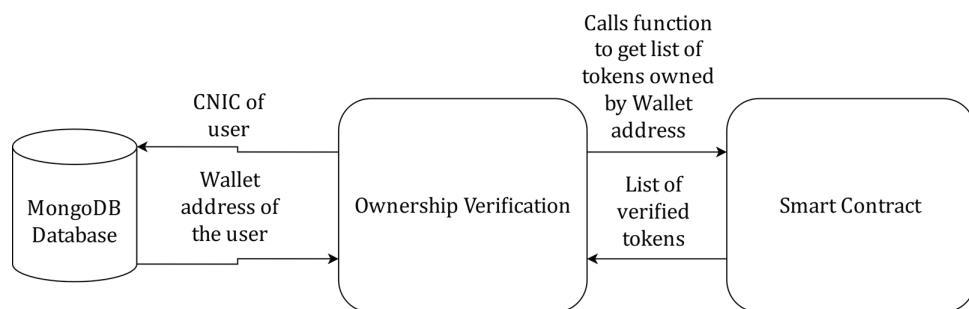


Source: Authors' illustration.

The next module essentially shows the verification of the applicant/business owner. How the system performs it is by creating a wallet for every user and etching the certificates/files in its unique name on the blockchain. This unique wallet ID helps retrieve all the files in the business owner's possession.



Figure 38: Ownership Verification



Source: Authors' illustration.

Architectural Strategies

The following are the architectural strategies applied to the devised system architecture.

Usage of MERN Stack

MERN stack is a full web development stack of libraries and frameworks that handle everything from the frontend to the database in a single language, JavaScript. The stack comprises MongoDB, Express.js, React.js, and Node.js.

To briefly explain each framework, MongoDB is a non-relational database that provides support for JSON-like storage. The data fetching speed is faster than SQL servers, so this is preferable. React.js is a component-based front-end development library. It is simple to use and implement, as it makes use of a virtual DOM to render elements on a browser

+r. Express.js is what connects the frontend to the database, working together with Node.js to create RESTful APIs in the backend.

The reason we chose to use this instead of any other frameworks or languages is that a full stack can be implemented in a single language. This gets rid of the maintenance complexity and language compatibility issues. Secondly, our application focuses on blockchain and web3 technologies, which are also developed in JavaScript. Using a full stack that is developed in the same language helps remove compatibility issues.

Other than the reasons above, we chose MERN over MEAN stack because Angular.js, which is part of the MEAN stack, is a much more extensive framework to work with. MEAN stack was comparatively simpler and easier to maintain.

User Interface

The user interface of this application was designed to be simplistic and easy to learn. This goes in line with our system design, which follows the rule of streamlined and straightforward code and makes the system efficient. The user won't be confused by the interface and will be able to navigate without issue. This is achieved by using React.js and CSS libraries.

External Databases and Persistence

IPFS storage is used in this system architecture. But it inherently has an issue with data persistence. To solve that issue and to effectively communicate with it, we are using Web3.Storage. Along with that, MongoDB is used to keep track of all the ContentIDs generated by IPFS and link them to the appropriate users. This ensures efficiency in file retrieval.

Ethereum Blockchain

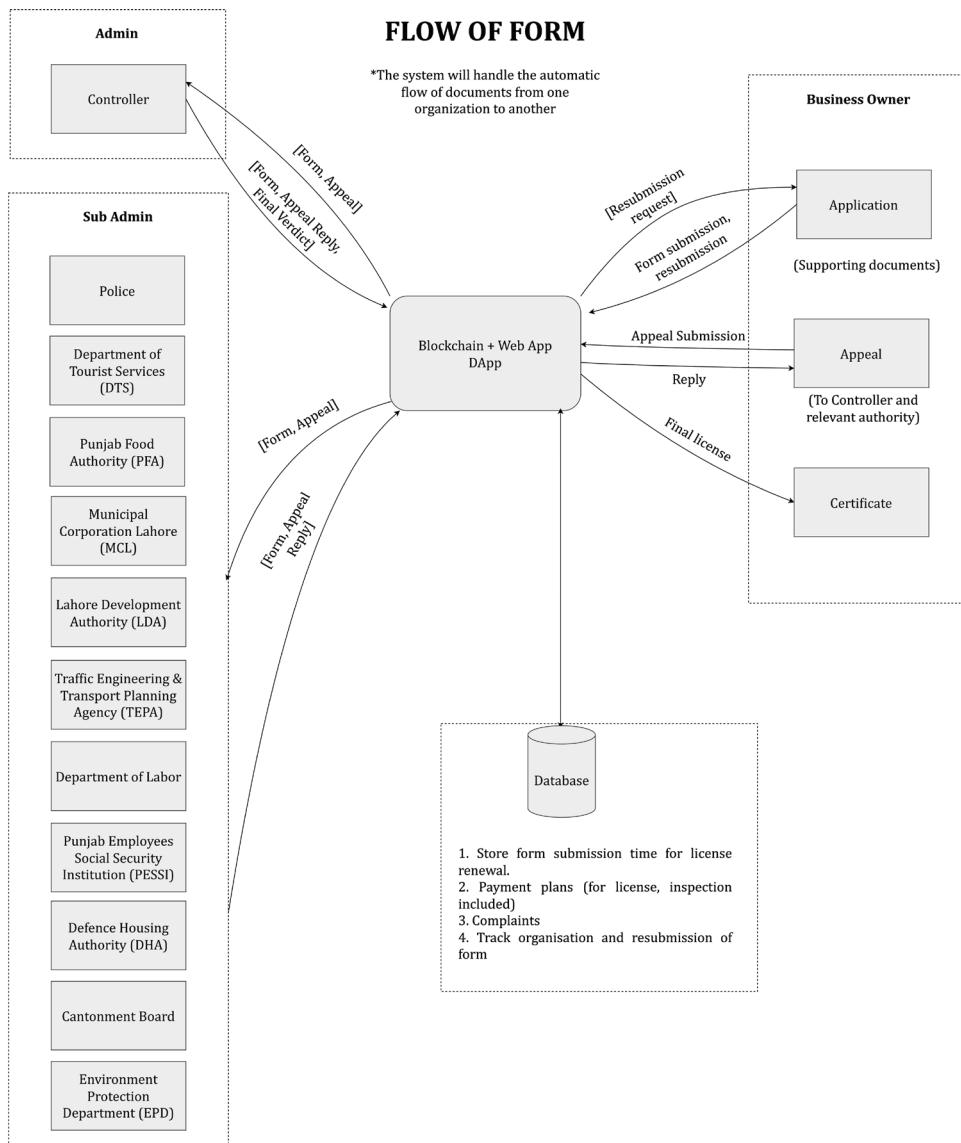
The Ethereum Blockchain was the first developed blockchain which uses ETH (Ethereum) Tokens. It uses Solidity as its language and has 930,000+ smart contracts available. The reason for using this instead of its competitors, Bitcoin and Stacks, is that it flows better with our system architecture and is developed by many developers. Hence, it has fewer vulnerabilities in its system.

Mapping of the Process Flows

The proposed web-application map aims to revolutionise the registration and licensing process for restaurants and food businesses in Punjab. By leveraging blockchain technology and automation, this platform streamlines the entire process, from initial application to final approval, renewal, and beyond. The system ensures transparency, accountability, and efficiency, benefiting both applicants and regulatory authorities.



Figure 39: Mapping of General Process Flows in the Web Application

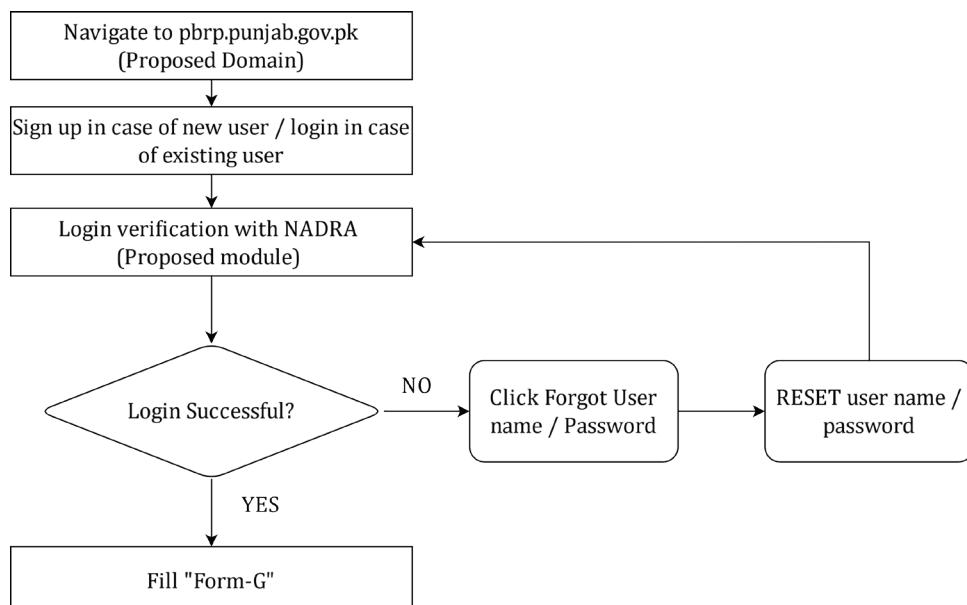


Source: Authors' illustration.

The list of admin/sub-admins can be dynamically added or modified, and their separate functioning will be built according to the specific procedures and regulations governing their roles. Additionally, a user-friendly dashboard will be developed for all stakeholders, including users (restaurant owners and operators), designated officers, inspectors, and administrative staff, providing them with easy access to relevant information and functionalities.

The process flow diagram illustrates the digitised and automated system for restaurant business registration, integrating a decentralised web application (DApp) on a blockchain/IPFS platform. The business owner initiates the process by applying with supporting documents. The DApp routes the form through various authorities, facilitating automatic document flow between entities. If an application is rejected, the business owner can submit an appeal, which is processed by the Controller and relevant authorities. Appeals can be replied to or further appealed, ensuring a transparent review process. The system also stores form submission times for license renewals, manages payment plans, handles complaints, and tracks the organisation and resubmission of forms, all recorded in a centralised database to ensure accountability and efficiency.

Figure 40: Login Verification and Sign-up Process Flow



Source: Authors' illustration.

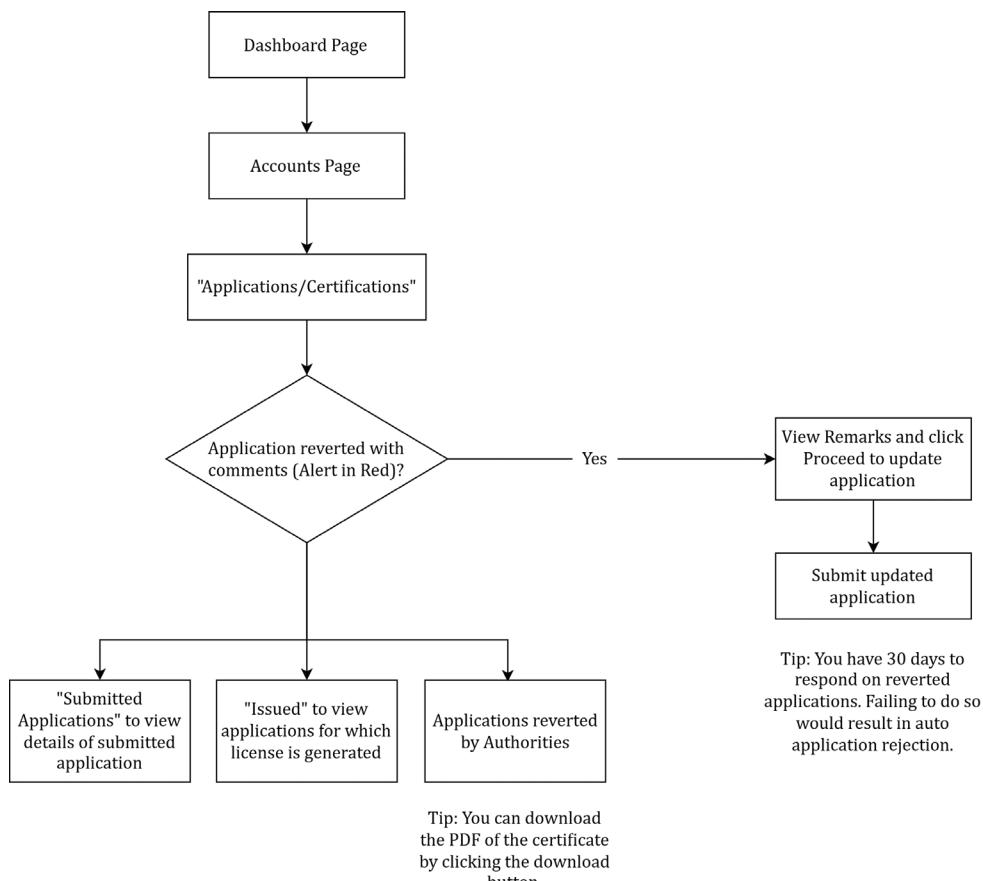
In the above flowchart, the process starts with the user navigating to the proposed domain (www.pbrp.punjab.gov.pk)²⁵. New users need to sign up, and all users undergo login verification with NADRA²⁶. If login is unsuccessful, users can reset their username/password. Successful login leads to the dashboard page.

²⁵ A proposed domain name for the Web-Application; Punjab Business Registration Portal (PBRP)

²⁶ Currently this module is not introduced but has been proposed and can be added later on in development



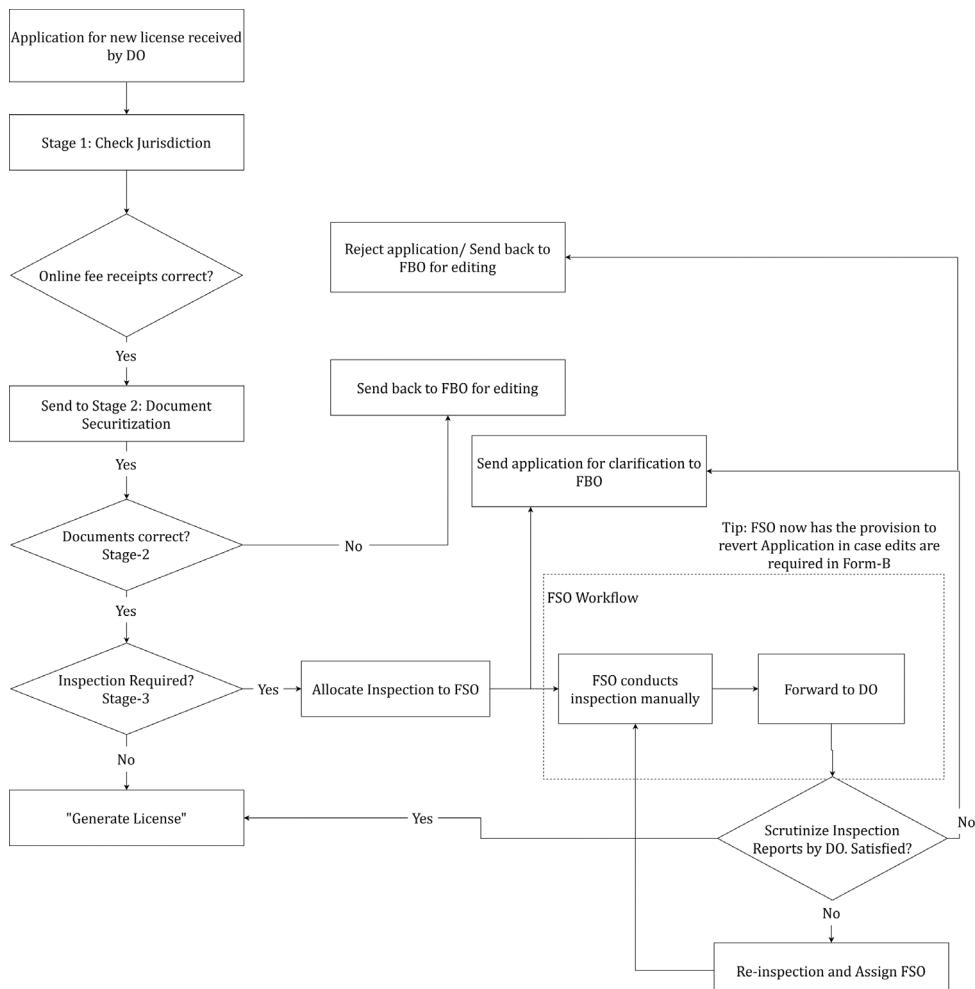
Figure 41: Dashboard Page Process Flow Overview



Source: Authors' illustration.

In the above flowchart, from the dashboard, users access the accounts page, then the "Applications/Certifications" section. If an application is reverted with comments (alert in red), users must view the remarks, update, and resubmit the application. If not, users can view details of submitted applications, issued licenses, or applications reverted by authorities. Users have 30 days to respond to reverts, with auto-rejection if they fail to do so.

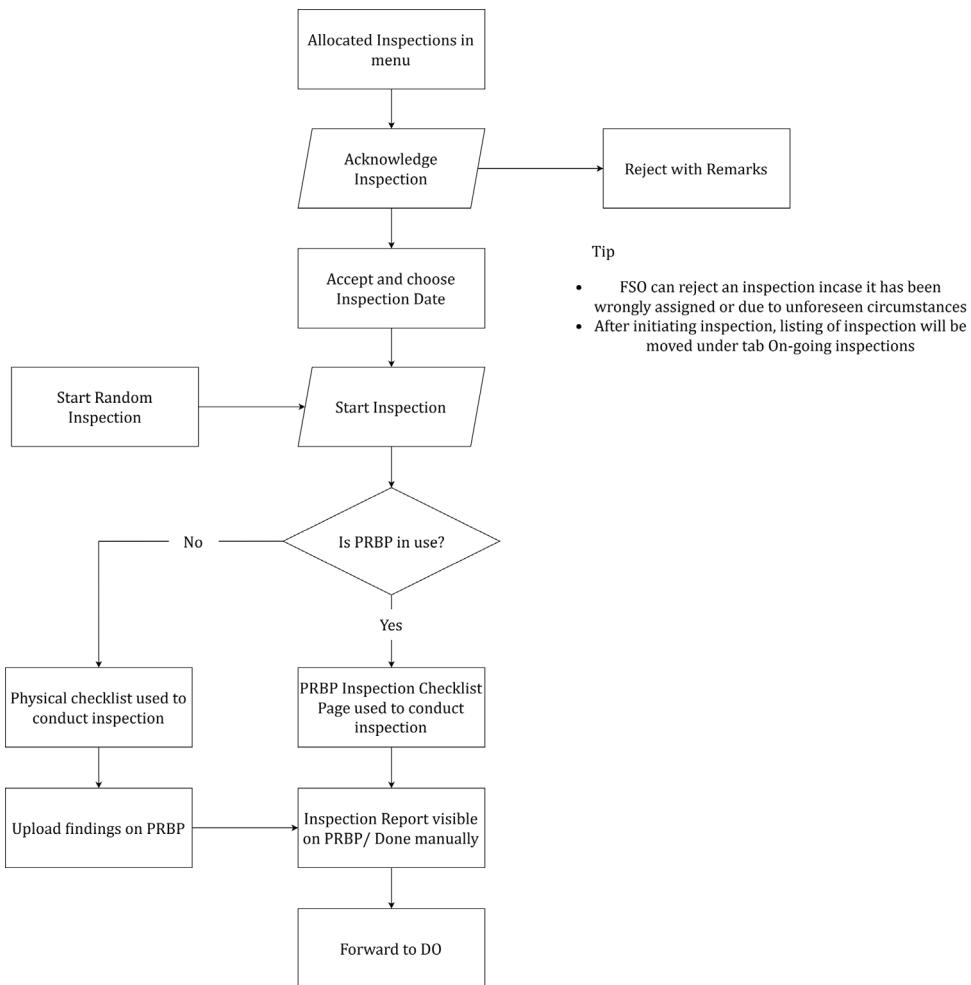
Figure 42: Process Flow for Application Processing by Designated Officers (DO)



Source: Authors' illustration.

The process for obtaining a food business license starts with the Food Business Owner (FBO) submitting an application, which the Designated Officer (DO) reviews to verify jurisdiction and fee receipts. After document verification, discrepancies are sent back to the FBO for correction. If inspection is required, a Food Safety Officer (FSO) conducts it, and the DO reviews the report. Unsatisfactory reports lead to re-inspections. The application may be returned for edits or clarifications at any stage. Once all requirements are met, the license is issued, ensuring a thorough review process.

Figure 43: Process Flow for Inspections



Source: Authors' illustration.

The food business licensing inspection begins with the Food Safety Officer (FSO) reviewing assigned inspections. The FSO may reject incorrect assignments with remarks or accept and schedule an inspection. Inspections can be random or scheduled, using either the PRBP²⁷ Inspection Checklist Page or a physical checklist if PRBP is unavailable. Findings are uploaded to the PRBP system, and the completed report is sent to the Designated Officer (DO) for further action, transitioning the process from physical to virtual (Grimmelmann, 2004; Wingreen et al., 2019).

²⁷ The Physical Random Basis Paper (PRBP) system ensures fair and thorough inspections using a predefined checklist. Inspectors follow this standard procedure, digitally or on paper, for consistency and transparency, maintaining a structured and unbiased approach.

Current Progress in Development

In the initial development, we were able to construct some major functionalities like Login and sign up, application submission, cancellation and storage. The overall front-end was developed in React JS, with added libraries for styling and error handling. The user interface is focused on and kept simple. MongoDB is maintained for login, sign up and contact us.

- 1) Submit Application: Submission of application was implemented in ReactJS, and the design was jotted down in Figma. The submission form will have all the required details needed from the relevant authorities. Additionally, other frameworks like Ant Design were used for input validation and related functionalities.
- 2) Cancel Application: In this component, the user will be able to see their previous and ongoing applications and have the opportunity to cancel any one of them. The prototype was implemented in ReactJS, and the design was initiated in Figma. The user will act by clicking on the button provided for cancelling, and upon clicking, an onClick function will be implemented to delete the particular application.
- 3) Login/Sign up: For both the Login and Signup, the frontend was developed in React.js. The design was implemented in Figma. When the user presses the login button after filling the form, a relevant API call will be sent to match the credentials. Similarly, for the signup module, the relevant API call for signup will be initiated. Additionally, the forms for Login and Signup were created with the help of a special React library: Ant Design. This made the form validation a lot easier as it checked if the format being entered by the user was correct and if all the inputs were being provided.
- 4) SubAdmin Creation: To handle the acceptance or rejection of the incoming forms, admins will be able to create SubAdmins to handle the work. The front end will present an option which will redirect them to a sign-up page. This page will take SubAdmin credentials and allow this new user to handle forms in their organisation.
- 5) Delete SubAdmin: Only Admin can perform this action. If the subadmin is no longer working with the organisation, then the admin can delete it from the database. This is handled from the front-end. This action is one click away. Admin will select the delete option from the action dropdown and confirm the deletion. The subadmin will be removed from the database.



- 6) Manage SubAdmins: Admin can see the list of all the subadmins that are currently working. Admin is also authorised to perform this action. Admin can update the account details of the subadmins in case the information given earlier was not correct.
- 7) Accept/Reject Application: On the admin dashboard, the admin will be able to view any submitted application with the pending status and accept or reject it accordingly. Upon acceptance, the system will allow only the next organisation to make changes. On rejection, the admin will be prompted to give a reason for rejection, and the system will mark the application as cancelled.
- 8) Track Application: The business owner will have the facility to track their application and its current status. They will be able to view which authority has accepted their application, and in case an authority has rejected the application, they will be notified of the reasoning.
- 9) Role-based access: Middleware is applied for security. On the basis of the roles, access to the portal will be given. There will be a division of Admin, Sub-Admin and Regular User, and they all will have different portals and functionality on the site. Regular User will be the restaurant owner, and sub-admins will be all the related authorities in the case. The Admin will be responsible for managing the sub-admins.

8. DISCUSSIONS AND POLICY RECOMMENDATIONS

The findings and discussions are categorised based on the components of the study as follows.

Modernising the Pakistan Hotel and Restaurants Act, 1976 and Associated Rules

Reviewing the current Act, i.e. Pakistan Hotel and Restaurants Act, 1976 (Act LXXXI of 1976) and rules (Pakistan Hotel and Restaurant Rules, 1977) made thereunder for restaurants and hotels registration reveals an urgent need for modernisation. The existing rules are outdated, requiring immediate amendment to facilitate the digitisation and automation of registration procedures. The current rules predominantly favour physical submissions of forms, manual downloading and submission for review, and manual challan

forms for fee submission following directions from the authorities. Additionally, there is a notable absence of delegated power to provincial governments for registering hotels and restaurants, highlighting the need for a more decentralised approach.

Being a provincial subject, and for proper working, it is recommended that the following amendments need to be made in the Pakistan Hotel and Restaurants Act, 1976 and associated rules as proposed thereunder, namely:

1. “Federal Government” needs to be substituted with the “Provincial Government” wherever occurring in the Act for proper and smooth functioning and within its constitutional mandate;
2. Appointing authority for the Controller, Deputy Controller, and other authorities shall be the provincial authority.
3. Rule-making powers must be entrusted to the provincial government so that proper implementation can be made in order to achieve the purpose of the Act within the Province. Though the Federal Government is empowered to delegate its power to the Provincial Government, the rule-making power that is entrusted to the Federal Government cannot be delegated, as it is a specific power.
4. Sealing power must also be provided to the provincial authorities under the Act of 1976, as the same power is substantive in nature.
5. In addition to the rules of 1977, there must be a regulatory power which shall be entrusted to the authority created under the Act.
6. Consequential amendments²⁸ pertaining to the aforesaid amendments shall also be proposed in the Act of 1976.

To address the complexities of varying provincial regulations, it is proposed that the Federation consider amending the Act of 1976 to apply uniformly across Pakistan. This can be achieved by engaging provincial governments for consensus and passing resolutions through their assemblies, creating a standardised framework that streamlines processes nationwide. A unified

²⁸ Consequential amendments are necessary to accommodate the proposed main changes in the law. These include provisions for conducting registration, licensing, and related processes online, ensuring the security and privacy of data submitted through the platform, recognising electronic records as valid for registration and licensing purposes, and allowing for the integration of the online platform with existing government systems and databases to facilitate seamless data sharing and processing.



approach would enhance public convenience by reducing regulatory complexity, financial burdens, and bureaucratic hurdles, while providing a transparent, cost-effective, and accessible one-window solution.

If consensus is not achieved, Parliament should enact new legislation to establish a centralised mechanism for procedural simplification. This would underscore the government's commitment to efficiency, inclusivity, and public trust. Key benefits include consistent regulations across provinces, reduced costs, improved efficiency, simplified access, and economic growth through clarity and reduced uncertainty. By implementing either strategy, the government can foster a citizen-centric administrative framework, enhance public satisfaction, and promote national cohesion through governance uniformity.

Integration of Various Departments Registration and Licensing Process

Here's a comprehensive table that outlines the integration and functioning of the various regulatory authorities and departments involved in the registration and regulation of restaurants in Punjab, Pakistan, with a focus on digitisation, automation, and integration. These functionalities are based on the regulatory review conducted in the study.

Table 24: Integration of Key Players in Web-Application Portal and Proposed Functioning

Player(s)	Current Functioning	Proposed Digitised Functioning	Integration in Web-Application Portal
Federal Government	Appoints Controllers for hotel and restaurant registration.	Delegates appointment authority to Provincial Governments.	The Federal Government sets overarching guidelines, with provincial-specific adaptations made through the portal.
Provincial Government	Limited delegated powers for regulation.	Full authority to appoint Controllers, Deputy Controllers, and other authorities.	Uses the web application for monitoring and reporting.
Controller (DTS)	Inspects premises and processes physical applications for registration and licensing.	Conducts virtual inspections and processes online applications.	Reviews and approves applications submitted through the web portal.



Player(s)	Current Functioning	Proposed Digitised Functioning	Integration in Web-Application Portal
Deputy Controller (DTS) Operations	Handles appeals and additional inspections.	Manages appeals and inspections through the web application.	Tracks appeals and inspections digitally, ensuring transparency and timely resolutions.
Punjab Food Authority (PFA)	Regulates food safety, conducts physical inspections, and processes manual applications for CPR.	Implements online application submission, digital CPR issuance, and virtual inspections.	Integrates food safety compliance checks into the web application, enabling synchronised reviews and automated feedback.
Food Safety Officers	Conducts physical inspections and enforces food safety standards.	Conducts virtual inspections, logs compliance digitally, and issues improvement notices through the web application.	Accesses digital logs and reports through the web application, ensuring up-to-date compliance records and efficient enforcement actions.
Public Analysts	Analyses food samples and provides manual reports to the PFA.	Conducts digital analysis and uploads reports directly to the web application.	Results are directly integrated into the web application, ensuring timely updates and actions based on analysis.
Metropolitan / Municipal Authorities	Manages local compliance, physical inspections, and fee collection for various permits and licenses.	Uses the web application for fee collection, virtual inspections, and compliance tracking.	Coordinates with other authorities via the web application for streamlined licensing and compliance processes.
Environmental Protection Authority (EPA)	Processes physical applications for Initial Environmental Examination (IEE) and issues NOCs for environmental compliance.	Implements online submission of IEE applications and digital issuance of NOCs.	IEE applications, inspections, and NOC approvals are handled digitally, with tracking and notifications via the portal.



Player(s)	Current Functioning	Proposed Digitised Functioning	Integration in Web-Application Portal
Traffic Engineering and Planning Agency (TEPA)	Reviews applications for parking agreements and traffic impact, ensuring compliance with zoning and parking requirements.	Manages parking agreements and traffic compliance checks digitally.	Parking agreements and approvals for traffic impact assessments are processed and tracked via the web-application portal.
Labour and Human Resource Department	Conducts physical inspections and ensures compliance with labour laws, including employee registration, wage enforcement, and workplace safety.	Digitises employee registration, wage compliance checks, and workplace safety audits.	Enables restaurant owners to register workers, track inspections, and resolve disputes through a unified platform.
Labour Inspectors	Conduct physical inspections to ensure compliance with labour laws, including minimum wage and safety standards.	Logs inspection reports and findings digitally, with automated reminders for non-compliance resolution.	Inspection outcomes and recommendations are integrated into the portal, visible to both authorities and restaurant owners.
Building Control Authority (DHA/LDA)	Reviews physical applications for building plans, commercialisation approvals, and completion certificates.	Implements a system for digital submission and approval of building plans and completion certificates.	Enables submission and tracking of building plans, zoning compliance, and structural approvals within the web application.
District Public Safety Commission (DPC)	Handles complaints against police misconduct and ensures law enforcement support aligns with legal boundaries.	Digitises complaint submissions, follow-ups, and resolutions related to law enforcement actions.	Allows restaurants to raise complaints or seek assistance through the portal, integrating police support into the workflow.
Water and Sanitation Agency (WASA)	Reviews physical applications and conducts inspections for water connections, sewerage setups, and compliance	Manages online applications for water/sewerage connections and monitors sanitation compliance digitally.	Allows restaurant owners to request connections and track sanitation compliance directly through the portal.



Player(s)	Current Functioning	Proposed Digitised Functioning	Integration in Web-Application Portal
Punjab Employees Social Security Institution (PESSI)	Processes manual registrations and compliance checks related to social security coverage for employees.	Digitises employee registrations for social security and monitors compliance through automated updates.	Restaurant owners can register employees for Social Security and track their status through the portal.
Civil Defence Department	Conducts physical inspections to ensure fire safety and emergency preparedness in commercial establishments.	Digitises fire safety certifications and compliance checks, integrating inspection results into a centralised system.	Fire safety inspections and certifications are seamlessly linked with other compliance data on the portal.
Police Department	Conducts background checks and physical verification of premises.	Provides digital police clearance certificates and conducts online verifications through the web application.	Uploads verification results directly into the web application, reducing delays and physical interactions.
Food Business Operators (FBOs)	Submits physical applications, follows up manually, and visits multiple offices for licenses.	Submits a one-time online application, tracks status, and receives digital licenses and certificates.	Uses the web application to submit applications, upload documents, track progress, and receive digital feedback and approvals from all relevant authorities.
Joint Secretary, Tourism Division, Islamabad	Handles appeals and revisions for hotel and restaurant registrations.	Manages appeals and revisions digitally through the web application.	Tracks and updates appeal statuses and revisions digitally, ensuring transparency and timely resolutions.
Hotels and Restaurants Committee	Advises on classification, fair rates, and other regulatory matters.	Provides digital advice and recommendations through the web application.	Committee decisions and recommendations are logged and accessible through the web application, enabling centralised and transparent advisory processes.

Source: Author's analysis based on regulatory review.



Integrated Digital Inspection System for Food Business Regulation

The proposed Integrated Digital Inspection System streamlines restaurant inspections through a centralised, online platform conducting random checks. By unifying processes across regulatory bodies, it enhances transparency, accountability, and grievance redressal while reducing inspection costs and duplication. Shared access to inspection reports for businesses and authorities ensures timely issue resolution and consistent standards, promoting compliance and operational efficiency. This system fosters a business-friendly environment while maintaining food safety and public health standards.

Streamlining Employee Medical Fitness Certification through Digital Integration

It is recommended that the process of medical fitness certification for food business employees be streamlined by requiring a one-time submission of the Certificate of Medical Fitness, alongside the CNIC details of employees through the web application. The portal should facilitate verification of these certificates electronically, ensuring compliance with health and safety standards while minimising repetitive documentation. This approach would enhance operational efficiency, reduce administrative burdens, and ensure transparency in the certification process, aligning with modernised registration and licensing procedures.

Enhancing Compliance through Integration of Commercialisation Completion Certificate

The inclusion of the Commercialisation Completion Certificate feature in the web portal provides a dual advantage of facilitating compliance and simplifying administrative procedures for food business owners. By allowing owners to upload an existing certificate or complete additional documentation to obtain it directly through the portal, this feature ensures streamlined processing and reduces delays associated with physical submissions. As the certificate is issued by the LDA, integrating this process into the portal fosters transparency, eliminates redundant bureaucracy, and ensures that businesses comply with zoning and commercialisation regulations.



9. CONCLUSION

This study identifies significant regulatory challenges faced by restaurant owners in Lahore, including high costs, excessive paperwork, frequent demands for bribes, and lengthy waiting periods. On average, the total cost for registrations, licenses, and approvals was approximately PKR 641,562 per restaurant, while the sludge constitutes approximately 9.46% of the total cost of setting up a restaurant in Lahore. This burden disproportionately affects small and medium-sized enterprises (SMEs), limiting their ability to invest in business growth. Moreover, the sludge cost as a percentage of the hotel and restaurant sector's GNP in Punjab has been estimated as 3.77% in 2020, 4.39% in 2021, and significantly dropped to 0.50% in 2022. This decline in 2022 correlates with a drastic reduction in the number of registered restaurants, attributed to a change in the registration methodology by the government, which impacts sludge burden estimates. The study highlights the systemic corruption within the regulatory framework, with numerous visits to various departments and substantial travel costs, as the actual payments the owners have been paying are substantially higher than the notified charges, as highlighted in the regulatory review.

To address these challenges, the study proposes a digitised and automated system to streamline registration and license acquisition processes from various regulatory authorities. This user-friendly web application aims to reduce paperwork, waiting times, and physical visits by integrating relevant departments' functions, enabling online status checks, license acquisition, payment processing, and grievance redressal.

The proposed solution has substantial public policy implications, supporting government initiatives on digital transformation, enhancing transparency, and potentially improving Pakistan's ease-of-doing-business ranking. By creating a more business-friendly environment, the proposed system can significantly reduce bureaucratic inefficiencies and promote integrity in public services.



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ANNEXURE

Table 25: Summary of the Costs and Visits by Restaurant Owners in Response to the Relevant Selected Department Intervention and Involvement

	<i>Obs.</i>	<i>Min. value</i>	<i>Max. value</i>	<i>Mean</i>	<i>Std. Deviation</i>
<i>Actual Time taken by the department in issuing the certificate/license (number of days)</i>					
<i>DTS</i>	105	1	1,520	133	280
<i>PFA</i>	229	1	365	35	52
<i>MCL</i>	51	3	210	30	38
<i>LDA</i>	45	1	180	57	47
<i>DMA</i>	16	2	90	17	24
<i>Labour Dept.</i>	149	0	362	31	51
<i>PESSI</i>	116	3	180	23	34
<i>EPA</i>	6	4	15	9	5
<i>Police</i>	52	1	30	7	6
<i>DHA & Cantt</i>	22	10	90	36	25
<i>Others</i>	4	30	365	121	163
<i>Total number of visits to the department for registration processes</i>					
<i>DTS</i>	60	1	30	4	5
<i>PFA</i>	29	1	12	3	3
<i>MCL</i>	117	1	33	4	5
<i>LDA)</i>	36	1	15	6	3
<i>DMA</i>	9	1	5	2	2
<i>Labour Dept.</i>	78	1	14	3	2
<i>PESSI</i>	39	1	13	3	3
<i>EPA</i>	4	2	4	3	1
<i>Police</i>	33	1	5	2	1
<i>DHA & Cantt</i>	19	1	15	4	3
<i>Others</i>	4	2	30	12	13
<i>Travel cost per visit (PKR)</i>					
<i>DTS</i>	53	300	20,000	1,864	3,243
<i>PFA</i>	25	500	5,000	2,348	1,446
<i>MCL</i>	112	300	30,000	2,789	3,538
<i>LDA</i>	35	400	30,000	4,363	5,093
<i>DMA</i>	8	1,000	7,000	3,750	1,909
<i>Labour Dept.</i>	64	300	20,000	4,334	4,347
<i>PESSI</i>	29	11	12,000	2,404	2,778



	<i>Obs.</i>	<i>Min. value</i>	<i>Max. value</i>	<i>Mean</i>	<i>Std. Deviation</i>
<i>Travel cost per visit (PKR)</i>					
<i>EPA</i>	3	500	1,000	733	252
<i>Police</i>	30	200	5,000	1,148	1,092
<i>DHA & Cantt.</i>	20	500	10,000	2,750	2,185
<i>Others</i>	4	1,000	12,000	4,500	5,066
<i>Obtaining approvals/licenses/noc/challan/penalty cost (PKR)</i>					
<i>DTS</i>	106	60	400,000	27,180	39,515
<i>PFA</i>	225	50	150,000	27,907	19,839
<i>MCL</i>	55	2,000	100,000	16,673	16,176
<i>LDA</i>	47	3,800	500,000	80,336	92,606
<i>DMA</i>	8	1,000	7,000	3,750	1,909
<i>Labour Dept.</i>	64	300	20,000	4,334	4,347
<i>PESSI</i>	29	11	12,000	2,404	2,778
<i>EPA</i>	3	500	1,000	733	252
<i>Police</i>	30	200	5,000	1,148	1,092
<i>DHA & Cantt.</i>	20	500	10,000	2,750	2,185
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<i>Obtaining approvals/licenses/noc/challan/penalty cost (PKR)</i>					
<i>DTS</i>	106	60	400,000	27,180	39,515
<i>PFA</i>	225	50	150,000	27,907	19,839
<i>MCL</i>	55	2,000	100,000	16,673	16,176
<i>LDA</i>	47	3,800	500,000	80,336	92,606
<i>DMA</i>	16	2,575	30,000	16,348	8,530
<i>Labour Dept.</i>	149	2,000	100,000	25,195	19,894
<i>PESSI</i>	118	1,000	400,000	43,605	52,715
<i>EPA</i>	1	4,000	4,000	4,000	.
<i>Police</i>	28	400	50,000	14,496	16,266
<i>DHA & Cantt.</i>	22	14,000	100,000	31,386	19,980
<i>Others</i>	6	1,000	150,000	50,167	52,251
<i>Other costs (including any hidden costs like bribes or miscellaneous expenses) (PKR)</i>					
<i>DTS</i>	15	3,000	30,000	10,667	7,916
<i>MCL</i>	49	1,000	60,000	7,396	10,280
<i>PFA</i>	23	10,000	150,000	50,000	34,345
<i>LDA</i>	34	2,000	500,000	39,088	90,332
<i>DMA</i>	2	5,000	20,000	12,500	10,607
<i>Labour Dept.</i>	58	2,000	150,000	21,293	26,582



	<i>Obs.</i>	<i>Min. value</i>	<i>Max. value</i>	<i>Mean</i>	<i>Std. Deviation</i>
<i>Other costs (including any hidden costs like bribes or miscellaneous expenses) (PKR)</i>					
<i>PESSI</i>	18	2,000	200,000	25,944	44,781
<i>EPA</i>	8	4,000	80,000	25,500	24,991
<i>Police (monthly)</i>	100	2,000	100,000	15,970	18,659
<i>DHA & Cantt.</i>	12	20,000	80,000	40,000	18,091
<i>Others</i>	8	2,000	50,000	22,625	16,044

Source: Authors' Calculations.

Table 26: Summary of Total Estimated Costs Incurred across Various Departments

		Estimated total cost incurred on registrations/licenses /approvals of your business from all relevant departments (PKR)	Estimated total fees paid to consultants or agents. (who hired consultants for business registration) (PKR)	Other associated total costs to obtain certificates/licenses (PKR)
<i>Obs.</i>	<i>Valid</i>	234	94	82
	<i>Missing</i>	11	151	163
Mean		309,453	89,606	149,659
Mode		200,000	100,000	150,000
Std. Deviation		467,142	147,294	185,483
Minimum		10,000	0	0
Maximum		4,000,000	1,000,000	1,000,000

Source: Authors' Calculations.



Table 27: Summary of Estimated Total Costs Incurred across Various Departments by Zones²⁹

Location	Variable	Obs	Mean	Std. Dev.	Min	Max
MM Alam Road	Q5_2	29	277,069	183,554	10,000	650,000
	Q5_4	19	62,632	33,180	10,000	120,000
	Q5_5	26	223,269	204,093	10,000	800,000
Main Boulevard	Q5_2	11	379,546	173,500	175,000	700,000
	Q5_4	6	75,000	46,690	20,000	150,000
	Q5_5	1	10,000	.	10,000	10,000
DHA Phase 1	Q5_2	12	123,333	91,982	10,000	300,000
	Q5_4	6	37,500	10,840	25,000	50,000
	Q5_5	12	105,833	50,715	30,000	200,000
Johar Town	Q5_2	27	249,315	382,209	12,000	2,000,000
	Q5_4	9	155,444	318,574	0	1,000,000
	Q5_5	4	92,500	80,571	10,000	200,000
Model Town	Q5_2	6	850,000	898,332	100,000	2,000,000
	Q5_4	4	137,500	47,871	100,000	200,000
	Q5_5	5	48,000	13,038	30,000	60,000
Cantonment Board	Q5_2	13	273,077	97,073	150,000	500,000
	Q5_4	5	42,600	19,204	18,000	70,000
	Q5_5	2	127,500	102,531	55,000	200,000
Jail Road, Shadman	Q5_2	9	801,111	1,240,468	60,000	4,000,000
	Q5_4	7	80,000	43,970	10,000	150,000
	Q5_5	7	183,571	211,162	0	500,000
Iqbal Town	Q5_2	13	719,231	847,078	20,000	2,500,000
	Q5_4	9	73,889	55,553	20,000	200,000
	Q5_5	6	49,667	29,541	8,000	100,000
Mall Road	Q5_2	10	131,500	120,924	20,000	300,000
	Q5_4	0				
	Q5_5	3	13,667	7,095	6,000	20,000
Anarkali Old	Q5_2	10	356,000	596,084	20,000	2,000,000
	Q5_4	4	16,500	12,871	6,000	35,000
	Q5_5	5	68,600	74,965	3,000	150,000
Wahdat Road	Q5_2	11	132,273	131,783	25,000	500,000
	Q5_4	0				
	Q5_5	0				

²⁹ Q_5_2 is Estimated total cost incurred in registrations/licences/approvals of your business from all relevant departments, till date (PKR) Q_5_4 is What were the estimated total fees paid to consultants or agents? (if applicable) Q_5_5 is Other associated total costs to obtain certificates/licenses (e.g., bribes, miscellaneous expenses) (PKR)



Location	Variable	Obs	Mean	Std. Dev.	Min	Max
<i>Lahore Fort</i>	Q5_2	8	250,000	53,452	200,000	300,000
	Q5_4	7	52,143	9,940	40,000	70,000
	Q5_5	0				
<i>DHA Phase 3</i>	Q5_2	13	326,231	211,766	41,000	700,000
	Q5_4	5	170,000	119,164	70,000	300,000
	Q5_5	1	300,000	.	300,000	300,000
<i>Bahria Town</i>	Q5_2	13	594,615	695,792	30,000	2,000,000
	Q5_4	9	194,444	316,588	20,000	1,000,000
	Q5_5	6	166,667	193,460	20,000	500,000
<i>Shalamar Link Road</i>	Q5_2	8	287,500	102,644	200,000	500,000
	Q5_4	3	45,000	22,913	25,000	70,000
	Q5_5	0				
<i>Samnabad</i>	Q5_2	14	70,714	42,556	20,000	150,000
	Q5_4	0				
	Q5_5	2	512,500	689,429	25,000	1,000,000
<i>Township</i>	Q5_2	9	146,667	113,606	40,000	400,000
	Q5_4	0				
	Q5_5	1	20,000	.	20,000	20,000
<i>Mozang</i>	Q5_2	7	143,571	175,088	25,000	500,000
	Q5_4	1	5,000	.	5,000	5,000
	Q5_5	1	10,000	.	10,000	10,000
<i>Wapda Town</i>	Q5_2	11	78,591	82,199	18,000	309,300
	Q5_4	0				
	Q5_5	0				

Source: Authors' calculations.



A DYNAMIC CGE-SLUDGE FRAMEWORK FOR PAKISTAN

Muhammad Zeshan¹

ABSTRACT

This study developed a dynamic CGE-sludge framework to analyse the economy-wide impacts of removing bureaucratic inefficiencies and red tape (“sludge”) in Pakistan. The simulation results revealed substantial potential gains across multiple economic dimensions, underscoring the importance of streamlining administrative processes and reducing regulatory burdens. Key macroeconomic findings included a short-term increase in investment by 314% and an increase in real GDP by 57.9%, while the projected welfare gain exceeded USD 142 billion in 2030, driven by increased household consumption across sectors. Sectoral analysis indicated significant shifts in economic activity, with the pharmaceutical sector showing a potential 950% increase and the construction sector a projected 140% increase in domestic activities by 2030. Conversely, the real estate sector was expected to contract, suggesting a reallocation of investments to more productive sectors.

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1. INTRODUCTION

The concept of a sludge economy has attracted increasing attention in recent years as a framework for understanding the drag on economic productivity and individual welfare created by excessive administrative burdens. Sludge refers to the frictions and inefficiencies that make it unnecessarily difficult for individuals and businesses to complete basic tasks, comply with regulations, or access public services (Sunstein, 2022). Reducing sludge has become a priority for policymakers seeking to streamline bureaucracy, improve service delivery, and promote economic dynamism.

The overall cost of sludge in certain sectors has been estimated to be 49% of Pakistan's GDP, equivalent to more than USD 132 billion in 2023, according to the PIDE Sludge Audits (1-3). PIDE Sludge Audit examined the burden of red tape on starting a business, such as registering new pharmaceuticals, or the administration of the judicial system. In a partial equilibrium and closed-economy setting, Faraz & Qasim (2022) found that digitisation can reduce time and monetary costs by over 40% and 34%, respectively. However, it is not as effective in reducing opportunity costs unless the government intervenes and eliminates the need for physical documents, which can reduce opportunity costs by over 60%.

While digitisation, particularly a streamlined one-window system, is a major recommendation, it is not the only approach identified to reduce sludge. The PIDE Sludge Audits also highlight the need for regulatory simplification, process reengineering, and the elimination of unnecessary steps in approval workflows. Compared to international studies, PIDE's focus aligns with broader sludge-reduction efforts but is particularly centred on inefficiencies in business and public service access in Pakistan.

Computable general equilibrium (CGE) models have become a cornerstone of economic policy analysis over the past few decades. They provide a powerful framework for assessing economy-wide impacts of policies, shocks, and structural changes across various sectors and regions. Though originally developed to analyse trade policies, CGE models have expanded to study various distortions and frictions that create welfare and deadweight losses. The recent unifying theme in using CGE models is to measure direct and indirect effects of market imperfections and institutional failures (Socci et al., 2021).



Literature on CGE modelling is vast and diverse, encompassing a wide range of applications and methodological advancements. One of the most prominent CGE frameworks is the Global Trade Analysis Project (GTAP), which has been at the forefront of multi-regional CGE modelling since the 1990s. It maintains a comprehensive global database and hosts annual conferences that showcase hundreds of applications across trade policy, environmental economics, development, and more (Hertel, 1997; Aguiar et al., 2019). This network has fostered a global community of researchers and policymakers, continuously expanding the frontiers of CGE analysis.

Beyond GTAP, several other well-established CGE modelling networks have contributed significantly to the field, including the International Food Policy Research Institute (IFPRI), which has developed numerous CGE models for various countries, including Pakistan. These models are powerful tools for analysing the economy-wide impacts of policy changes, external shocks, and structural transformations (Lofgren et al., 2002). Particularly, Cororaton & Orden (2008) have outlined different interesting scenarios to provide policymakers with a roadmap for forecasting and influencing Pakistan's future economic growth. Similarly, the Partnership for Economic Policy (PEP) focuses on building capacity for CGE modelling in developing countries (Galindev & Decaluwe, 2022). MONASH model, developed at the Centre of Policy Studies in Australia, is renowned for its detailed microeconomic structure and strong forecasting capabilities (Dixon & Rimmer, 2003).

While CGE models have traditionally been used to study market-based policies and distortions, there is growing interest in applying these tools to analyse institutional factors and non-market frictions. This includes studies on governance quality, regulatory burdens, and informal economies (Savard & Melancon, 2013). The application of CGE modelling to analyse sludge, as undertaken in this study, represents a novel extension of this approach to examining bureaucratic inefficiencies in a general equilibrium framework through a productivity lens. However, Zaki (2009) has developed a dynamic CGE model to incorporate red tape and trade aspects in Egypt, whereas Fehr et al. (2012) modelled bureaucratic inefficiency as a tax on intermediate inputs. Inter-industry analysis is really important to quantify how sludge in one sector affects other sectors through backwards and forward linkages. Moreover, open-economy analysis is required to examine how it affects domestic activities and international trade in different industries. An analysis of these channels is very important for firms and investors for their business and investment decisions. This knowledge gap motivates the application of a CGE model to assess how sludge propagates through different sectors in Pakistan.

CGE models provide a powerful simulation tool for quantifying the total costs of sector-specific shocks or policies given the input-output linkages in an economy. The Social Accounting Matrix (SAM), which underpins a CGE model, captures how economic agents interact across activities like production, consumption, trade, and investment. Once calibrated to a SAM, a CGE model can estimate changes in macro aggregates like GDP, employment, prices, and welfare induced by specified shocks or policies (Zeshan, 2019).

Sludge fits squarely within this class of market imperfections that CGE models can provide nuanced assessments of given economy-wide interactions (Zeshan & Shakeel, 2023; Zeshan et al., 2024). By imposing bureaucratic burdens on firms, workers, investors and consumers, sludge reduces productivity, distorts prices, and alters resource allocation, creating ripple effects throughout supply chains, labour markets, and trade flows. Fully capturing these complex mechanisms requires a general equilibrium approach like CGE modelling.

The vast literature has demonstrated the advantages of CGE analysis, but sludge remains under-explored as a distinct distortion amenable to quantification using economy-wide modelling. To the best of the author's knowledge, no study has employed a dedicated dynamic CGE model to analyse the macroeconomic implications of sludge for a developing country like Pakistan. Therefore, this study provides novel empirical insights into how the costs of sludge propagate through a general equilibrium framework.

Reducing sludge is an urgent priority for Pakistan's economic development. However, effective policies that address this issue require a rigorous diagnosis of how sludge permeates the economy. This research provides a diagnosis of sludge and its effects on Pakistan's economy by leveraging a CGE model tailored to analyse sludge in Pakistan. This study uses GTAP data and simulates the results of our dynamic CGE sludge model. A detailed mapping of activities studied in the PIDE Sludge Audits (1-3), which forms the starting point for our analysis, and the GTAP sectors is provided in Appendix A. Our model quantifies sludge impacts at the macro level on GDP, investment, domestic rate of return (DROR) on capital, and aggregate welfare, capturing both direct effects and indirect spillovers. At the micro level, the study focuses on sectoral domestic sales and household demand for domestic and imported goods and services.



The CGE approach also permits targeted policy simulations to identify high-return interventions for sludge reduction. Roos et al. (2020) propose a CGE model approach to identify sectors in which sludge removal can provide larger dividends to the economy. By illuminating the macroeconomic footprint of sludge and priority areas for reform (sludge removal), this research promises vital insights to guide policy aimed at alleviating one of Pakistan's most binding development constraints.

2. LITERATURE REVIEW

This study contributes to two main bodies of literature, namely, research on the causes and consequences of sludge on economies and the application of CGE models to analyse economic frictions.

Sludge Economy Literature

The concept of “sludge” originated in behavioural economics to describe excessive bureaucratic burdens that distort individual decision-making and impose wasteful costs on citizens and firms. Seminal work by Sunstein (2013) advocates simplifying processes and choice architecture to reduce sludge. McChesney (1997) provides a theoretical model of how politicians and bureaucrats design sludge to extract rents, showing that excessive red tape can persist even in the presence of benevolent leaders due to commitment problems. Earlier, Ferguson (1984) found that economic frictions of sludge reduce female labour force participation more than that of males.

More recently, the sludge framework has been applied to analyse administrative frictions in developing countries. However, most of these studies have focused on micro-level impacts or individual sectors. Nguyen & Van Dijk (2012) surveyed firms in Vietnam to quantify the sludge costs of starting a business. Fedosov & Paientko (2017) measured productivity losses in Ukrainian manufacturing from bureaucratic burdens and weak governance. While highlighting the micro burden of sludge, few studies have adopted a macroeconomic lens for quantifying economy-wide effects. Bovi (2002) estimated that sludge increased the size of the underground economy in the UK by 13% of GDP. These studies point to macro impacts but lack detailed economic modelling of transmission channels.

PIDE Sludge Audits (1-3) have examined various micro-level costs and inefficiencies due to sludge in Pakistan. The audit results are summarised in Appendix B. For instance, Sludge Audit 1 focused on the construction and business setup processes (Haque et al., 2022). Obtaining permission for high-rise buildings from the Capital Development Authority (CDA) is particularly costly, amounting to 17.5% of annual GDP over 4 years. Other processes, like residential construction permits, environmental approvals, and setting up businesses, like pharmacies or hospitals, also incur significant costs and stress. Moreover, Sludge Audit 2 examined costs in different industries and services (Haque et al., 2023). Restaurant businesses face the highest sludge cost at 1.5% of GDP. Getting electricity connections and setting up an intercity private bus service also incur notable costs. Registration of new medicines and intellectual property rights, on the other hand, has relatively lower sludge costs.

Finally, Sludge Audit 3 analysed Pakistan's judicial system (Haque & Qasim, 2023). Criminal trials for theft cases have slightly higher costs than homicide cases. Civil trials for inheritance cases are more costly and time-consuming than divorce cases. Inland revenue court cases are particularly expensive, costing 1.4% of the annual GDP over 3 years. Other legal proceedings, like customs tribunals, anti-corruption trials, and banking suits, also incur varying levels of costs and require numerous trips over multiple years.

CGE Modelling Literature

This study also contributes to the applied literature on CGE models for analysing frictions and distortions affecting economic productivity and efficiency.

One application is quantifying the economic costs of over-regulated governance. Taylor (1990) reviewed the use of CGE models since the early 1970s, which are essential to understanding the behaviour of developing economies. Roos et al. (2020) modelled bureaucratic inefficiency as a tax on intermediate inputs, estimating large productivity and growth impacts in South Africa. These applications demonstrate CGE modelling's usefulness for intangible institutional constraints.

More recent studies have applied CGE models to related concepts such as informality and red tape (Das et al., 2023; Samuels & Duramany-Lakkoh, 2023). Urbiztondo et al. (2009) modelled regulations as a tax on Argentinian firms and showed gains from reducing delays in customs, courts, and licensing. However, no existing CGE model in mainstream literature focuses



specifically on the macroeconomic burden of sludge. This requires tailoring the model's structure, parameters, and calibration to analyse how sludge manifests institutionally in Pakistan based on micro-evidence. By embedding firm-level impacts into the CGE framework, it provides a concrete analytical framework to suggest policy reforms for alleviating sludge.

In summary, this study makes two main contributions. It provides the first economy-wide analysis of the costs of sludge in Pakistan using a purpose-built CGE model. Second, it demonstrates this modelling approach's potential as a diagnostic tool for analysing bureaucratic inefficiency in developing countries. Our results will enhance understanding of how sludge drags economic performance and provide an evidence base for meaningful productivity-enhancing reforms. A summary of selected previous CGE studies on Pakistan, to which this study contributes an additional dimension, is shown in Table 1.

Table 1: Summary of Selected CGE Studies for Pakistan

Authors	Year	Focus Area	Methodology	Key Findings
Ahmad et al.	2022	Agricultural trade, poverty reduction	CGE model	Trade liberalization policies have mixed effects on ultra-poor households, with some benefits depending on crop type.
Ahmed et al.	2013	Infrastructure and economic growth	CGE microsimulation	Public infrastructure investments significantly impact economic growth, employment, and poverty alleviation in Pakistan.
Bhatti et al.	2015	Fiscal policy, income inequality	CGE model	Progressive fiscal policies reduce income inequality, while regressive taxes exacerbate disparities.
Cororaton & Orden	2008	Cotton and textile economy, poverty impact	CGE model	Cotton and textile sectors are crucial to rural and urban economies, with significant linkages affecting poverty reduction, especially in rural areas.
Mahmood & Marpaung	2014	Carbon pricing, energy efficiency, climate policy	CGE model	Carbon pricing positively impacts energy efficiency and reduces emissions but can strain economic growth without compensatory measures.



Authors	Year	Focus Area	Methodology	Key Findings
Siddiqui & Iqbal	2001	Tariff reduction, income distribution	CGE model	Tariff reductions benefit higher-income groups, creating concerns about income inequality.
Shaikh et al.	2012	SAFTA, regional trade, economic impacts	CGE model	SAFTA enhances Pakistan's trade opportunities but leads to trade deficits in the short term.
Sarwar	2023	Tax reforms, economic impact	CGE model	Tax reform proposals have varied effects on revenue generation, growth, and income distribution, requiring balanced reforms.
Shaikh & Rahpoto	2009	Trade liberalization, SAFTA	CGE model	Trade liberalization improves economic output but also introduces vulnerabilities in the domestic market.
Shaikh	2009	Bilateral trade, SAFTA	CGE model	SAFTA enhances bilateral trade but requires complementary policies to manage negative effects on smaller industries.
Zeshan et al.	2024	Water resource management, future markets	CGE-Water model	Water market reforms can optimize resource distribution, mitigating future water scarcity risks.
Zeshan & Shakeel	2023	Climate change, adaptation and mitigation policies	CGE-Water-Energy (WE) model	Adaptation and mitigation policies significantly reduce climate vulnerabilities but require substantial investments.
Zeshan & Ko	2019	Climate change adaptation	Gdyn-W model	Climate change adaptation policies are crucial for minimizing economic damage, especially in agriculture and energy sectors.



3. RESEARCH METHODOLOGY: DYNAMIC CGE-SLUDGE FRAMEWORK

Our CGE-Sludge framework extends the use of the dynamic GTAP model (Ianchovichina & McDougall, 2000) by incorporating sludge features through the productivity channel and accounting for changes over time. In particular, at the macro level, effects on GDP, investment, domestic rate of return on capital, and aggregate welfare level are assessed. At the micro level, we focus on domestic sales and household demand for domestic and imported goods and services. This model is designed to analyse short- and medium-run policy effects.

Salient Features of the Model

Capital accumulation is a central component of our CGE-Sludge framework. The model uses an integral equation to represent the evolution of capital stock over time. This equation accounts for net investments and the existing capital stock at the base period in a recursive dynamic framework.

Investment behaviour in our model is driven by expectations of returns and adjustments in capital stocks. It incorporates adaptive expectations, where agents form their investment decisions based on past experiences and anticipated future returns. This lagged adjustment mechanism ensures that capital stocks adjust gradually over time, reflecting the real-world delays in investment responses to economic signals.

The model seeks to balance complexity and computational efficiency. It aims to maintain the strengths of the standard GTAP model, such as detailed sectoral disaggregation, while extending its capabilities to dynamic analysis. However, this approach also introduces challenges, such as ensuring the accuracy of dynamic equations and dealing with potential inaccuracies in capital accumulation over longer time periods.

Model Dynamics

Our model utilises a recursive dynamic methodology, solving each time period sequentially and updating key variables based on outcomes from previous periods. This approach offers several advantages:

1. It allows for the tracing of capital stock evolution and investment flows over time.

2. It provides insights into how investments in earlier periods impact long-term economic outcomes.
3. It incorporates time as a variable, enabling more dynamic and temporally nuanced simulations.

Total Factor Productivity

The total factor productivity (TFP) channel is a crucial aspect of our dynamic CGE-Sludge framework. TFP measures the overall productive efficiency with which all inputs are combined to produce output. It captures factors beyond what is accounted for by their mere quantity. It captures the combined effect of technological advancements, efficiency improvements, and the effectiveness of resource use. TFP is crucial for understanding long-term economic growth.

Our model incorporates TFP changes to reflect how economies evolve. Our model uses TFP to adjust production functions in various sectors, thereby influencing overall economic output. We model TFP through production functions that include labour, capital, and land inputs. The general form of the production function incorporating TFP in period t is:

$$Y_t = A_t \times F(K_t, L_t, T_t),$$

where

Y_t = Output in period t

A_t = Total factor productivity in period t

K_t = Capital in period t

L_t = Labour in period t

T_t = Land in period t

F = Functional form representing the combination of inputs

TFP in our CGE-Sludge framework serves as a critical indicator of economic efficiency. Its inclusion allows for a more detailed and accurate analysis of economic policies and their long-term effects on the economy. Finally, the key model equation for linking TFP and value-addition is as follows:

$$Value\ added_i = f(Output_i, TFP_i, Elasticity\ of\ substitution_i, Price\ of\ VA_i, Price\ of\ output_i)$$



Definition and Explanation of Key Variables

Adding brief explanations for each key macro variable provides more clarity on how the model quantifies these key macroeconomic impacts. It also helps to specify which particular measure is being used to assess economy-wide performance, such as:

Investment

Definition: The addition to the economy's capital stock.

Measurement: In the current dynamic CGE-Sludge framework, it is modelled as a function of the expected rate of return on capital relative to the cost of capital. Thus, investment in each period adds to the capital stock available for production in subsequent periods.

Real GDP growth

Definition: Percentage change in the total real value of goods and services produced in the economy.

Measurement: Calculated as the percentage change in real GDP between two periods. Real GDP is typically measured as the sum of value added across all sectors, deflated by a price index.

Domestic Rate of Return (DROR)

Definition: The return earned on investments within the domestic economy.

Measurement: It was calculated as the ratio of capital income to capital stock. In the current dynamic CGE-Sludge framework, this is typically an endogenous variable that adjusts to equate savings and investment.

Welfare

Definition: A measure of economic well-being, typically based on household consumption.

Measurement: It was measured using equivalent variation (EV) in the GTAP modelling framework. It measures the change in income that would be equivalent to the impact of a policy change on household utility. Aggregate welfare changes are typically calculated as the sum of EV across all households.

Social Accounting Matrix (SAM)

The GTAP Data Base represents a comprehensive snapshot of the global economy for a specified reference year. It integrates various data sources, including national input-output tables, trade statistics, macroeconomic indicators, energy data, and tariff information. Due to the heterogeneous nature of underlying input-output tables in terms of sources, methodologies, base years, and sectoral specifics, significant efforts are invested to ensure consistency and comparability across disparate data sources. Rather than simply providing input-output tables, the primary goal of the GTAP Data Base is to support economic simulation models by offering users a reliable and uniform set of economic data.

The construction of the GTAP Data Base version 11 aims to harmonise global-scale data sources for analytical purposes, offering comprehensive time series data on value flows, volumes, and various tax measures. This extensive coverage of economic activities enhances its utility in conducting wide-ranging studies on global economic issues.

Simulation Design

Our dynamic CGE-Sludge framework was initially calibrated to a SAM that reflects Pakistan's current economy, including existing sludge. Baseline equilibrium inherently incorporates productivity losses and distortions caused by sludge across different sectors.

To simulate sludge removal, sector-specific TFP parameters were adjusted based on empirical estimates from the PIDE Sludge Audit Series. These adjustments represent productivity gains from removing administrative burdens. For example, the audit data suggests that sludge in construction due to "Obtaining permission from the CDA for a high-rise building" causes cumulative productivity loss in the construction sector equal to 17.5% of annual GDP over four years. Our dynamic CGE-Sludge model increased (matched) the TFP parameter for construction by corresponding to each year to reflect this effect in each of the four years. Other causes of sludge affecting construction were similarly modelled to obtain our initial sludge removal change in TFP for this sector. In the model, simulating the removal of all sludge, as estimated in the PIDE audits, similar adjustments were made across all sectors based on their specific sludge burdens. After implementing these changes, the CGE model was solved for a new general equilibrium, allowing all markets to adjust. Economic impacts of sludge removal were then quantified



by comparing key macro and micro indicators (e.g. GDP, sectoral output, etc.) between the no-sludge simulation counterfactual equilibrium and sludge-inclusive baseline.

One point to note is that we model the effect of sludge removal on an improvement in TFP only for one year or for the number of years for which the PIDE audits show an effect. After these years, in our model, TFP returns to its baseline value. This is a relatively conservative approach. For example, an improvement in getting a permit for high-rise buildings may result in a multi-year period of expanded construction before dampening down. Sludge removal in other sectors or activities might be expected to have long-term benefits, such as changes to the judicial system that remain in effect and affect legal processes on a continuing basis.

Matching of PIDE Sludge Audit Estimates to GTAP Sectors

The most recent GTAP Data Base version 11 was used for analytical purposes in our dynamic CGE-Sludge model (Aguiar et al., 2022). It encompasses data from 141 countries and 19 aggregate regions, representing 99.1% of the world's GDP and 96.4% of the global population, including 65 sectors for each country. The base year for this is 2017.² For the present study, a mapping of 34 activities, for which sludge effects were estimated in the PIDE audits, to 12 GTAP sectors is provided in Appendix A. All other GTAP sectors were aggregated into a single "Other" sector, for which the PIDE audits provided no sludge effect estimates. Finally, all trade partners were aggregated into a single "Rest of the World." It used the expected rate of return closure (RORE), where capital moves across regions and regions' trade balances change accordingly.

The integration of PIDE sludge estimates with GTAP sectors is a necessary step for our CGE analysis, but presents certain conceptual and methodological challenges that require careful explanation. Importantly, the simulation results are tied to GTAP sectors rather than PIDE-specific activities, necessitating clarity in how the mapping was conducted. In this regard, Table A1 in Appendix A illustrates the mapping between activities included in the PIDE Sludge Audit and the GTAP sectors. The table also provides the abbreviated names used in reporting the simulation results, some of which match the GTAP sector names, while others are more focused based on the PIDE Sludge audits.

² The author is the solo contributor to the Pakistan input-output table for the GTAP Data Base version 11.

First, the aggregation of sludge estimates for various sub-sectors into broader GTAP sectors can mask important distinctions. For example, sludge estimates titled "Setting Up: Pharmaceutical Unit," "Setting Up: Pharmacy," and "Registration of New Medicine" are aggregated under the GTAP sector "Basic pharmaceutical products." Such aggregation risks losing the nuances of specific sub-sectors, potentially overstating or understating the broader pharmaceutical industry's sludge impacts.

Additionally, the GTAP sectors are often more generalised than the specific activities assessed by PIDE. This results in the application of sludge estimates derived from narrowly defined activities to broader economic categories. For instance, sludge estimates titled "Setting Up: Petrol Pump" are mapped to the GTAP sector "Business services nec." This broader categorisation could lead to an overgeneralisation of sludge effects, misrepresenting inefficiencies in sub-sectors where bureaucratic barriers may not be as significant.

Another limitation arose from the inherent gaps in the PIDE sludge estimates. Many forms of sludge in the mapped sectors, as well as in sectors not represented, remain unevaluated. For instance, while several judicial and administrative processes are mapped to the GTAP sector "Public Administration," numerous inefficiencies within this sector likely remained unaccounted for in our analysis.

4. SIMULATION RESULTS

We present results for two simulations: a) the illustrative removal of sludge in the electricity sector only by reducing burdens on acquiring electricity connections, and b) the removal of all sludge as estimated in the PIDE Sludge Audits (1-3). Results of these two scenarios are compared to a baseline simulation with no sludge removal.

Case Study: Sludge Removal in the Electricity Sector Only

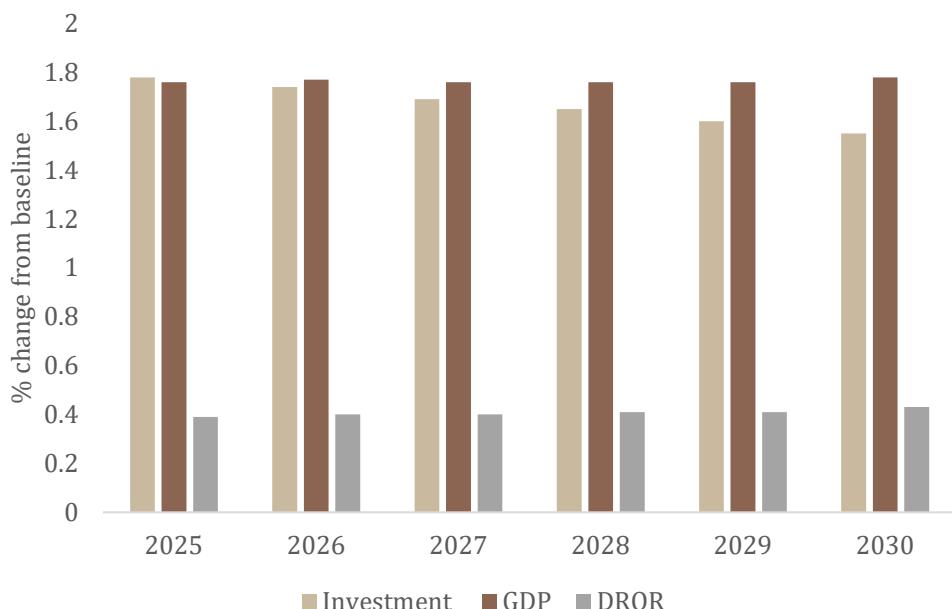
Macro Indicators

According to the PIDE Sludge Audit Vol. 2, the cost of sludge in the electricity sector for year 1 only is around 1.50% of GDP (see Appendix B, Table B19). Compared to the baseline model, a 30.3% TFP productivity gain in the electricity sector would raise total GDP by this amount. Therefore, this scenario increases the baseline productivity parameter by 30.3% in the electricity sector for this single year.

The simulation results of removing sludge in the electricity sector reveal a picture of steady growth and positive trends across multiple sectors. Macroeconomic indicators show an increase in investment, with a slight decline in the pace of investment growth from 1.78% in 2025 compared to the baseline to 1.54% in 2030 (see Figure 1). Nevertheless, GDP growth demonstrated a consistent upward trajectory, with annual GDP rising from 1.76% to 1.78% with the sludge removal compared to the baseline. This suggests improved economic efficiency, higher output, even with slightly diminished investment growth. The DROR showed a steady increase from 0.39% to 0.43%, indicating improved profitability and efficiency of the domestic investment.

It is important to note that this simulation implemented a single direct intervention only. The observed changes in the economy at the macro and micro levels emerged as a result of this one direct exogenous intervention and from indirect effects through intersectoral linkages and general equilibrium adjustments.

Figure 1: Macro Indicators: Electricity Sector Sludge Removal Only



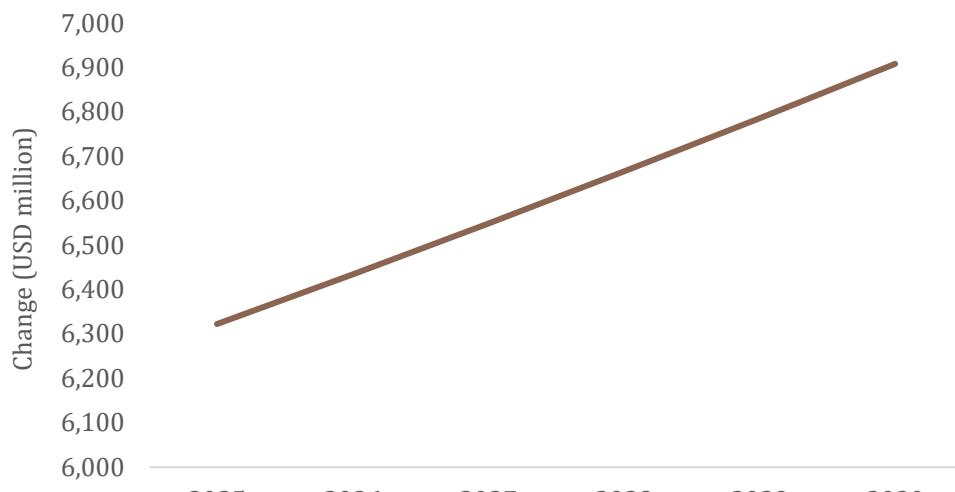
Source: Author's calculations.



Welfare

The direct and indirect effects of electricity sector reform (sludge removal) that removes sludge from establishing electricity connections translate into meaningful welfare improvements. Welfare levels exhibited consistent growth, rising from USD 6.3 billion in 2025 to USD 6.9 billion in 2030 (see Figure 2). This represents an average annual growth of about 1.8%, suggesting improvements in living standards for the population. The positive trend in welfare indicates that the economic gains from removing sludge in the electricity sector would translate into tangible benefits for households.

Figure 2: Welfare Level: Electricity Sector Sludge Removal Only



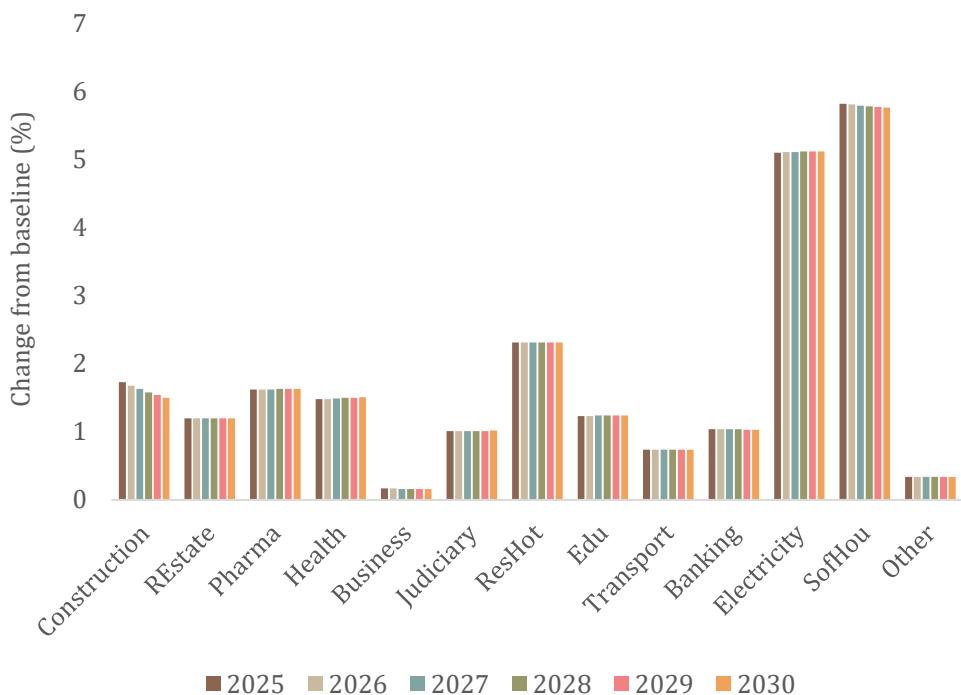
Source: Author's calculations.

Domestic Sales

Domestic sales showed varied performance, reflecting both the direct and indirect effects of electricity sector reform. As expected, the electricity sector, where reform occurred, recorded one of the largest increases in domestic sales. Within this sector, computer, electronic, and optical products (SofHou, see Appendix A) rose by the largest margin, from 5.76% to 5.82%. Effects on other sectors arose indirectly through inter-sectoral linkages and the inter-temporal dynamics of the model. The next largest gains were observed in accommodation, food, and service activities (ResHot), while the impacts were minimal for business services nec (Business) and the aggregated "Other" sector. Construction showed moderate but declining growth relative to the baseline.

It is worth noting at this point that domestic sales of the electricity sector in our second general equilibrium simulation are higher (19.8% in 2025 and 13% in 2030, see Figure 8) compared to the effects when reform occurs only in the electricity sector (around 5.12%, see Figure 3). The latter simulation captures the interlinkage effect of sludge removal in all the activities in the PIDE Sludge Series (1-3), allowing more substantial ripple effects in the economy. The net effect is a larger increase in electricity domestic sales than from the reform in electricity only.

Figure 3: Domestic Sales: Electricity Sector Sludge Removal Only

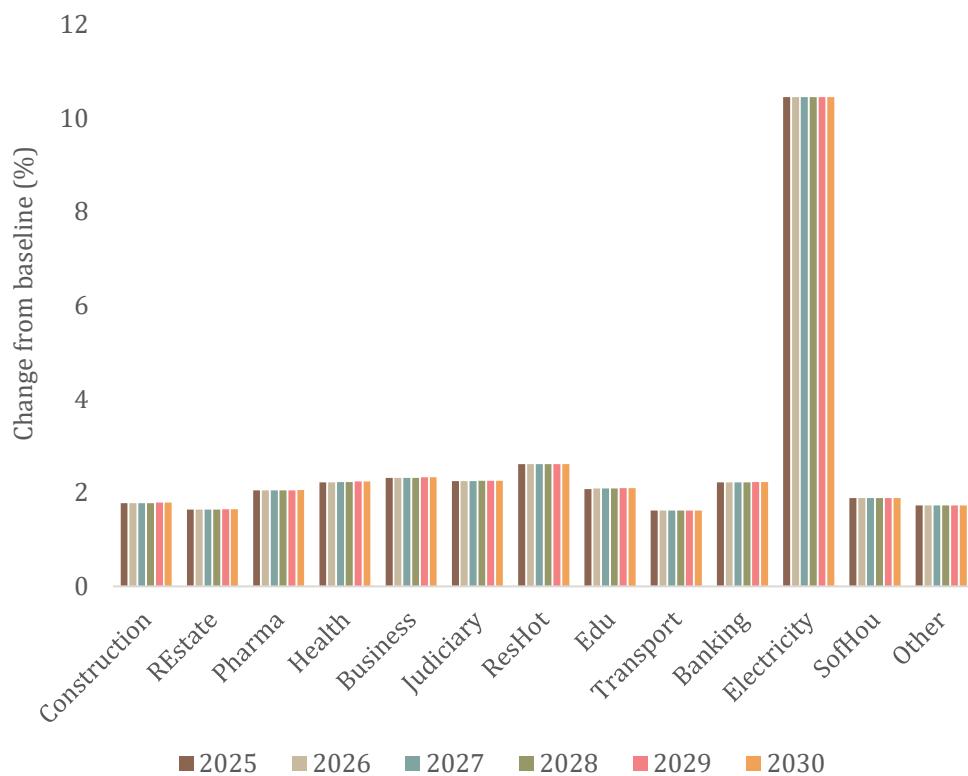


Source: Author's calculations.

Overall Private Household Demand

Supportive of improved welfare, household demand showed a positive growth across all sectors, with electricity (10.45%), where the reform occurs, experiencing the most significant increase, followed by ResHot (2.61%), and Business (2.32%). This widespread increase in demand reflects greater purchasing power stemming from the productivity gains in the electricity sector (see Figure 4).

Figure 4: Overall Private Household Demand by Sector: Electricity Sector Sludge Removal Only



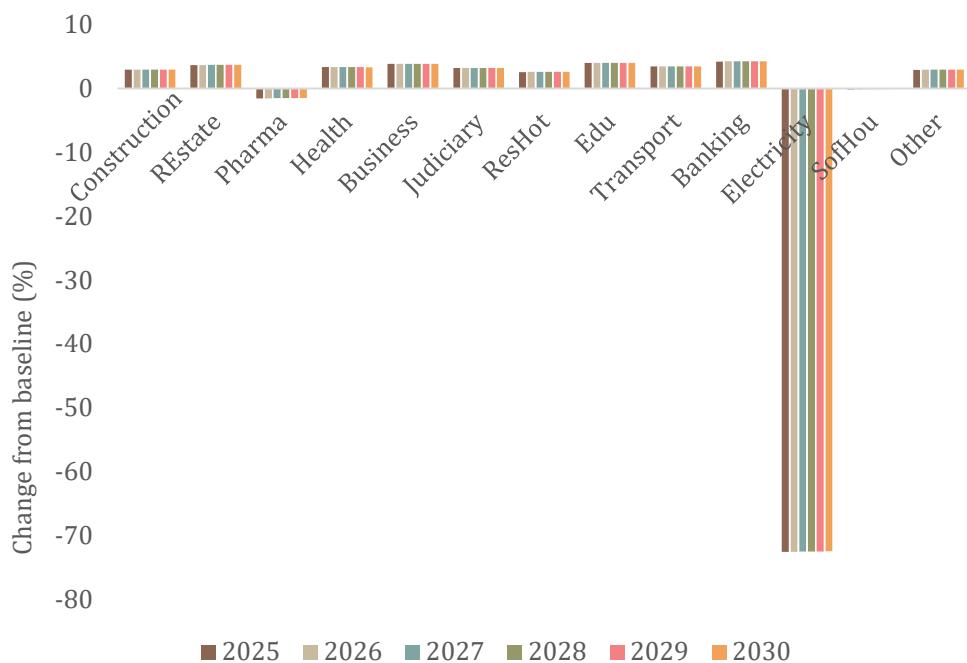
Source: Author's calculations.

Private Household Demand for Imports

Demand for imported commodities varied greatly due to the direct and indirect effects of electricity sector reform. There was a dramatic decrease in electricity sector imported products, suggesting a major shift towards domestic energy sustainability, with a smaller decline in imports of basic pharmaceutical products (Pharma, see Figure 5). Conversely, there was a modest increase in household demand in other sectors, with financial services (Banking), education (Edu), and Business showing strong growth of imports in these sectors, indicating an increased use of international services in these sectors.



Figure 5: Private Household Demand for Imports by Sector: Electricity Sector
Sludge Removal Only



Source: Own calculations.

Sludge Removal in All the Given Sectors

Macro Indicators

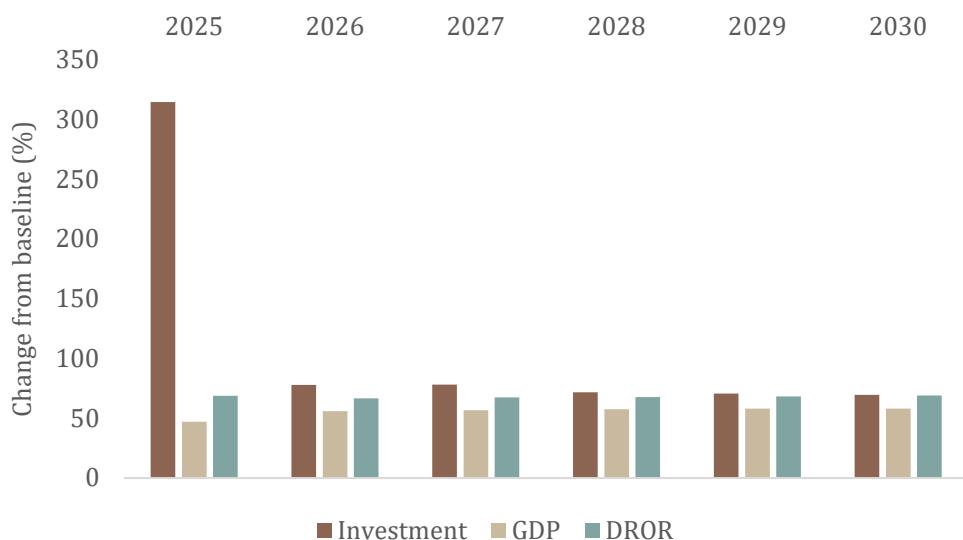
In the simulation of complete sludge removal, as calculated in the PIDE Sludge Audit (multi-sector scenario), there were direct effects on the 12 sectors in which total factor productivity (TFP) was raised to represent the removal of sludge. Indirect effects were also observed on these sectors and on the aggregated “Other” sector.

The removal of these bureaucratic hurdles unlocks significant investment potential in the early years. The initial effect on investment from sludge removal in all the given sectors was extraordinarily high, increasing by 314.6% compared to the baseline in 2025 (see Figure 6). PIDE Sludge Audit Vol. 1 explains that obtaining permission for a high-rise building from the CDA costs 10.9% of GDP in year 1, which is the primary cause of such huge investment loss in Pakistan. However, it reduces significantly in the subsequent years.



The real GDP showed a consistent increase from 47% in 2025 to 57.9% by 2030 compared to the baseline. Therefore, the overall impact of removing sludge in the general equilibrium framework was higher after five years than the combined estimate of 49% of GDP (PIDE Sludge Audit Vols. 1-3), which is based on the partial equilibrium framework. The higher impact estimated in this study is due to intertemporal effects and backwards and forward linkages. This impact is propagated by backwards and forward linkages between different industries, which is intensified by the dynamic interaction of sludges in the same sector and across different industries. Therefore, the DROR increased by around 68% in Pakistan. This substantial increase in the rate of return signifies a more efficient and productive allocation of capital within the economy.

Figure 6: Macro Indicators: Multi-Sector Sludge Removal

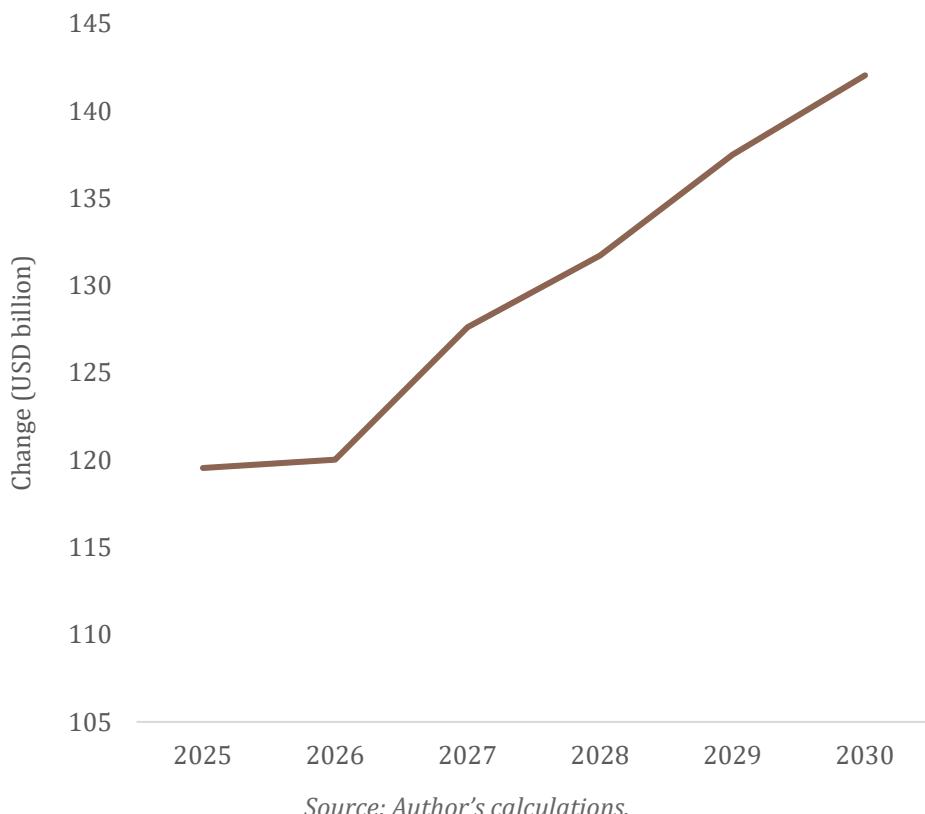


Source: Author's calculations.

Welfare

Our simulation results indicated significant welfare gains from removing sludge in Pakistan, with these gains closely tied to increased household consumption. Welfare gains were expected to keep rising, reaching over USD 142 billion by 2030 (41% higher compared to the baseline; see Figure 7). This substantial increase in welfare demonstrates the positive impact of removing bureaucratic inefficiencies across multiple sectors on the overall well-being of the population.

Figure 7: Welfare Level: Multi-Sector Sludge Removal



Domestic Sales

The construction sector showed a drastic increase in 2025, with a 303% rise in domestic construction activities (Figure 8). The domestic real estate sector, in contrast, was estimated to shrink during 2028-2030. This seems to be a correction mechanism in the real estate industry after removing the sludge. In Pakistan, people have a tendency to invest in real estate because it is considered a safe investment. However, after removing the sludge, investment shifts from the real estate sector to other, more productive sectors. Effects on Pharma were particularly large, as shown separately in Figure 9. Removing sludge makes the pharmaceuticals industry more profitable. Since Pakistan imports most of the medicines, which puts a lot of burden on our foreign exchange reserves, this is an important impact with remarkable growth of 600% in 2025, further increasing through 2030.

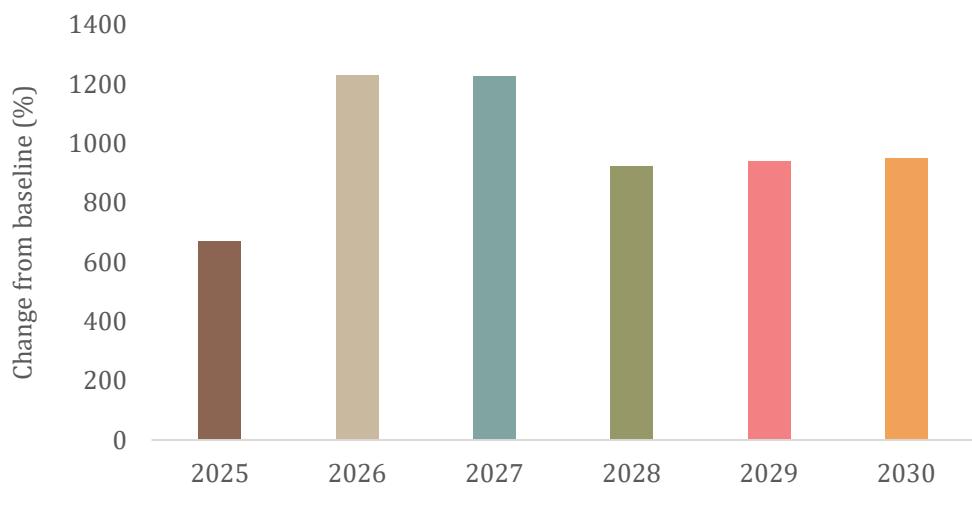


Figure 8: Domestic Sales by Sector, Excluding Pharmaceuticals:
Multi-Sector Sludge Removal



Source: Author's calculations.

Figure 9: Domestic Sales: Pharmaceutical Sector: Multi-Sector Sludge Removal



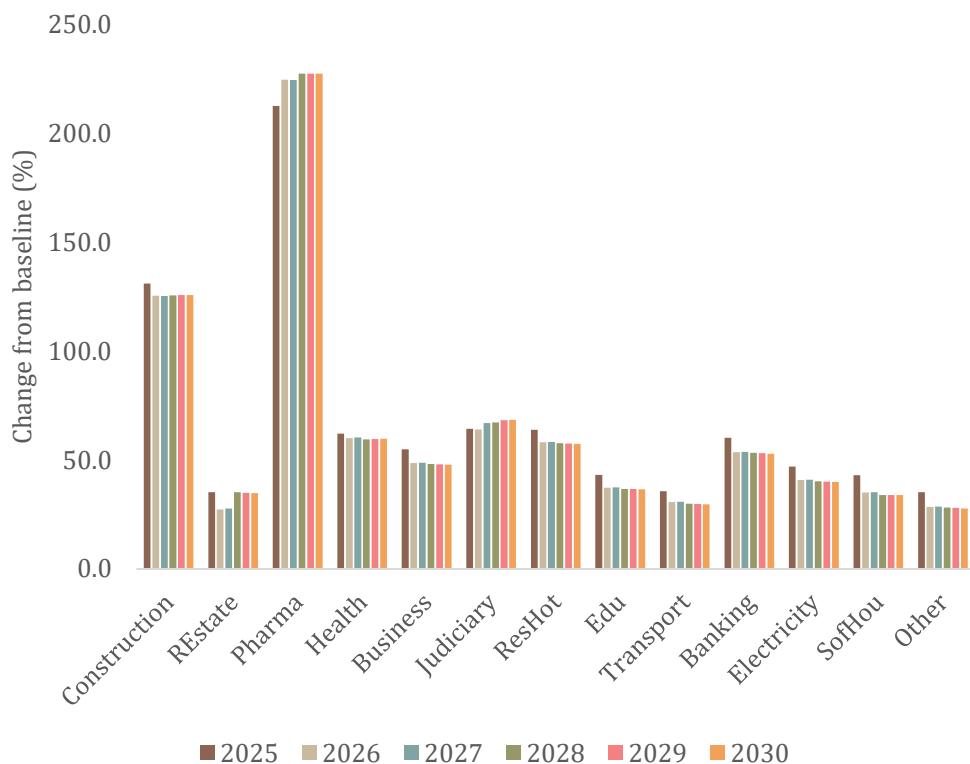
Source: Author's calculations.



Overall Private Household Demand

Our simulation results illustrated a persistent boost in private household demand for various commodities in Pakistan from 2025 to 2030. Household spending was higher across the board. In some sectors, such as construction, it rose by more than 130% in 2025 and remained quite stable until 2030 (see Figure 10). This suggested that people would spend substantially more on building and buying homes compared to the weakest-performing real estate sector. Easier access to domestically produced medicines increased Pharma expenditures by more than 200% compared to the baseline and household health expenditures (Health) by almost 60%, resulting in a healthier society. Similarly, household demand for other products increased as well, reflecting a broader improvement in economic activity. Household demand for the aggregated Other sector, where the effects of sludge removal arose only indirectly, also increased noticeably.

*Figure 10: Overall Private Household Demand by Sector:
Multi-Sector Sludge Removal*

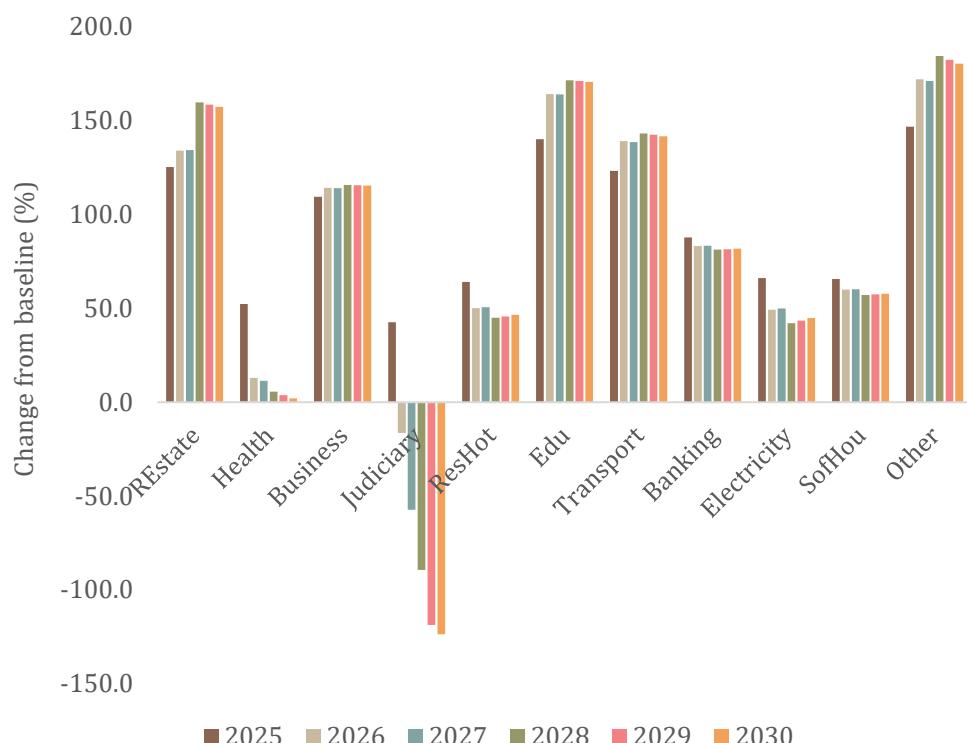


Source: Author's calculations.

Private Household Demand for Imports

Our simulation results revealed significant changes in private household demand for imported commodities across various sectors (see Figures 11-13). The results projected a staggering decrease of over 400% in demand for imported construction materials by 2025, and it kept reducing over time (Figure 12). This suggests a significant shift away from imported materials, due to increased availability of domestic goods. Similarly, our results revealed an eye-watering decrease in demand for imported pharmaceuticals through 2030 (Figure 13). This indicates less dependence on foreign medicines, due to the greater availability of certain drugs domestically and an efficient local production system. Conversely, the demand for imported real estate products increased (Figure 11) to meet the increase in overall household demand in the real estate sector, although domestic sales reduced, as shown above. Most other sectors also show modest increases in import demand.

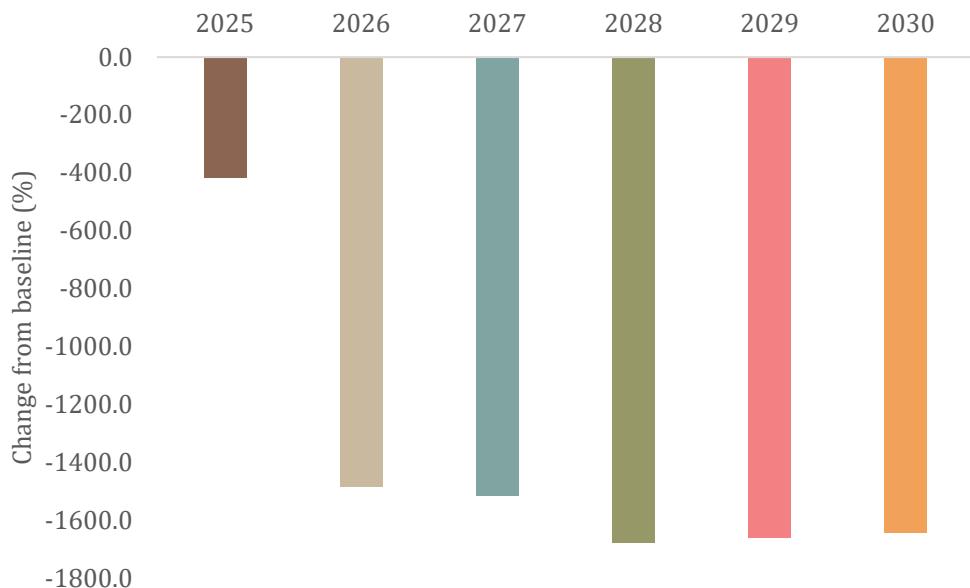
Figure 11: Private Household Demand for Imports, Excluding Construction and Pharmaceuticals: Multi-Sector Sludge Removal



Source: Author's calculations.

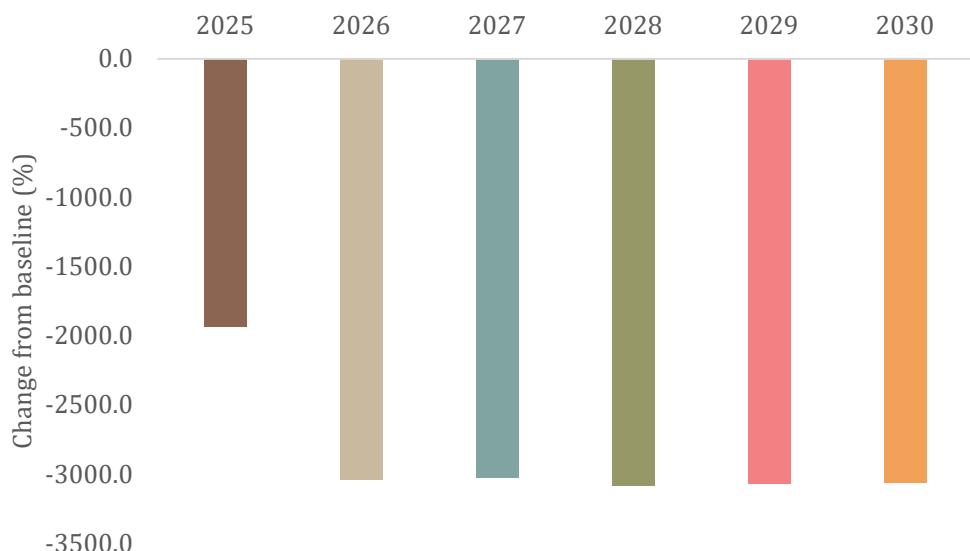


Figure 12: Private Household Demand for Construction Imports by Sector: Multi-Sector Sludge



Source: Author's calculations.

Figure 13: Private Household Demand for Pharma Imports: Multi-Sector Sludge Removal



Source: Author's calculations.

5. CONCLUSION AND DISCUSSION

Our simulation results from the dynamic CGE-Sludge framework provide valuable insights into the economy-wide impacts of removing sludge, i.e., bureaucratic inefficiencies and red tape, in Pakistan. The findings reveal substantial potential gains across multiple economic dimensions, highlighting the critical importance of streamlining administrative processes and reducing regulatory burdens. For instance, even when considering sludge removal in the electricity sector alone, we observed notable improvements in GDP, welfare, and domestic sales, indicating the significant impact of targeted reforms. These effects were further magnified when a broader removal of sludge across all sectors, as identified by the PIDE Sludge Audits, was considered.

One of the most striking outcomes in our scenario of multi-sector sludge removal is the projected boost to investment. Our model predicted an extraordinarily high initial increase in investment of 314.6% in 2025 compared to the baseline. Any such dramatic increase in investment could be transformative for Pakistan's economic development, potentially accelerating industrialisation, technological adoption, and productivity growth. Results were similarly large, but not quite as much, in the PIDE sludge effect estimates in a partial equilibrium framework.

The impact on real GDP is equally impressive, with the model projecting an increase from 47% in 2025 to 57.9% by 2030 relative to the baseline. This surpasses previous microeconomic estimates, which suggested combined sludge costs of around 49% of annual GDP. The higher figure in our CGE model can be attributed to the capture of intertemporal effects and intersectoral linkages, demonstrating the value of a general equilibrium approach in fully accounting for pervasive impacts of sludge throughout the economy. Furthermore, the DROR increased by around 68% under this scenario, signifying a more efficient allocation of capital and higher returns on investment, driving the substantial GDP growth.

Welfare gains projected by the model are substantial, reaching over USD 142 billion by 2030. This improvement is closely tied to increased household consumption across various sectors, indicating a broad-based enhancement in living standards. Persistent boost in private household demand for commodities over time suggests that removing sludge could lead to a more dynamic and prosperous consumer economy.



At the sectoral level, our results revealed significant shifts in economic activity. In particular, the pharmaceutical sector stood out with significant increases in domestic sales and household demand, followed by the construction sector. This boom in the pharmaceutical and construction sectors could have far-reaching effects on employment, urban development, and overall economic growth. Interestingly, our model predicts a contraction in the real estate sector. This counterintuitive result suggests a potential correction in the real estate market as investments are redirected to more productive sectors following sludge removal.

The shift in household consumption patterns is noteworthy. Our model projects increased spending across various sectors, with construction and pharmaceuticals seeing particularly large gains. The rise in pharmaceutical spending indicates improved access to healthcare, potentially leading to better health outcomes for the entire population. This aligns with the overall increase in household health expenditures by almost 60% by 2030, suggesting a healthier society as a beneficial side effect of sludge removal.

One of the most intriguing findings is the projected change in demand for imported commodities. The model predicts a dramatic decrease in demand for imported construction materials and pharmaceuticals. In other sectors, import demand increases with higher GDP and welfare. The shift away from imports towards domestic production for construction materials and pharmaceuticals could have significant implications. It suggests enhanced efficiency, supporting import substitution and reducing dependence on foreign goods, strengthening Pakistan's trade balance and promoting self-reliance. It may also create opportunities for exporting locally made products, boosting Pakistan's export potential, although this study has not reported empirical results on Pakistan's exports in the sludge removal scenarios compared to the baseline. Overall, a more efficient economy could be a key to transitioning from an import-focused economy to an export-driven one, contributing to sustainable growth and development.

Furthermore, the transition process itself could present challenges. Rapid shifts in economic structure, such as projected contraction in real estate, could lead to short-term dislocations in employment and asset values. Policymakers would need to carefully manage this transition to ensure that the benefits of sludge removal are broadly shared and that vulnerable groups are protected.

6. KEY POLICY RECOMMENDATIONS

This section reinforces several key recommendations validated by our CGE analysis:

Prioritise High-Impact Sectors for Reform: Our CGE analysis reveals that certain sectors offer disproportionate economy-wide benefits when freed from sludge. The large potential in the domestic activity of pharmaceuticals and construction sectors suggests prioritising reforms in these sectors. Furthermore, the magnitude of their effects, captured through our general equilibrium framework, is substantially larger than what partial equilibrium analysis alone would suggest due to inter-industry linkages and dynamics.

Manage Structural Economic Transitions: The CGE results uniquely highlight the need for careful management of structural economic changes. Our analysis shows that removing sludge could cause a significant contraction in the real estate sector while boosting other sectors. This insight, which emerges from the general equilibrium effects, suggests policymakers need to:

- Develop transition strategies for affected sectors.
- Implement gradual reform timing to avoid market disruptions.

Balance Import Substitution and Export Promotion: The economy-wide analysis reveals complex import demand effects that were not visible in sector-specific studies. The projected large decrease in pharmaceutical and construction imports alongside domestic sector growth suggests opportunities for import substitution. However, policymakers should:

- Target sectors showing strong domestic growth potential.
- Support export capacity development in newly competitive sectors.
- Maintain balanced trade policies during the transition.

Challenges in Sludge Reduction

It is important to acknowledge that achieving substantial sludge reduction in practice is a complex and challenging undertaking. Ingrained bureaucratic processes, vested interests, and resistance to change within institutions can create significant obstacles. Furthermore, the interconnectedness of various forms of sludge means that addressing one specific inefficiency may have unintended consequences in other areas. Successfully navigating these



challenges requires strong political will, sustained commitment to reform, and careful consideration of potential implementation hurdles. However, even partial progress in reducing sludge can yield significant economic benefits, making even incremental reforms worthwhile.

Technical Limitations

A critical technical aspect of our modelling approach involves the mapping of specific activities assessed in the PIDE Sludge Audits to the broader sectoral classifications within the GTAP Data Base. This process necessitates careful judgment due to the differing levels of granularity between the two data sources, as described in the text and detailed in Appendix A. PIDE audits often focus on narrowly defined processes, while GTAP sectors represent aggregated economic activities. As discussed, we mapped each PIDE-audited activity to the most relevant GTAP sector based on the nature of the activity and its primary economic impact. Given these issues, future research should prioritise expanding sludge audits across a broader range of sectors and activities. This will enable more precise mappings and enhance the accuracy of CGE models in capturing the economic impacts of sludge.

Furthermore, the temporal dimension of TFP adjustments is crucial. The CGE-Sludge model implements exogenous changes to sector-specific TFP parameters corresponding to the duration and magnitude of productivity impacts based on the PIDE audits, see Appendix B. For instance, if an audit identifies that a specific sludge lasts for two years, it increases the relevant GTAP sector's TFP parameter for those two years by the corresponding percentage, allowing it to return to its baseline level thereafter. This approach ensures that the model captures the time-limited nature of many sludge-related inefficiencies, while also allowing for persistent effects where justified by the audit findings. This careful mapping and temporal specification of TFP changes are fundamental to accurately translating micro-level sludge impacts into macroeconomic outcomes within the CGE framework. However, as we have noted, this is a conservative approach because removal of sludge on an ongoing basis could yield continuing benefits over time.



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**APPENDIX A - SECTOR AGGREGATION SCHEME³***Table A1: Sector Aggregation Scheme*

PIDE Sludge activities	GTAP sectors	Abbreviation	Sludge Effect (% of GDP)
High-rise Building	Construction	Construction	17.50%
Residential Construction	Construction	Construction	0.63%
Environmental Protection Agency	Construction	Construction	12.00%
Plot in a Private Housing Society	Real estate activities	REstate	2.75%
Setting Up: Pharmaceutical Unit	Basic pharmaceutical products	Pharma	2.34%
Setting Up: Private Hospital	Human health	Health	0.10%
Setting Up: Diagnostic Centre	Human health	Health	0.03%
Setting Up: Pharmacy	Basic pharmaceutical products	Pharma	3.75%
Registration of New Medicine	Basic pharmaceutical products	Pharma	0.03%
Setting Up: Petrol Pump	Business services nec	Business	0.07%
Cash and Carry Business	Business services nec	Business	0.30%
Intellectual Property Rights	Business services nec	Business	0.07%
Restaurant Business	Accommodation, food and service activities	ResHot	1.50%
Hoteling Business	Accommodation, Food and service activities	ResHot	0.70%
Private School	Education	Edu	0.50%
Public Transport	Transport nec	Transport	0.04%
Private Bus Service	Transport nec	Transport	1.07%
Banking Services	Financial services nec	Banking	0.40%
Bank Loan	Financial services nec	Banking	0.20%
Electricity Connection	Electricity	Electricity	1.50%

³ The sectors are aggregated in “Other” where sludge is not estimated by PIDE audits.



PIDE Sludge activities	GTAP sectors	Abbreviation	Sludge Effect (% of GDP)
Software House	Computer, electronic and optical products	SofHou	0.03%
Kick-off Pension	Public Administration	Judiciary	0.06%
Criminal Trial: Homicide Case	Public Administration	Judiciary	0.07%
Criminal Trial: Theft	Public Administration	Judiciary	0.10%
Civil Trial: Divorce Trial	Public Administration	Judiciary	0.22%
Civil Trial: Inheritance Case	Public Administration	Judiciary	0.25%
Inland Revenue Court Case	Public Administration	Judiciary	1.40%
Smuggling and Duty Evasion	Public Administration	Judiciary	0.22%
Income Tax Case	Public Administration	Judiciary	0.46%
Anti-Corruption Trial	Public Administration	Judiciary	0.26%
Banking Court	Public Administration	Judiciary	0.28%
Consumer Courts	Public Administration	Judiciary	0.01%
Fraudulent Investment Trial	Public Administration	Judiciary	0.70%
Competition Appellate Tribunal	Public Administration	Judiciary	0.01%
Total	Total		49.54%

Source: Haque et al. (2022).



APPENDIX B - SUMMARY TABLES OF PIDE SLUDGE AUDITS (1-3)

The Appendix outlines different costs of sludge as estimated in the PIDE Sludge Audits (1-3). These costs are represented in three categories: 1) In terms of GDP, 2) Stress level, and 3) Number of trips. The first indicator (cost in per cent share of GDP) summarises all the costs faced by the private sector, where the other two indicators are additional explanatory factors that represent additional dimensions of this cost. In our analysis in the dynamic CGE framework, this study uses only the first indicator because it sums up all types of costs in monetary terms.

The PIDE Sludge Audit 1 focuses on various bureaucratic hurdles, including obtaining permissions for high-rise buildings, residential construction, environmental protection, private housing society plots, pharmaceutical units, private hospitals, diagnostic centres, pharmacies, petrol pumps, and the pension process.

Table B1: Obtaining Permission for a High-rise Building from CDA

Year	Share in GDP (%)	Stress Level
1	10.88	1.20
2	6.51	2.40
3	0.10	0.68
4	0.01	0.68
Total	17.5	

Source: Haque et al. (2022).

Table B2: Obtaining Permission for Residential Construction from CDA

Year	Share in GDP (%)	Stress Level
1	0.63	3.80

Source: Haque et al. (2022).

Table B3: Obtaining Permission for a Project from the EPA

Year	Share in GDP (%)	Stress level
1	11.89	3.2
2	0.11	1.8

Source: Haque et al. (2022).



Table B4: Acquiring a Plot in a Private Housing Society

Year	Share in GDP (%)	Stress level
1	0.40	2.2
2	0.09	3/5
3	0.09	3/5
4	2.17	2.2
5	0	2/5
6	0	2/5
7	0	2/5
8	0	2/5
9	0	2/5
10	0	2/5
11	0	2/5
12	0	2/5
13	0	2/5
14	0	2/5
15	0	2/5
16	0	2/5
17	0	2/5
18	0	2/5
19	0	2/5
Total	2.75	11.60

Source: Haque et al. (2022).

Table B5: Setting Up a Pharmaceutical Unit

Year	Share in GDP (%)	Stress Level
1	2.00	2.00
2	0.34	3.00
Total	2.34	5.00

Source: Haque et al. (2022).

Table B6: Setting Up a Private Hospital

Year	Share in GDP (%)	Stress Level
1	0.10	0.00

Source: Haque et al. (2022).



Table B7: Setting Up a Diagnostic Centre

Year	Share in GDP (%)	Stress Level
1	0.03	0.00

Source: Haque et al. (2022).

Table B8: Setting Up a Pharmacy

Year	Share in GDP (%)	Stress Level
1	3.75	0.62

Source: Haque et al. (2022).

Table B9: Setting Up a Petrol Pump

Year	Share in GDP (%)	Stress level
1	0.01	0.71
2	0.06	0.90
Total	0.07	1.61

Source: Haque et al. (2022).

Table B10: Pension: Kick-Off Process

Year	Share in GDP (%)	Stress Level
1	0.06	0.588

Source: Haque et al. (2022).

The PIDE Sludge Audit 2 primarily focuses on different industries (such as restaurants, hotels, and cash & carry), services (such as private school, intercity public/private transport business, banking & loan services, electricity connections and IT business, and others (including registration of a new medicine, and intellectual property rights).

Table B11: Restaurant Business

Year	Share in GDP (%)	No. of Trips
1	1.50	31

Source: Haque et al. (2023).

Table B12: Hoteling Business

Year	Cost of Sludge (% of GDP)	No. of Trips
1	0.68	60
2	0.01	15
Total	0.7	75.0

Source: Haque et al. (2023).



Table B13: Cash and Carry Business

Year	Share in GDP (%)	No. of Trips
1	0.30	36

Source: Haque et al. (2023).

Table B14: Setting up a Private School

Year	Share in GDP (%)	No. of Trips
1	0.50	18

Source: Haque et al. (2023).

Table B15: Intercity Public Transport Business

Year	Share in GDP (%)	No. of Trips
1	0.04	19

Source: Haque et al. (2023).

Table B16: Intercity Private Bus Service Business

Year	Cost of Sludge (% of GDP)	No. of Trips
1	0.01	30
2	1.06	50
3	0.00	11
Total	1.07	91

Source: Haque et al. (2023).

Table B17: Banking Services

Year	Cost of Sludge (% of GDP)	No. of Trips
1	0.40	4

Source: Haque et al. (2023).

Table B18: Getting a Business Loan from a Bank

Year	Cost of Sludge (PKR Million)	No. of Trips
1	0.20	12

Source: Haque et al. (2023).

Table B19: Electricity Connection in Islamabad

Year	Cost of Sludge (% of GDP)	No. of Trips
1	1.50	7

Source: Haque et al. (2023).



Table B20: Software House and Call Centre – IT Business

Year	Cost of Sludge (% of GDP)	No. of Trips
1	0.03	18

Source: Haque et al. (2023).

Table B21: Registration of a New Medicine

Year	Cost of Sludge (% of GDP)	No. of Trips
1	0.02	17
2	0.01	11
Total	0.03	28

Source: Haque et al. (2023).

Table B22: Getting Intellectual Property Rights

Year	Cost of Sludge (% of GDP)	No. of Trips
1	0.05	25
2	0.02	12
Total	0.07	37

Source: Haque et al. (2023).

Finally, the PIDE Sludge Audit 3 primarily focuses on Pakistan's judicial system, such as criminal trial, civil trial, inland revenue court case and various other categories.

Table B23: Criminal Trial: Homicide Case

Years	Cost (% of GDP)	No. of Trips
1	0.05	24
2	0.00	20
3	0.02	27
4	0.00	5
Total	0.07	76

Source: Haque & Qasim (2023).

Table B24. Criminal Trial: Theft

Years	Cost (% of GDP)	No. of Trips
1	0.07	57
2	0.03	14
Total	0.10	71

Source: Haque & Qasim (2023).



Table B25: Civil Trial: A Divorce Trial

Years	Cost (% of GDP)	No. of Trips
1	0.22	28
2	0.00	3
Total	0.22	31

Source: Haque & Qasim (2023).

Table B26: Civil Trial: Inheritance Case

Years	Cost (% of GDP)	No. of Trips
1	0.08	43
2	0.01	8
3	0.15	16
4	0.01	4
Total	0.25	71

Source: Haque & Qasim (2023).

Table B27: Inland Revenue Court Case

Years	Cost (% of GDP)	Average No. of Trips
1	0.32	11
2	0.07	20
3	1.01	86
Total	1.4	117

Source: Haque & Qasim (2023).

Table B28: Customs Appellate Tribunal: Smuggling and Duty Evasion Case

Years	Cost (% of GDP)	No. of Trips
1	0.14	55
2	0.01	65
3	0.06	17
4	0.00	1
Total	0.22	138

Source: Haque & Qasim (2023).

Table B29: Income Tax Case Under the Appellate Tribunal Inland Revenue

Years	Cost (% of GDP)	No. of Trips
1	0.18	38
2	0.28	29
Total	0.46	67

Source: Haque & Qasim (2023).



Table B30: The National Accountability Bureau (NAB) Anti-Corruption Trial

Years	Cost (% of GDP)	No. of Trips
1	0.01	11
2	0.09	16
3	0.01	12
4	0.00	15
5	0.00	15
6	0.14	26
7	0.00	1
Total	0.26	96

Source: Haque & Qasim (2023).

Table B31: Banking Court: Suit of Recovery

Years	Cost (% of GDP)	No. of Trips
1	0.27	39
2	0.01	8
Total	0.28	47

Source: Haque & Qasim (2023).

Table B32: Consumer Courts

Years	Cost (% of GDP)	No. of Trips
1	0.006	28

Source: Haque & Qasim (2023).

Table B33: Fraudulent Investment Trial

Years	Cost (% of GDP)	No. of Trips
1	0.20	51
2	0.02	0
3	0.48	19
4	0.01	3
Total	0.71	73

Source: Haque & Qasim (2023).

Table B34: Competition Appellate Tribunal

Years	Cost (% of GDP)	No. of Trips
1	0.005	32
2	0.000	33
Total	0.005	65

Source: Haque & Qasim (2023).



AN EVALUATION OF BALOCHISTAN'S KACHHI CANAL PROJECT

Irfan Ali¹ and Verda Salman²

ABSTRACT

The Kachhi Canal Project (KCP), a Public Sector Development Programme (PSDP) initiative conceived in 2002, aimed to boost agriculture and improve the socioeconomic conditions of the underprivileged population of Balochistan. Due to issues of incompetence, poor planning, and shifting project goals, Phase I was completed in 2018 with an expected irrigation area of 72,000 acres and projected annual economic benefits of PKR 3 billion. This study evaluates the performance of Phase I over the past five years and its contributions to local socioeconomic development using a mixed-methods approach. A cost-benefit analysis was also conducted to assess the project's long-term feasibility through economic and financial internal rates of return. Qualitative data were collected through focus group discussions with farmers and landowners benefiting from irrigation in Phase I (Part A), while quantitative data were obtained from the Agriculture Extension Department of Balochistan. Results indicate that the project initially had a substantial positive impact on socioeconomic indicators; however, severe flooding in 2022 rendered the canal non-operational, reversing socioeconomic gains to pre-KCP levels and raising concerns about long-term viability. Economic and financial analyses suggest that the canal remains viable only if reconstruction begins in 2024–2025. Any delay in restoration or future flooding events would render the project financially unfeasible. Policy recommendations are proposed for sustainable regional development, socioeconomic improvement, and canal reconstruction.

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1. INTRODUCTION

Balochistan is the most underdeveloped province of Pakistan, facing abject poverty, acute food shortages, and malnutrition. Sixteen percent of the children in Balochistan are malnourished, 52% are stunted, and 39.6% are underweight (UNPO, 2017). To offset these disadvantages, the Kachhi Canal Project (KCP) was conceived to develop water and land resources in the Kachhi Plains of Balochistan. The project aimed to “enhance agricultural production, resulting in a boost to the economy, improvements in the physical environment, including the atmosphere, climate, land, and water, and an improvement in the quality of life due to improvements in socio-cultural and socioeconomic conditions” (WAPDA, 2023).

The KCP originates from Taunsa Barrage, Punjab, and passes through the districts of Muzaffargarh, Rajanpur, and DG Khan in Punjab, and Dera Bugti, Naseerabad, and Bolan in Balochistan, irrigating 713,000 acres of culturable command area (CCA) in the Kachhi Plain of Balochistan (AGP, 2019). The main canal has a total length of 500 kilometres, with 306 kilometres located in the Punjab province and the remaining 194 kilometres extending into Balochistan (WAPDA, 2023). The project's command area encompasses the districts of Dera Bugti, Naseerabad, Kachhi (Bolan), and Jhal Magsi, located in the Kachhi Plains of Pakistan.

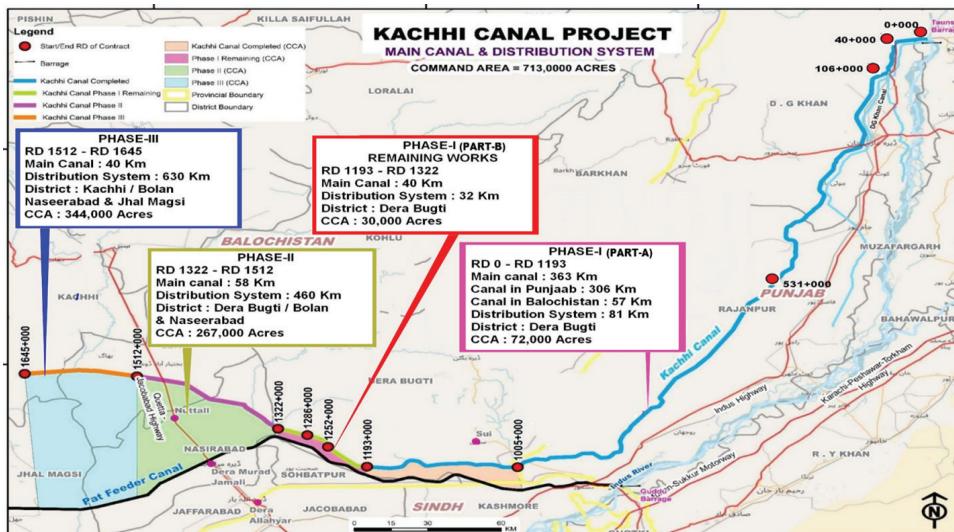
The KCP is envisioned as a lifeline for Balochistan's agriculture, unlocking a new era of socioeconomic development in the region and transforming the lives of millions of local populations in the districts of Punjab and Balochistan. It aims to significantly raise the current annual cropping intensity from 4.68% to about 88.50% in the project region, resulting in an annual benefit of PKR 19.66 billion (with PKR 3.82 billion for Phase I) to the national economy (AGP, 2019). The primary crops cultivated on the plain are wheat, pulses, oilseeds, and sorghum. The projected agricultural benefit from the project amounts to PKR 6 billion annually. The project has been funded by the Government of Pakistan (GoP) via the Public Sector Development Program (PSDP), without any assistance from international sources, and is being executed by the Water and Power Development Authority (WAPDA).

Since its inception in 2002, the project has hit multiple snags and is not yet fully operational. It was initiated as part of the ten-year Perspective Development Plan 2001–2011, and its execution began on October 4, 2002. Figure 1 shows the project's location plan. According to the initial PC-1, the project was allocated a budget of PKR 31,204 million and was expected to be



completed by 2007 (AGP, 2019). The project encountered many obstacles, and its completion estimates and timeframes had to be updated twice in 2013 and 2017. Following the second revision, the project was split into three distinct stages: Phases I, II, and III. The approved cost for the project increased from PKR 31,204 million to PKR 80,352 million, with a revised deadline of December 2018—a 10-year delay in Phase I only.

Figure 1: Project Location Plan



Source: WAPDA (2023).

In 2017, owing to its weak performance, the Auditor General of Pakistan (AGP) was tasked with conducting a comprehensive audit of the project. The AGP report identified poor contract administration, numerous design modifications, and insufficient internal controls as the primary factors contributing to the project's dismal performance (AGP, 2019).

In 2018, Phase I (Part A) of the project was finally inaugurated by the former Prime Minister of Pakistan, Shahid Khaqan Abbasi, to irrigate an area of 72,000 acres in Sui Tehsil of Dera Bugti. Work on Phase I (Part B) is in progress to irrigate an additional 29,000 acres of land, with an expected completion timeline of December 2023.

Despite its challenges and setbacks, Phase I (Part A) of the project has been completed and operational since 2018. This phase of the project has been operationalised for the past five years and was expected to irrigate 72,000 acres of land with annual benefits of PKR 3 billion to enhance the overall

socioeconomic profile of the area (AGP, 2019). The work on the remaining phases of the project (Phases II and III) has not started and would entail substantial economic costs. Before the commencement of work on the remaining phases, it is imperative to assess the performance of Phase I of the project and its contributions to bringing sociocultural and socioeconomic betterment to the populace living in the area.

This study aims to assess the socioeconomic effects of the KCP on the local population, including improvements in the quality of their life. The study also conducts an economic and financial viability analysis of the project under alternative simulated scenarios.

2. LITERATURE REVIEW

Pakistan's public sector development projects contain numerous megaprojects, referred to as the "privileged particles of the development process," through which the government determines its development objectives via a set of socioeconomic goals (Hirschman, 2014). These megaprojects are primarily different breeds of projects with respect to lead time, stakeholder involvement, level of aspiration, complexity, and impact (Flyvbjerg, 2017). Some examples of such large-scale development projects include motorways, seaports, airports, canal irrigation projects, oil extraction projects, and dams – all of which normally cost billions of rupees, considering their scale of operation (Hirschman, 2014).

Despite the opportunities megaprojects present for the development of a country, Flyvbjerg (2017) identified some recurring issues with them, regardless of the sector a project falls under. These "iron laws of megaprojects," as referred to by the author, include overrunning timelines, exceeding allotted budgets, overselling benefits, and underestimating costs (Flyvbjerg, 2017).

One such megaproject comprises the development and expansion of irrigation infrastructure, which has consistently been presented in existing literature as a solution to intensify agricultural production, enhance resilience to climate change and variability, and support rural economic development in the face of water scarcity (Aw & Diemer, 2005; Bertoncin et al., 2019). Such initiatives significantly affect crop-yield gaps in smallholder farming systems across Asia and Africa outside of the tropics (Hanjra et al., 2009; Higginbottom et al., 2021; Moris, 1990).



The aforesaid notion has also been supported by the Green Revolution of the 1950s as one way of achieving global food security (Shah et al., 2002). Under this revolution, the construction of water channels was one of the most popular methods implemented in South Asia and Africa throughout the 1960s and 1970s. In the 1980s, however, the utility of water canals in improving socioeconomic conditions was scrutinised, as various examples of their failure to uplift local communities came to light (Cleaver, 1972).

One such example is of Malawi, where the Likangala and Domasi irrigation schemes worsened the socioeconomic status of the country's rural communities by disrupting local communities, exposing farmers to water-related diseases, and relocating families away from their ancestral land without proper compensation (Gwiyani-Nkhoma, 2011). This occurred because the production of rice, the expansion of rural communities' sources of income, and the growth of towns associated with irrigation schemes were limited in quality and quantity and benefited only a few privileged farmers. To improve the implementation of such schemes, the study strongly recommended the recognition of local structures and systems and minimal dependency on donor support (Gwiyani-Nkhoma, 2011).

On the other hand, the socioeconomic conditions of the local population improved after the construction of the Teesta-Jhaldhaka and Karotwa-Kalama Canals in the Jalpaiguri district of India. Tracing temporal changes in the development of canal irrigation, identifying the existing socioeconomic status of farmers in the district, and measuring the impact of canal irrigation on the farmers' socioeconomic status, Mandal et al. (2020) concluded that canal irrigation had a significant and positive relationship with the socioeconomic status of local communities.

The nexus between such megaprojects and socioeconomic development is further explained by Rukuni et al. (2006), who suggest that the development of irrigation systems is an essential connection between water and land resources. Better irrigation development leads to improved quality and quantity of raw materials and food production, which subsequently fosters rural development and ensures food security (Barau et al., 1999; Branca & Natali, 2020). Irrigation is thus of paramount importance in agrarian economies, as it significantly contributes to poverty reduction and rural development by increasing agricultural output (Nathan & Sinha, 2013). The benefits of an improved irrigation system for rural development, however, may also manifest through effects on other economic variables, including the demographic distribution patterns of rural settlements and the advancement of public services (Ali & Ali, 2023).

Improvements in the socioeconomic status of local communities are not, however, solely a function of megaprojects. One study evaluating the economic effectiveness of two community-based small-scale irrigation schemes in Adami Tullu Jido Kombolcha Woreda (ATJK) assessed different socioeconomic characteristics of households before and after the implementation of irrigation schemes. The study concluded that small-scale irrigation schemes have potentially low environmental impacts and no significant soil erosion. Poor coordination and a lack of transparency in financial affairs, however, result in lower economic performance (Assefa et al., 2008).

Apart from direct benefits such as increasing the income of agricultural communities and reducing poverty, the development of irrigation schemes also has positive spillovers for surrounding communities, including job creation, higher income, food diversification, and sharecropping (Masela et al., 2018). Socioeconomic factors, however, determine the extent of benefits received by families. These factors include proximity to the project, primary income source, gender of the head of the household, employment, marital status, and agricultural land availability.

It is further noteworthy that water has been used for agriculture since ancient times, while canals have served as a major and significant channel of inter-regional trade that augments commerce and transportation, which further reiterates the importance of the development of irrigation schemes (Pietz & Zeisler-Vralsted, 2021). Given its importance, the enhancement in the well-being of rural settlements requires programs that aim to improve infrastructure, such as irrigation systems (Manggat et al., 2018).

The establishment of irrigation or canal systems has a positive and significant effect on family income, particularly when the tillage method is employed for agriculture (Turdalieva & Abdiyeva, 2002). Lined canal projects further increase the overall welfare and contentment of farmers (Nadeem et al., 2021). Additionally, irrigation is vital for the sustained survival of populations living in dry areas because it enables them to engage in trade (Pietz & Zeisler-Vralsted, 2021). In arid regions, irrigation is further essential for the effective control of over-agriculture production, landscape preservation, weed growth suppression, and soil fertility restoration (Muthuminal & Priya, 2023). The acknowledgement of the existence of local structures and institutions, nevertheless, is essential to ensure that irrigated farming improves the well-being of the rural populace (Gwiyani-Nkhoma, 2011).



To evaluate the impact of irrigation schemes in arid regions, Ashraf et al. (2016) carried out the impact evaluation of the karez irrigation scheme of Dilsora on the socioeconomic conditions of the local population in Balochistan, Pakistan. The study collected data from farmers through a questionnaire survey to assess the impact of the scheme, as well as the constraints on farmers. The results suggested that, along with positively affecting the socioeconomic conditions of the farmers and local populace by increasing farmers' income, crop yields, area under irrigation, and volume of water, the development of an irrigation network further reduced the drudgery on women, water disputes, and maintenance costs in terms of financial and physical liabilities. The primary concerns and constraints reported by farmers, however, included deferred necessary overhaul and repairs of irrigation systems, a decline in water quality at conveyance, and, *inter alia*, the absence of watershed management initiatives.

Further adding to the literature, Razzaq et al. (2018) analysed the impact evaluation of high-efficiency irrigation systems (HEIs), i.e., sprinkler and drip irrigation, in Khushab, Bhalwal, Sargodha, and Lodharan in Punjab, Pakistan, while also comparing and measuring the water productivity from conventional and modern irrigated farms and estimating the net present worth and benefit-cost ratio. Their results not only suggested significant benefits for farmers who use HEIs in terms of higher gross margins but also indicated that the development and implementation of such systems is an economical option.

Similarly, Shah (2018) suggests that the pace at which the PSDP projects are executed in Pakistan is highly inefficient in terms of cost and time. According to the PSDP 2018-19 time overrun study, it was determined that 399 projects had been delayed for over 10 years, 98 projects for 5 to 10 years, 44 projects for 3 to 5 years, and 218 projects for 1 to 3 years. Furthermore, cost overrun analysis indicated that a total of 94 projects' actual costs exceeded the estimated costs in PC-1. Out of 94 projects, nine projects experienced an increase of less than 30% in total cost, 13 projects experienced an increase of 31% to 60%, 17 projects 61% to 100%, and 55 projects experienced an increase of more than 100% in their total costs. The study also identified several bottlenecks to the implementation of PSDP projects. The most problematic is perhaps the delay in the release of funds that slowed the progress of 450 projects. Other factors include unfamiliarity with Pakistan Procurement Regulatory Authority (PPRA) procedures and rules, lack of coordination, delays in staff recruitments, land acquisition, and adverse law and order situations, among others.



Outdated irrigation infrastructure in developing countries, such as Pakistan, also poses a significant risk to livelihoods and food security, as it results in substantial water losses. However, higher investment to increase efficiency can assist countries in managing water scarcity and enhance the well-being of farmers (Nadeem et al., 2021). Moreover, in a developing country like Pakistan, PSDP funds need to be utilised on projects of immense potential and utility. The KCP is a significant irrigation project under PSDP designed to irrigate 713,000 acres of the CCA in the Kachhi Plain in Balochistan and improve agricultural output and productivity. This initiative is widely regarded as a possible driver of socioeconomic change in the province of Balochistan and is likely to improve food security and provide significant job opportunities. In addition to providing water for agricultural and arid areas, it can also help alleviate the water scarcity issue for around two million people who lack access to safe drinking water.

Balochistan is getting only 3.5% of its allocated share of 12% of Pakistan's water resources, with existing irrigation canals in the province consisting of Patfeeder, Kirther, Uch, Faizabad, and Mauthi canals (Khan & Malik, 2023). The extension of the Patfeeder Canal and construction of the Kachhi Canal will enable the province to obtain a total of 805.5 million m³ (0.653 MAF) of the remaining allotted water effectively (Ramzan, 2013). The KCP's progress, however, has been hindered by insufficient funds and internal disputes among its divisions (Ramzan, 2013).

Despite the potential benefits of the KCP, there are also potential challenges, such as apprehensions over the social and cultural impact on local people in terms of land use and acquisition. There has been no research study that has examined the socioeconomic impacts of the KCP on the local population. In the existing academic debates about the utility of irrigation canals in improving the socioeconomic conditions of the local population, the KCP provides an interesting case study, and the current study would further enrich the debate. Furthermore, it would facilitate better utilisation of the PSDP funds before the commencement of the next phases of the project.



3. RESEARCH METHODOLOGY

Methodology

The primary objective of this study is to examine the socioeconomic impacts of KCP Phase-1 on the livelihood of the local population and carry out an economic and financial viability analysis of KCP Phase-1 (Part A). The stakeholders include landowners and farmers who accessed and benefited from the canal irrigation water. This objective is achieved by ascertaining the improvements in groundwater, land use and cropping intensities, crop yield, farmers' incomes, livestock development, and the education level of people in the study area.

The perspectives of the WAPDA representatives and the agriculture department of Balochistan were incorporated through the lens of their experiences with the management and operationalisation of the KCP. The landowners' and farmers' perspectives were incorporated through the lens of their experiences with the benefits obtained from KCP irrigation water and problems faced while the Kachhi canal was damaged after the hill torrent in August 2022.

The economic and financial viability analysis of the project was carried out using benefit-cost ratios, net present value (NPV), and the economic internal rate of return (EIRR). The data was obtained from the agriculture extension department of Balochistan. The financial analysis is based on wholesale prices. A detailed discussion on methodology adapted to achieve objective 2 is presented in section 4.8.3.

The motivation to use the mixed methods, i.e., both qualitative and quantitative approaches, was that the study is set under the research philosophy of "social constructivism (SC)" in the case of qualitative analysis. The stance of the SC is that there is no fixed or single truth; rather, there are multiple versions of truth, and that reality is socially defined. Therefore, there are no set hypotheses in this philosophy (unlike positivism).

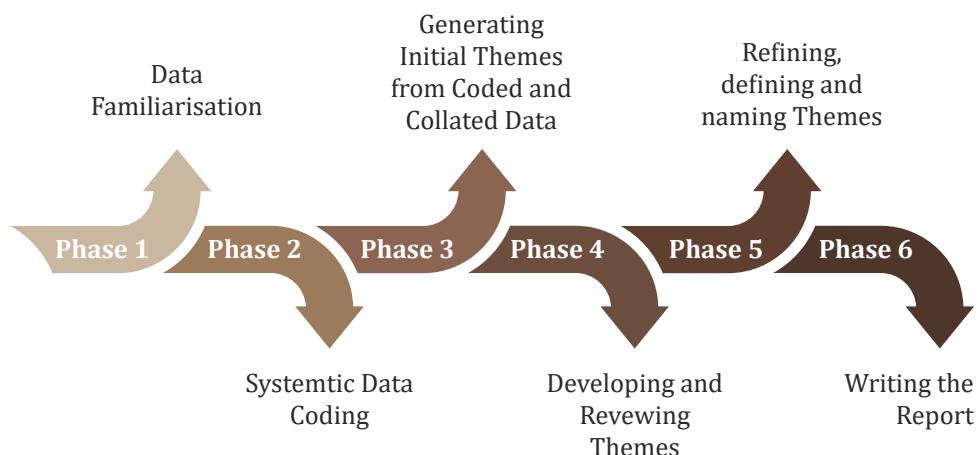
Research Philosophy

The purpose of scientific research is to elaborate on a phenomenon in a way that is consistent with current scientific understanding.

The objective of a standard scientific inquiry is to enlighten a phenomenon in accordance with contemporary scientific understanding. Since this is where the power of inquiry is concentrated, most of the efforts are concentrated. Research philosophy is the application of simplifying assumptions to explain complex social and natural phenomena by combining scientific intelligence with a human philosophical outlook (Creswell, 2013).

For the objective stated previously, we conducted focus group discussions (FGDs) with the relevant landowners and farmers to examine the stakeholders' perceptions about the socioeconomic impacts of the completed phase. The FGDs were also conducted with purposively selected landowners and farmers who benefit from the project directly and indirectly, to understand the socioeconomic effects. The FGDs included those farm owners/farmers who have access to and benefited from irrigated water from the KCP in the Sui region of Dera Bugti, Balochistan. To ensure rigour, the research followed the Lincoln & Guba (1985) model. Data were analysed using reflexive thematic analysis based on Braun & Clarke (2021).

Figure 2: Phases of Reflexive Thematic Analysis



Source: Braun & Clarke (2021).



This research enabled us to evaluate improvement in socioeconomic conditions, including the quality of life, as the KCP phase-I has been completed and has been operational for approximately the last 5 years. This also enabled us to measure the benefits of projects as stated originally.

Sampling Methodology

Choosing an appropriate sampling methodology is necessary to determine reliable generalisation from the investigation. This section provides a detailed description of the sampling methods that were followed.

1. Informed consents before the FGD were obtained from each participant.
2. The focus group participants were informed that their data would remain confidential and would be used for research purposes only, as none of the participants' microlevel details would be shared unless the data had been anonymised.

For the selection of landlords/farmers, a purposive sampling methodology was adopted. Initially, seven mauzas were selected that have access to the KCP irrigation system. The mauzas through which the KCP passes in the Sui region of Dera Bugti, Balochistan, include Lanju, Saghari, Go, Landow, Shazain, Kattan, Mozoi, Ladkha Mari, Toba Sandrani, Punhan, Gizi Junwi, Nadranja, and Uch. From these mauzas, Saghari, Go, Landow, Shazain, Khattan, Mozoi, and Nadranja were selected. Landowners/farmers were then selected from these mauzas.

The participants of the FGDs were the heads of households, aged 25 years and above, who have access to and benefited from irrigated water from the KCP Phase-I, Part A, in the Sui region of Dera Bugti, Balochistan, that was inaugurated in 2017. They demonstrated a willingness to participate.

Research Instruments

Field notes were maintained during the FGDs, which were conducted over a period of two months from June 2024 to July 2024. The FGDs with landowners and farmers lasted for 30 to 50 minutes. The average duration of an FGD was 41 minutes.

Transcription of Interviews

The Participants of FGDs were allowed to express their views either in Urdu or Balochi. Due to the remoteness of the area, most of the participants predominantly opted to talk in Balochi, which is their mother tongue, as it was hard for them to communicate in Urdu and express their opinions at length in a language other than Balochi. Therefore, vernacular Balochi was used by the majority of participants. The FGDs were transcribed by the professionals to avoid subjectivity. Additionally, all the transcribed FGDs were validated by the principal investigator of the current study, whose mother tongue is also Balochi.

Data Analysis

The authors collaborated to process the FGDs' transcripts in a series of collective meetings. The validation and accuracy of every transcript were ensured before the beginning of the coding procedure. Initially, codes were assigned to various statements, ensuring their compatibility with the objectives of the study. At this stage, colour-coding patterns were adapted to align similar statements with their respective codes. As coding is an iterative process, authors frequently combined analogous codes and altered existing codes as patterns appeared. This process led to a refined and standardised coding framework that the team mutually endorsed.

Throughout this process, different coding methods, perspectives and/or interpretations were openly discussed to reduce the complexity of the coding process and consensually resolved. One methodology of coding was the use of Microsoft Excel and its built-in features and/or formulas, which were adapted throughout the coding process and previous coding was modified. This fostered a cohesive approach towards data analysis. The authors mutually decided how and when to incorporate new themes in the transcripts based on an evolving understanding of the data. The team also maintained the thematic memoranda and field notes to describe, summarise key insights, and analyse the content of each theme.



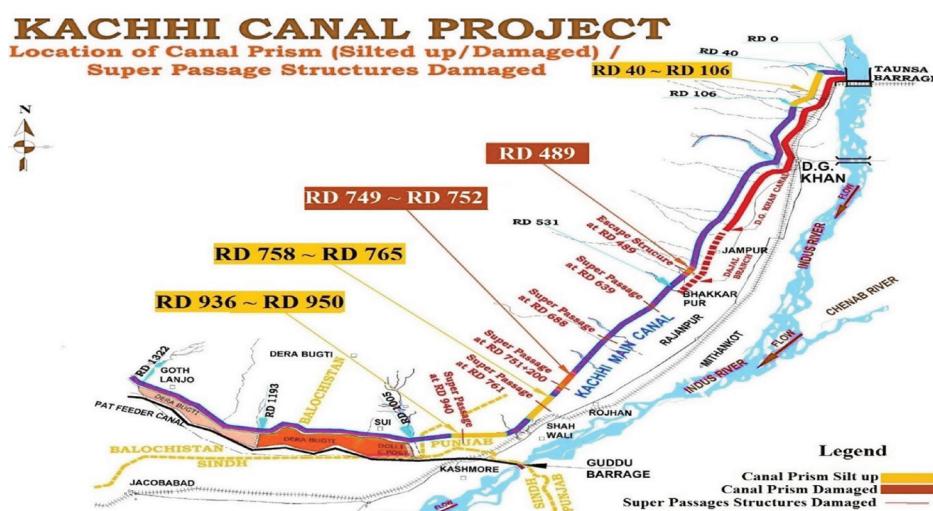
4. FINDINGS AND DISCUSSION

Situation Analysis-Flood Damages

In August 2022, a flash flood from the Koh-e-Suleman hill torrents severely damaged the Kachhi Canal in the Punjab portion, rendering the canal non-operational. The canal suffered 129 major cuts/breaches, and six structures were partially or completely damaged. The canal bed was eroded at two locations, and heavy silt was deposited at three locations (See Figure 3). Owing to substantial damage, massive restoration work was required to make the canal operational. In November 2023, a PC-I amounting to KR 10.572 billion was submitted to the MoWR, suggesting that thirty-six months would be required for the restoration effort.

The PC-1 for restoration has been under a lot of debate, and no authority is willing to take ownership of the project. The Project Steering Committee has advised direct contracting, and WAPDA's request for the construction of cuneate to the MoWR on an urgent basis before Kharif 2023 (May 2023) did not yield any results. The MoWR funds from the GoB, which have so far shown an inability to undertake the project, have requested the federal government to bear the restoration cost. The urgent restoration work for the restoration of 400 to 500 cusecs of the water supply has a financial implication of PKR 1,500 million, requiring 3 to 4 months for completion.

Figure 3: Flood Damages – 2022



Source: WAPDA (2023).

Initial Field Visits

Initial field surveys were conducted to ascertain the situation in the vicinity of the Kacchi Canal, identify the socioeconomic status of the area, and assess the benefits that have been incurred due to the operationalisation of the canal.

During the initial field visits, the focus was on determining the areas to visit and understanding the situation of the Kachhi Canal in the area. It was discovered that the area is completely barren, with only a few pieces of land being cultivated using tube wells. Such cultivated lands are rare to find, and most agricultural lands were found to be barren. It was observed that the watercourses had been damaged, and most of them were filled with sand, i.e., they had silted up. The lands were covered with various types of wild plants. However, we found traces suggesting that, years ago, the land was levelled for agricultural purposes and fields were ploughed.

Currently, there are hardly any fields being cultivated, except for those irrigated by tube wells. The water in the area is saline due to underground gas pockets. However, landlords repeatedly emphasised that the investment in tube wells would not last long because the underground water is increasingly becoming saline as it is extracted from deeper levels and will no longer remain suitable for cultivation.

Water is not available in the area for several miles, and people do not have enough water to drink or for other purposes. An individual was spotted in the vicinity of Gate 9 (RD 1109+081), who was transporting water from an area called Jani Berri near Patfeeder, which was approximately 14 to 15 kilometres away from the location. In the vicinity of Mauza Shazain, a pond was discovered where both animals and humans were drinking water at the same time. This place is called Asreli (see Figure 4). Additionally, people are migrating from different areas of the Kacchi Canal to other parts of the district. The landowners and farmers are migrating to Sindh, Punjab, and other parts of District Dera Bugti. Initially, farmers mostly came from Sindh, Dera Bugti, and other areas of District Dera Bugti, especially from the areas adjacent to the Sui, to cultivate lands.

The mosques in the area were found to be deserted, while some were under construction. During visits to the fully constructed mosques, there were birds inside, likely due to the closure of the mosques for an extended period, with no one present to offer prayers or maintain cleanliness. Moreover, houses had been abandoned as farmers had vacated them since the Kachhi Canal had not been operational in 2022. School buildings were left incomplete, as their construction was halted when the KCP became non-operational.

Figure 4: Mauza Shazain



Source: Authors' picture.

Respondents' Profile

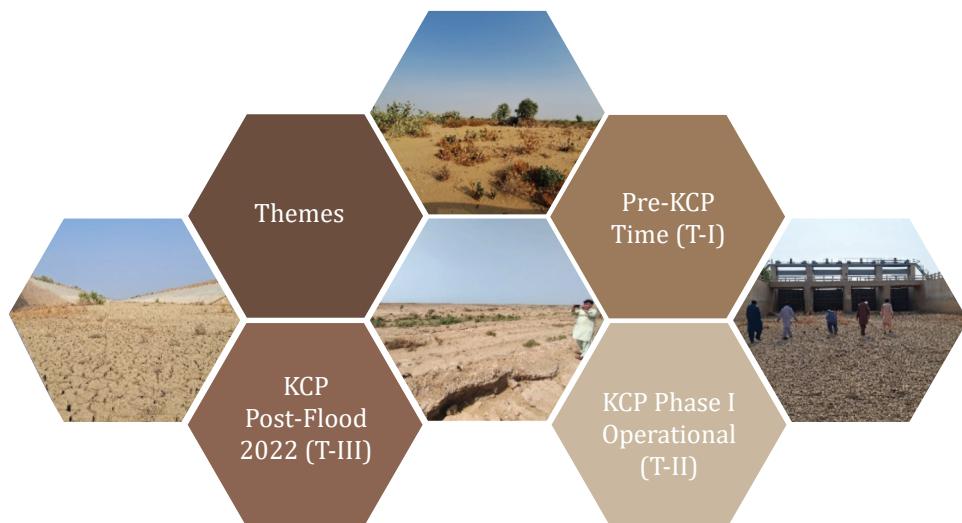
In order to ensure a representative sample, a wide range of participants were included in the FDGs. Multiplicity in terms of mauzas, their age, agricultural experience, landholdings, and family income sources other than agriculture was ensured. The participants' age, education, and farming experience ranged from 25 to 70 years, 0 to 16 years, and 0 to 61 years, respectively, while landholdings ranged from 12 to 500 acres of land. Family sources of income, other than agriculture, included businesses, semi-government, and government jobs. The family size of respondents ranged from 3 to 108 members. All of the respondents were male, while the majority of them were landowners, except those who were working as tenants of another landlord due to the unavailability of water on their lands in the Kachhi canal. Details of the participants are provided in Table 1.

The main Bugti tribe, which owns land adjacent to the Kachhi Canal, belongs to Rahijo, which is one of the main subtribes of Bugti. The main tribe is further subdivided into four subtribes, which are Khalper, Perozani, Masori, and Shambani. Within the Bugti tribe, the Khalper, Perozani, and Rahijo (Nawab family) subtribes hold a majority of the land adjacent to the Kachhi Canal Phase-1 (Part A).



The FGD participants were asked about the socioeconomic impacts of KCP on the livelihood of the local populace. The transcription of FDGs indicates that the socioeconomic impacts of the KCP Phase I (Part A) fall into three main themes, i.e., pre-KCP time (T-I), KCP Phase I operational (T-II), and the KCP post-flood 2022 (T-III), as indicated in Figure 5. Separate discussions on each of the aforementioned themes are provided in subsequent sections in detail (See Appendix A: A Thematic Map for Each Sub-Theme).

Figure 5: Main Themes



Source: Authors' illustration.

Table 1: FGD Participants Profile

FGD No.	Mauza/Village	Respondent No.	Age	Education (Years)	Land-holding (Acres)	Family Size (Members)	Farming Experience (Years)	Family Income Sources other than Agri
01	Saghari	01	46+	10	350	26	7	Business
		02	25-30	16	70	40	5	Govt. servant
		03	25-30	16	15	14	0	Semi-govt.
		04	25-30	16	45	39	5	None
		05	25-30	16	12	18	10	None
02	Go	01	57	16	30	9	50	Govt. servant
		02	37	16	10	12	5	Teaching
		03	40-45	0	40	12	23	None
		04	40-45	0	125	8	32	None
		05	31	10	140	7	20	None
		06	70	0	100	27	61	Education



FGD No.	Mauza/Village	Age	Education (Years)	Land-holding (Acres)	Family Size (Members)	Farming Experience (Years)	Family Income Sources other than Agri	
03	Landow	01	46+	16	150	9	20	Teacher
		02	46+	0	300+	19	55	None
		03	46+	0	20-25	15+	50+	Line worker
		04	46+	0	200+	14+	30+	None
		05	46+	0	280+	20+	55+	None
04	Shazain	01	46+	5	250	28	40	Livestock
		02	46+	0	50	25	30+	Tractor Driver
		03*	40-45	0	30	30	12	Farming
		04	46+	10	150	25	20	None
		05	35-39	0	100	35	26	None
		06	46+	0	50	35	30	None
		07	40-45	0	60	27	30	Govt. servant (Air Force)
05	Mozoi	01	31-34	10	10	9	20	None
		02	35-39	8	50	30	25	None
		03	40-45	0	50	7	32	None
		04	31-34	12	80	10	26	PPL
		05	25-30	10	500	3	20	None
06	Kattan	01	35-39	14	40	108	20	Govt. servant
		02	56	14	25	25	44	Govt. servant
		03	40-45	5	20	25	20	Semi-govt (PPL)
		04	55	0	50	35	28	Semi-govt
		05	70	0	60	45	50	Semi-govt
		06	35-39	16	150	20	10	Govt. servant

Source: Authors' calculations. Note: * indicates that the participant is both a landowner and a farmer.

Pre-KCP Time (T-I)

The socioeconomic development and problems faced by the local populace before the operationalisation of the KCP in the Sui region of the Dera Bugti district of Balochistan were brought together in this theme. The major problems faced by the community were grouped into those related to agriculture, water management, socioeconomic conditions, and land record management.

Agriculture

Before the Kachhi Canal project, the Sui region of district Dera Bugti, Balochistan, relied predominantly on the Khushkaba system, which is rainfed agriculture. Rainfed agriculture is a practice intrinsically associated with seasonal rainfall that governs agricultural output and stability, which not only dictates crop selection but also governs the socioeconomic landscape of the area, signifying the era of limited productivity, growth, and agricultural output. The uncertainty in rainfall and rudimentary farming techniques left the local population vulnerable to climatic conditions. In the pre-KCP time, the lack of alternative crops and limited water availability were the chief barriers to sustainable economic growth and development in the area.

Before the Kachhi Canal's construction, the agricultural landscape of the region was also characterised by limited crop output, intensity, variety, and productivity. In particular, there exist rainfed agriculture systems in the region, with limited agricultural output and variety. The FGD participants indicated that most of the farmers relied on only a few traditional crops, such as pearl millet (*bajra*), wheat, mustard (*sarson*), and occasionally sorghum (*jawar*), which were grown in the area irrigated with rainwater. The cropping intensity was very low in the area. The limited water availability and arid climate conditions in the region hampered crop diversity and productivity, influencing both the resilience of the local populace and their socioeconomic conditions in the area.

During the research, it was informed by the FGD participants that wheat was the staple crop grown in the area before the Kachhi canal. *"Before the Kachhi Canal, we used to cultivate onion and wheat"* (FGD 01, Respondent 01). The crops that require water intensively were not grown in the area due to water scarcity. *"As far as crops are concerned, wheat was cultivated here as the crops, like rice, require more water"* (FGD 01, Respondent 02). This constraint had a significant impact on the local economy since it limited the crops that could be cultivated. Consequently, it affected the standard of living and socioeconomic conditions of those dependent on agriculture in the area.

Before the operationalisation of the KCP phase-I (part A), mustard and millet used to be important crops as well, but their yield heavily depended on the seasonal rainfall that was often inadequate and unpredictable. As one participant responded, *"Before the Kachhi Canal, mustard was cultivated using rainwater"* (FGD 01, Respondent 05). Another FGD participant seconded the dependency on the rainfed irrigation system, stating that *"Earlier, sorghum and millet were grown by our forefathers"* (FGD 03, Respondent 04). The



traditional farming system with minimal diversification in crop variety was adapted due to harsh weather conditions, as suggested by these responses. The heavy reliance on rainfed agriculture with a limited crop variety reflects the vulnerability of the local populace to climatic conditions. Additionally, it highlights the significance of the availability of water for the expansion of agricultural practices.

The absence of efficient irrigation infrastructure also hindered agricultural productivity. As suggested by the respondents of FGD 04, *“Before the Kachhi Canal, we could only cultivate a few crops such as millet and a limited number of vegetables. If it rained, these crops would grow; otherwise, nothing.”* Such dependence on unpredictable rainfall has led to problems in attaining stable, reliable, and predictable agricultural output.

The agricultural methods, before the Kachhi Canal project, were simple, orthodox, and predominantly dependent on rainfall, which limited the type of crops that were cultivated in the area, resulting in low-value grains that did not offer significant economic benefits. Moreover, extensive agricultural practices were rare, as mentioned by Respondent 05 of the FGD 05, *“Only 4 to 5 acres of land used to be cultivated with occasional rains.”* Such restrictions on the cultivable area severely restricted the agricultural output and productivity, as the rainfed system was not suitable for extensive farming.

Beyond such restrictions, the system of seasonal rainfall made agricultural productivity highly unstable. This had a direct impact on the socioeconomic conditions and prosperity of the area. *“Previously, there were intermittent periods of cultivation; there was no prosperity”* (FGD 04, Respondent 02). This uncertainty created a situation where the prosperity of the community was heavily reliant on unpredictable rainfall, resulting in a fragile agricultural base and food insecurity in the area.

Additionally, the landscape of the area was totally barren and deserted before the KCP, as stressed by many respondents. *“Before the canal, the area was like a desert without any vegetation”* (FGD 03, Respondent 04). Before the project, the area looked like a desert, and the villages did not have any canal system. This underlines that the region was totally inhospitable, further compounded by the desert-like harsh conditions, which led to complications in attaining sustainable agricultural output, productivity, growth, and food security.

The economic system in the area was simple, with scarce infrastructure and development. Businesses were rare, and the economy was mainly dependent on agriculture, with limited income. *“Earlier, people did not have their own businesses”* (FGD 01, respondent 05). The commercial opportunities were very

scarce in the area, along with the limited exposure of the local population to alternative income-generating sources. Furthermore, the pre-KCP era was marked by the presence of absentee landlordism, where many landlords did not actively participate in agricultural activities, directly or indirectly, and lived in major cities of Balochistan, Sindh, and Punjab. This indicates that a significant portion of land is either underutilised or left in the hands of either farmers or tenants who do not possess the resources to improve it.

The sparse population density was another prominent feature of the area. *“Before KCP, the population density was quite low”* (FGD 01, Respondent 02). As the water was very scarce in the area, population density remained low. This contributed to a low level of social ties.

As a whole, the area before the KCP was dependent heavily on the rainfed agricultural system with a harsh landscape, limited economic opportunity, lack of prosperity, low population density, and minimal infrastructure.

Water Management

Before the establishment of the Kachhi Canal, there were two sources of water available to the local community: rainwater and tubewells. The region faced substantial challenges due to scarce water resources, which led to precarious socioeconomic conditions. Agriculture was mainly dependent on water, which is scarce in the area. Thus, agriculture was sustained using rainwater and tubewells, which often came with great financial risk. Many landlords and farmers of the area invested in the tubewells without knowing whether the water would be fresh or brackish. *“If the water turns out to be fresh, the settlement will thrive, but if it is saline, all the investment will go to waste”* (FGD 01, Respondent 01). The underground water is predominantly brackish due to the existence of gas pockets. This unpredictability in access to the water formed a delicate foundation for the development of agriculture in the region.

The potable water scarcity was another serious problem in pre-KCP times that affected daily life. Local populations often travelled miles to obtain drinkable water, which underscored the extreme hardship before the KCP. *“People used to travel to Sui, which is 30 to 40 kilometres away, only to obtain drinking water”* (FGD 01, Respondent 03). The lack of consistent water resources caused immense inconvenience and halted the economic growth of the Sui region. A few wealthy landlords who could afford tubewells had some relief, which was not a viable solution for the majority of the local populace. Subsequently, social disparities worsened due to a lack of access to groundwater, while the poor endured extensive hardships in the region.



Another prominent issue that landlords and farmers faced in the region was the depth of underground water. Before the KCP, the underground water level was around 190 to 200 feet. However, near the Patfeeder Canal had shallower water tables, making the water slightly more accessible and tubewells less costly. *"Before the canal, the underground water table was 200 feet"* (FGD 01, Respondent 04).

In sum, before the Kachhi Canal's construction, the local population contended with unreliable irrigation, acute scarcity of water, and deeply buried groundwater. These obstacles impeded not only agricultural output, productivity, and the daily life of the local population, but also had far-reaching impacts on socioeconomic conditions.

Socioeconomic Conditions

The area of Sui in the Dera Bugti exhibits significant disparities in several key socioeconomic aspects, characterised by a sparse population, heavy dependence on traditional means of livelihood, and limited employment opportunities. The social and economic structure of the region is closely associated with the accessibility of natural resources and subsistence methods.

Population density was astonishingly low before the KCP. *"There wasn't a large population here before the Kachhi Canal"* (FGD 01, Respondent 02). The others seconded the opinion that *"there was indeed population, but it was not as dense"* (FGD 03, Respondent 05). These responses indicate that population density was extremely low in the area that underwent significant transformation after the construction of the Kachhi Canal. Additionally, the employment opportunities were predominantly reliant on the Pakistan Petroleum Limited (PPL), characterising the narrow scope of economic opportunities available in the area. *"Initially, the sole source of employment was the Pakistan Petroleum Limited in the District Dera Bugti"* (FGD 01, Respondent 03). This apparent lack of economic opportunities on gas fields operated by the PPL signified the deficiency of diversity in job variety, made the local economy vulnerable, and had low socioeconomic indicators.

The primary means of livelihood also depended heavily on the livestock in most of the areas of the Dera Bugti. *"Our livelihood is mainly tied to the livestock"* (FGD 02, Respondent 02). This reliance on livestock and conventional means not only shaped the economic landscape of the area but also restricted access to economic prospects, leaving the local economy

primitive. *"Earlier, people did not have shops or other small businesses"* (FGD 01, Respondent 05). This underscores the deficiency of infrastructure and economic opportunities available to the local population.

In short, the pre-KCP time showcased the challenges encountered by the population, ranging from low employment opportunities and reliance on livestock and traditional methods of farming to restricted access to business opportunities.

Land Record Management

The land in the region was largely unproductive, barren, sandy, and deserted. The land record and ownership were tied to ancestral rights and traditional tribal practices based on verbal agreements rather than formal documentation. *"People used to rely on verbal transactions and receive payment based on that"* (FGD 01, Respondent 03). Land ownership was a fluid concept in the area governed by the tribal norms that define land rights. Moreover, the formal documentation was rare. *"Initially, the land records were written on cloths, and those who had such records could claim the land"* (FGD 01, Respondent 05). Furthermore, land was traditionally distributed and managed among tribes and, in turn, among the individuals within the tribe. These customary practices faced challenges with the arrival of the KCP, as access to resources often necessitated a more organised structure.

The absence of formal land records was a recurring problem. *"Historically, there has been no formal land record management system; it was just understood that certain lands belonged to certain tribes"* (FGD 01, Respondent 03). Such a system often led to social and armed conflicts. Therefore, a formal land record system became increasingly essential to maintain law and order situations, along with securing water rights and agricultural productivity once the canal arrived. Earlier land records inscribed on cloths became increasingly insufficient to prove the owner's rights and secure legal recognition.

Land in the area was divided based on a tribal system, in which it was distributed among various families and communities, which illustrates a communal land use system. Land allocation was carried out by the tribes themselves. *"Our lands were divided by the owners themselves inherently"* (FGD 02, Respondent 04). This method of land allocation, along with no formal land record management system, resulted in confusion and disagreements. Such a system also posed challenges to formalising land use, land records systems, and property rights.



Most of the land is owned by the various Bugti tribes: "*Khalper tribe and other Bugti tribes are landowners*" (FGD 06, Respondent 01). Nevertheless, due to the lack of formal land records, many of the tribes remained unaware of the particulars and precise boundaries. Moreover, the cost of accessing formal land records was prohibitive. "*The records were stored in the DC Office of Dera Bugti, and a significant amount was required to access them*" (FGD 01, Respondent 01). This lack of accessibility to formal land records hindered locals from formalising ownership, further complicating the land management system before the operationalisation of the Kachhi Canal.

KCP Phase I Operational (T-II)

The operationalisation of the Kachhi Canal signified an era of agricultural development in the region, profoundly affecting socioeconomic conditions. With the water availability from the canal, previously barren and sandy land was cultivated, fostering crop variety, agricultural output, productivity, and yield. The sustained availability of water from the canal irrigation system enabled farmers to diversify the crop varieties, resulting in a significant increase in the cultivation of wheat, cotton, and mustard, along with vegetables. This shift fostered economic stability and improved food security. The Kachhi canal evolved as an influential project rejuvenating the local economy and supplying critical resources for sustained agricultural growth.

Agriculture

The implementation of the Kachhi Canal significantly transformed the area's agriculture and socioeconomic conditions. A dependable water supply was ensured due to the canal that allowed landowners and farmers to diversify the crops and enhance agricultural output that was once dependent upon rainwater, including crops that were previously non-viable. "*From 2021 to 2022, almost 72,000 acres of land came under cultivation in Sui, Dera Bugti*" (FGD 05, Respondent 01). The newfound agricultural potential was a catalyst for prosperity, as emphasised by the multitude of respondents. "*Once the Kachhi Canal started, we experienced tremendous prosperity; the previously barren lands became fertile and productive*" (FGD 05, Respondent 04). Kachhi Canal introduced an unprecedented level of productivity, as the previously barren and sandy lands thrived with crops. Such views were consistently echoed, highlighting that access to water not only boosted cultivation but also revitalised the barren and sandy lands.

The operationalisation of the Kachhi Canal facilitated a significant increase in crop variety. The introduction of water to dry and desolate lands fostered crop variety and increased the volume of output that was once unattainable. *“Upon the activation of the Kachhi Canal, yield remarkably improved; now one acre of land can yield up to 45 maunds of wheat”* (FGD 03, Respondent 02). This increase in yield significantly benefited staple crops, such as wheat and mustard, which not only satisfied regional demands but also aided in the economic stability and widespread prosperity of the region.

Beyond crop yield, the introduction of water to arid and desolate lands altered land use and labour dynamics. The area that was once uncultivable and uninhabited due to water scarcity experienced extensive cultivation. *“Fields in which we could not envision installing a tubewell are now producing crops. Those areas were filled with sand like a desert, but because of the Kachhi Canal, agriculture became possible in such areas”* (FGD 01, Respondent 03). This revolution affected the socioeconomic landscape of the local populace as they migrated to new cultivable lands for farming, which enhanced population density within the region and fostered the growth of domestic markets.

The Kachhi Canal significantly affected the agricultural intensity, with a multitude of farmers enhancing the frequency of cropping cycles. The reliable water source from the canal enabled the landowners and farmers to experiment with various cropping patterns, allowing crop diversity and increasing agricultural intensity. The canal impacted the introduction of new crops as well. Farmers started to cultivate high-value crops such as cotton. This shift to new crops significantly improved their income levels. *“Once the canal started, we cultivated diverse crops from wheat and cotton to mustard and pulses”* (FGD 06, Respondent 01). This transformation significantly stabilised the local economy and protected the farmers and landowners from risks, coupled with monoculture farming.

In addition to benefits accruing to individual landowners and farmers, the Kachhi Canal also provided community-wide benefits in boosting the socioeconomic landscape. Higher income from agriculture substantially increased the quality of life of the local population. The agricultural income facilitated investment in education, mosques (also serving as educational institutes in rural areas), and housing. Moreover, the Kachhi Canal also facilitated technological advancement and the modernisation of agricultural practices that enabled the farmers to adopt modern machinery, fertilisers, and farming techniques that were previously unfeasible. The integration of technology in farming practices facilitated per-acre productivity.



“It is not feasible to till the land with the use of cows to cultivate cotton and onions” (FGD 03, Respondent 01). This transition not only increased agricultural output but also established a sustainable farming ecosystem with minimal resources.

As a whole, the introduction of the Kachhi Canal marked a profound transformation in the agricultural landscape of the region. It resulted in substantial gains in crop diversity, productivity, yield, and output, along with enhanced agricultural intensity, area under cultivation, and adaptation of modern machinery and know-how. The ripple effects of this transition transcended agriculture, elevating the quality of life and improving economic stability. The canal not only brought water, but it also revitalised the lands and hope in the local population.

Water Management

The FGD participants expressed their opinion about irrigation systems, groundwater, and water management. The operationalisation of the canal brought a transformative shift to the area’s water management, tackling the long-standing issue faced by the local population.

The FGD participants were also asked about water management after the Kachhi Canal became operational. One of the prominent benefits reported by FGD participants was the enhanced water availability for irrigation. Before the KCP, local communities faced severe water scarcity. *“The first thing is that initially, the irrigation water was extracted straight from the source with an engine and then brought to the fields”* (FGD 04, Respondent 01). This indicates the chaotic nature of the rainfed irrigation system before the operationalisation of the KCP, where the reliance was on less efficient methods. Conversely, the canal offered a more reliable and sustained supply of water, guaranteeing that agricultural fields were regularly irrigated, especially amid fluctuating seasonal weather conditions.

The canal also led to improvements in groundwater levels in various areas, especially adjacent to the Kachhi Canal. Before the canal, many areas faced critically low levels of the groundwater table. *“Before the groundwater level was as deep as 600 feet. With the arrival of the Kachhi Canal, it has come up significantly at about 180 to 200 feet”* (FGD 04, Respondent 01). This demonstrates that the canal directly replenishes the region’s groundwater table by regulating the flow of water to natural aquifers. However, as noted by other respondents, *“The arrival of the Kachhi Canal did not exert any noticeable impact on groundwater level”* (FGD 03, Respondent 04). This indicates that the



benefits from the Kachhi Canal in terms of replenishment of groundwater levels were not uniformly experienced across the region. Additionally, “*brackish water converted to fresh water*” (FGD 04, Respondent 02), suggesting a critical shift in the region’s groundwater resources, which could be used for irrigation purposes to some extent once unviable.

The improvement in access to water directly aided a shift to modern irrigation techniques from conventional methods, such as animal-drawn ploughs, to mechanised irrigation methods employing tractors. “*With the advent of KCP, awareness among the enhanced, and they started employing tractors, which replaced the conventional bullock carts for ploughing*” (FGD 04, Respondent 03). Moreover, other respondents reiterated that “*The tractor-based system is now in place; the old days of utilising oxen ploughs have been over. With the operationalisation of the Kachhi Canal, everyone became happy, gave up the oxen, and started employing tractors; the livelihood of everyone has improved*” (FGD 04, Respondent 04). The adoption of modern technology improved water efficiency, markedly augmented productivity, minimised labour-intensive techniques, and spawned new economic prospects, including the generation of employment opportunities, particularly in the study area.

The social welfare of the local population was also affected by the advent of the canal. The FGD participants generally highlighted that they were very pleased with the arrival of irrigated water in the Kachhi canal. Their thirst was quenched, along with the livestock and other animals, as before KCP, water was unavailable for animals.

However, the operational time of the KCP also encountered challenges. Insufficient canal branches and poor maintenance had been identified as some of the deficiencies. It was identified by the respondents that “*WAPDA constructed only main branches and did not build smaller branches*” (FGD 05, Respondent 01). Moreover, water was available, but there were some minor issues with the distribution of branches. Additionally, disputes also arose over water utilisation due to a lack of a conflict resolution process. “*There were conflicts on distributaries because of a lack of checks and balances*” (FGD 02, Respondent 02). “*Neither was there any tribal force to prevent conflicts or resolve issues*” (FGD 02, Respondent 02). This emphasises the deficiency of effective dispute-resolution mechanisms.



Notwithstanding these deficiencies, the overall impact of the canal on water management and the livelihood of the local population was profound. It improved access to water for agricultural purposes. *“As soon as the Kachhi Canal was initiated, the government made the water available; we were very pleased”* (FGD 02, Respondent 04). Thus, reliable water availability increased prosperity and improved living conditions in the region.

Socioeconomic Conditions

Substantial changes were observed during the operational phase of the Kachhi Canal. The socioeconomic condition changed profoundly. The significant positive impacts were noted across various dimensions. The most evident benefit was the growth of commercial activities, enhancing wealth and alleviating poverty in the region. The canal's other positive impacts included increased agricultural output, water resource availability, and enhanced livelihood prospects for the local populace.

The canal instilled the hope of employment opportunities and prosperity in the region. *“The Kachhi canal’s arrival undoubtedly provided benefits as it instilled hope for employment”* (FGD 02, Respondent 02). People believe that with the operationalisation of the irrigation system, work opportunities and prosperity in the area would come. This indicates that the canal has the potential to transform people's lives. Additionally, people were optimistic about the transformation in their lives.

The FGD respondents highlighted the economic development that took place in the region because of the availability of water. New businesses and shops opened up in the region. *“After agriculture started, people started shops”* (FGD 01, Respondent 05). After the surge in economic activity, the business community also benefited. *“Obviously, several businessmen also benefited”* (FGD 03, Respondent 01).

The canal also facilitated employment generation in the region by offering job opportunities for previously unemployed people. *“Those who were unemployed found sources of income because of the Kachhi Canal”* (FGD 01, Respondent 03). People found employment in various ways; some of them became tractor drivers, some started transportation of wheat and other crops via rickshaws, while some started farming.

Agricultural productivity also improved because of improvements in the canal irrigation system, resulting in enhanced farmers' income. The barren and sandy lands transformed into fertile lands, allowing farmers to grow all types of crops and generate income. *“When water comes, the lands become fertile,*

which enables agriculture and obviously raises income." (FGD 01, Respondent 02). These improvements significantly increased the living standards of people and individuals dependent upon agriculture. "*We earned PKR 800,000 from an acre when the canal was operational*" (FGD 06, Respondent 01). Thus, significant benefits were reaped from the Kachhi Canal in the form of income generation.

Beyond revenue generation, the regions experienced improvements in the form of infrastructure development, including better electricity supply and roads. "*With the enhanced electricity supplies and construction of roads, such benefits were observed.*" (FGD 01, Respondent 04). Additionally, canals brought an influx of skilled workers and farmers from various places, including adjacent areas as well as from other provinces. This influx of skilled workers and farmers imparted agricultural skills and knowledge to locals, causing knowledge diffusion and spillover effects. "*Most of the farmers belong to Sui; many came from Sindh who had knowledge of cultivating other crops such as melon*" (FGD 02, Respondent 05). This migration of farmers and skilled labour, along with knowledge sharing, promoted agricultural productivity, yield, and output with the use of modern techniques.

The benefits of the canal extended beyond individual welfare to subnational and national levels. As highlighted by a FGD respondent, "*If this issue is considered, the benefits of the Kachhi Canal extend not only to Balochistan but to all of Pakistan*" (FGD 03, Respondent 01). This statement demonstrates the broader economic and development impacts anticipated from the operationalisation of the canal.

Moreover, participants consistently mentioned that the canal brought widespread prosperity in their lives and villages by significantly enhancing their standards of living. "*The individuals nearby us were also happy*" (FGD 03, Respondent 05). "*The impoverished benefited greatly*" (FGD 05, Respondent 02). This indicates that the Kachhi Canal significantly contributed to fostering social advancement and economic relief for society, particularly for the marginalised segment of society at large.

Besides economic advantage, the canal also facilitated return migration. The individuals who vacated their hometowns in search of economic opportunities returned to their homes and started cultivating their lands. "*Those who left their homeland in search of employment also returned because of the Kachhi Canal; this was an additional advantage*" (FGD 01, Respondent 04). This return migration to rural areas from cities underscores the significance of canals in revitalising lands that had been abandoned before.



Despite the substantial positive impacts of the canal, issues related to corruption on various grounds and unequal resource distribution have been experienced by the local population. Instances of fraudulent land transactions in terms of land ownership transfers and corruption in land levelling compromised the realisation of the full potential of the Kachhi Canal. The respondents expressed their dissatisfaction over such matters. *"Settlement officials accepted bribes from powerful individuals and altered the land records"* (FGD 03, Respondent 02). *"The big landlord got some benefits from the government"* (FGD 05, Respondent 02). This indicates inequitable benefits accrued to farmers and small and large landlords in the region.

The operation of the Kachhi Canal has undeniably brought transformative changes to the region, which significantly reduced poverty, created employment opportunities, and improved the socioeconomic and livelihood conditions, especially in the Sui area of Dera Bugti. As a whole, it significantly enhanced the overall well-being of the local populace. Nonetheless, proper addressing of corruption in various aspects, resolving social conflicts that arise due to land conflicts, and enhancing infrastructure are key factors in realising maximum benefits from the canal.

Land Record Management

Land record management plays a significant role in mitigating conflicts through equitable land distribution. The functioning of the Kachhi Canal significantly changed the terms of land management, highlighting prospects and challenges inherent to such transactions. The respondents identified enhanced awareness of the land records following the operationalisation of the Kachhi Canal, as many locals, for the first time, became aware of formal land records. Despite these positive impacts, problems such as incorrect land registration and disputes over land ownership due to improper land records persisted.

A significant positive effect experienced by the local population during the operational time of the Kachhi Canal was the resolution of land disputes mediated by the security forces and local tribal leaders. As a respondent mentioned, *"this is why the Frontier Corps (security forces) and others intervene to resolve the issues, and thereafter the situation normalises"* (FGD 01, Respondent 01). The tribal leaders also played their role in the dispute resolution process. This effective dispute-resolution process brought stability to the region and enabled the local population to focus on agricultural production without fear of conflict. Moreover, the land allocation and

formalisation of land records mitigated conflicts and significantly enhanced agricultural productivity. *“Land was being distributed through tribes, with the availability of water in the Kachhi Canal”* (FGD 01, Respondent 05). This system is perceived as fair in many instances, as another respondent added that “in our area, no instances of transferring land to others than the original owner had occurred” (FGD 03, Respondent 02). However, respondents also indicated their regret over the performance of the Balochistan Settlement Department. *“Settlement department did not play any role in the area”* (FGD 03, Respondent 03). This support from law-and-order enforcement authorises tribal leaders to play a significant role in equitable land distribution, demonstrating lasting effects on the land distribution system.

The local population became aware of formal land documentation in the operational phase of the Kachhi Canal. Numerous individuals became cognisant of land entitlements during this phase. *“Most of the population living nearby became aware of the system of formal land document (Khatta) after the operationalisation of the Kachhi Canal”* (FGD 01, Respondent 04). This awareness reduced ambiguities about land ownership. However, the problem of inaccurate land registrations and social and armed conflicts over land ownership persists.

The operationalisation of the canal brought widespread prosperity to the region. The availability of water increased agricultural productivity, a greater area has come under cultivation, and arable land generated greater returns to landowners and farmers. The land that was levelled naturally benefited more than other lands. *“Conversely, there are areas where land was levelled and became more fertile, obtaining greater benefits”* (FGD 02, Respondent 05). This economic uplift of landowners and farmers has encouraged further investment in land levelling and development. *“With the operation of the Kachhi Canal, everyone developed their lands”* (FGD 02, Respondent 05).

Notwithstanding these factors, the operationalisation phase is marked with a multitude of challenges, such as flaws in the land registration system. *“Land possession was handed over to others instead of the original owner”* (FGD 02, Respondent 02). People managed the land ownership in such a way that it led to ambiguity in ownership. Such disparities resulted in grievances and occasional conflicts.

The period when the Kachhi Canal was operational appears to be a significant phase for regional progress and development. It boasted an agricultural economy, improved awareness regarding the land registry system, and brought significant areas under cultivation, along with improvements in



governance mechanisms. The distribution of lands was ensured with the help of law enforcement authorities and tribal leaders. This blend of modern techniques and traditional practices resulted in significant impacts.

KCP Post-Flood 2022 (T-III)

The post-flood phase of the KCP is characterised by significant socioeconomic and environmental challenges. One of the most critical issues faced by the local population is acute water scarcity, rendering the communities fighting for survival. Participants in the FGDs unanimously highlighted the problem of dire water scarcity. *"We are longing even for a glass of water"* (FGD 03, Respondent 03). The acute water scarcity not only disrupts daily life but also damages the backbone of the region, which is agricultural output, yield, and productivity.

The severe flooding has damaged the Kachhi Canal, which has significantly affected the socioeconomic dynamics. Respondents expressed their sorrow about the operation of the canal, stating that the canal was merely functional for two years. The canal dysfunctionality halted water supplies, making the land infertile, and forced the local population to migrate.

Agriculture

Agricultural activities, previously revitalised by the functioning of the Kachhi Canal, have returned to barren and unproductive conditions, even critical during rainfed time, because of the inoperability of the canal. Several respondents emphasised the catastrophic impact of canal cessation on production and livestock. *"Now it has become non-operational; the land has become barren"* (FGD 02, Respondent 05). Landowners and farmers forsook their properties and vacated the area due to a severe water crisis. *"People have migrated from where they once lived because of water scarcity"* (FGD 02, Respondent 01). The loss of the primary source of income has resulted in outmigration, which has destroyed community cohesion and exacerbated economic challenges.

The economic repercussions exerted by the canal closure are profound. The inadequate water supplies necessary for sustainable agriculture and livestock production have been stressed by several respondents. *"The agricultural production flourished due to water; now there is no water, and available water is saline"* (FGD 04, Respondent 05). The paradigm shift from canal-driven irrigation to a drought-affected region has led to all-embracing poverty,

compelling the residents to liquidate their personal assets and livestock barely to satisfy their day-to-day needs. "Individuals are selling three to four goats to buy flour and resolve their problems" (FGD 03, Respondent 02).

Landowners experimented with the installation of tubewells in the region. However, saline water from tubewells rendered it unsuitable for human as well as livestock utilisation. "*Tubewells are being installed; however, water is saline*" (FGD 02, Respondent 04). This water salinity not only reduced drinking water availability but also constrained agricultural recovery, compounding the difficulties of the region.

Notwithstanding these grim circumstances, the respondents persistently called for government action to restore the canal on an emergent basis. "*Complete this work for us, for God's sake*" (FGD 06, Respondent 02). The potential benefits of the Kachhi Canal have been highlighted in the case of the operationalisation of the canal. "*If it had remained operational for 5 to 6 years, there would have been significant benefits*" (FGD 02, Respondent 05). These perspectives emphasise the dependence of the community on external assistance, which, in turn, reversed their plight and rebuilt the sole source of their livelihood.

As a whole, the post-flood scenario portrays a picture of acute water scarcity resulting in extensive loss of agricultural output and compelled migration. The community collectively emphasised the urgent need to restore the canal, underscoring the crucial role of large-scale irrigation projects in sustainable socioeconomic development and stability.

Water Management

The aftermath of the Kachhi Canal represents a critical moment in various aspects, such as changes in socioeconomic conditions, environmental impacts, water scarcity, etc. The operational phase of the canal transformed the region by enhancing water availability, agricultural output, and income levels. Nonetheless, its inoperability and damage resulting from extensive hill torrents, which caused a massive flood, have reversed the pace of advancement, leading to stark issues faced by the local populace.

The restoration of the canal brings prosperity to the local economy as it is essential for the regional recovery. "*The entire system would be restored once water flows into the canal*" (FGD 03, Respondent 03). This implies that a canal is of the utmost necessity for local economic revival. "*Once the canal has been restored, all the problems will be resolved*" (FGD 03, Respondent 03). The issue



of water scarcity is resolved once the water flow has been established, which is crucial for mitigating the scarcity of water and rejuvenating agricultural techniques.

The frustration among the local populace is exacerbated by the lack of restoration work and government intervention. *"The Kachhi canal water should be restored promptly, and water should be available in the rabbi season so that our village thrives again"* (FGD 06, Respondent 01). Notwithstanding the logistics and technological solutions, including prompt repair, FGD respondents highlighted the lethargy of authorities. *"The repair work can be finished within a month if the federal government assumes responsibility"* (FGD 06, Respondent 03). This necessitates the authorities to take immediate action to address the administrative and technical hurdles, among others, to initiate restoration work.

The availability of inadequate alternatives, such as tubewells, resulting in saline groundwater, has further intensified the problem. *"There is no water nowadays; if there is, it is saline"* (FGD 04, Respondent 02). The problem requires having an alternative source of sustainable water management infrastructure to overcome the misery faced by the residents. Additionally, the absence of supplementary infrastructure, such as dams, has rendered the local population vulnerable to water shortages. *"The rainwater could have been stored, and water could be used if there existed dams"* (FGD 01, Respondent 04).

In sum, the post-flood situation requires immediate rehabilitation work to be initiated on an urgent basis. The responses not only narrate the canal's centrality to the livelihood but also highlight the frustration of the local population with the failure to restore the canal. This demands attention to restoring sustainable water supplies to revive socioeconomic stability in the region.

Socioeconomic Conditions

The socioeconomic impacts of the post-flood situation are profound. The closure of the water canal has created water constraints. It starkly contrasts with the previously generated wealth due to the operations of the canal. The community is facing considerable difficulties encompassing economic hardship, social turmoil, and demographic decline. The canal's inoperability and damage resulted in extensive social, economic, and agricultural repercussions that have critically impacted the standard of living and stability of the study area.

The economic hardship is most prominent in the region. The population, previously dependent on a canal irrigation system, now faces extreme water shortages, which have resulted in employing expensive alternatives such as tubewells. However, the risk is highly attached to the tubewell as underground water is mostly saline. *“Due to the closure of the canal, nowadays there is uncertainty attached to the successful installation of the borehole, whether the water would be drinkable or saline”* (FGD 01, Respondent 03). The financial strain resulting from unsuccessful attempts at tubewells has already worsened the situation. “We obtain loans on interest and borrow money from others” (FGD 06, Respondent 01). *“This led to greater losses to the poor”* (FGD 06, Respondent 04). The economic repercussions not only affected agriculturists but also extended to the broader community, leading to difficulties in securing basic amenities, as one of the respondents stated that *“the population residing in villages and adjacent areas is very distressed”* (FGD 06, Respondent 01).

The infrastructure gap played a massive role in compounding the challenges faced by the local population. The unavailability of adequate dams has been emphasised by the FGD respondent, who stated that such infrastructure could have significantly mitigated the damage from massive hill torrents. *“Because there exist no dams or comparable system, if there had been dams, water could have been stored and utilised, but no such system exists”* (FGD 01, Respondent 04). The recurring hill torrent water from Koh-e-Suleman has been highlighted as the main cause of canal damage. The construction of dams to store water coming from Koh-e-Suleman has been proposed as the solution. *“The solution involves the construction of dams to manage the water of Koh-e-Suleman to prevent the canal from damage”* (FGD 03, Respondent 01). The economic hardship has been further intensified due to a lack of basic facilities such as schools, hospitals, and electricity. *“You cannot find schools, clinics, or electricity; the whole budget is being utilised in the cities”* (FGD 06, Respondent 03). These responses imply the urgent need for basic infrastructure facilities to ensure long-term sustainability, development, and resilience.

The canal damage triggered massive depopulation in the region. The migration started due to water scarcity, which undermined community cohesion and highlighted the extensive displacement. This situation left the community to depend solely on cattle farming. The formerly prosperous region has become desert and barren. *“Everyone departed from the region as it had been wrecked”* (FGD 03, Respondent 05). The abandonment is also evident in places of worship that also serve as educational institutes in the region.



"Even now mosques have become deserted as there are no worshippers; everyone has fled" (FGD 05, Respondent 02). This massive depopulation has resulted in lawlessness. *"Consequently, it's a jungle out there; everyone acts as per their own desires where might is right"* (FGD 02, Respondent 02).

Considerable social and psychological anguish has been caused by canal inoperability. The once-deemed blessings have turned into misery. *"Every landowner was grieved when the Kachhi Canal became inoperable. It brings intense pain when Allah provides a blessing, and it is taken away."* (FGD 04, Respondent 03). This loss has affected society at large by diminishing its social cohesion, with many grappling with the harsh realities of life.

Land Record Management

The damage and inoperability of the Kachhi Canal brought issues to land record management. The post-flood situation highlighted a surge of social conflicts over land. A multitude of respondents highlighted the existence of inaccuracies in the land registry and issues relevant to land appropriation. *"Those who do not have land illegally occupy it"* (FGD 01, Respondent 05). There has been a systematic issue as well. The land records are being altered by registering lands in someone else's name, which gives rise to social conflicts. These conflicts necessitate that a strong and transparent framework be adopted to reestablish order and justice to uphold the land record management system.

Despite such challenges, conventional tribal methods provided a glimmer of hope to the residents to resolve land issues. The role of the jirga system and tribal system has been highlighted by respondents in mediating conflicts and resolving land-related issues. *"The jirga system is held to find a resolution of land disputes, and solutions are generally found as they know which land belongs to whom"* (FGD 02, Respondent 02).

Future Course of Action

The post-flood situation is marked by widespread problems, such as agricultural deterioration, economic stagnation, and social adversity. The urgent rehabilitation of the canal has been consistently reiterated by the respondents, as the destruction of the canal plunged the local population into despair because of heavy reliance on agriculture.

The key issue identified by the respondents is the failure of planning and policy that has intensified the precarious situation. The lack of comprehensive feasibility studies and improper assessment of environmental factors has been highlighted as a prime factor leading to the current prevailing fragile situation. *"The feasibility plan was totally flawed"* (FGD 03, Respondent 01). Moreover, *"the super passages were not properly identified"* (FGD 03, Respondent 01). Such observation raises critical questions about the sustainability of the project, its future planning, and resource allocation, rendering restoration more complicated.

Although the restoration request is a call for canal repair, it is in fact a desperate plea for the survival of a community heavily dependent upon agriculture. *"We appeal to the president and prime minister of Pakistan to restore the canal on an urgent basis"* (FGD 05, Respondent 04). Moreover, the socioeconomic effects of the canal's inoperability are devastating. *"There will be nothing left for us if this resource is eliminated"* (FGD 06, Respondent 01). Therefore, this collective desperation underlines the heavy reliance of the local population on the Kachhi Canal for survival. The way forward requires a comprehensive strategy, a proper feasibility strategy to devise super passages that can handle massive water coming from the mountains of Koh-e-Suleman and other areas, long-term maintenance, and inclusive planning. Repair of the canal not only brings prosperity to the region but also revives the agricultural economy, promotes sustainable economic development, and addresses the issues of marginalised populations.

Discussion of Results

Impact Timeline with Annotations

Key events and their effects across different phases of the Kachhi Canal project are illustrated in Table 2. In the pre-KCP time (T-I), reliance on rainfed agriculture led to limited economic growth and low crop yields with recurrent conflicts due to scarcity of water and limited opportunities available to the local population. During the KCP Phase I Operational (T-II), the local population experienced a boost in agricultural productivity and economic growth with the formalisation of the land record system and technology adaptation because of the operationalisation of the Kachhi Canal. However, Post-Flood 2022 (T-III), severe hill torrents damaged the canal, causing the local population to return to scarcity of water and an economic downturn.



Table 2: Impact Timeline with Annotations

Phase/Time Period	Key Events	Impacts/Changes	Annotations/Insights
Pre-KCP Time (T-I)	Dependence on rainfed agriculture	Low crop yields, limited economic growth	Water scarcity led to frequent conflicts and reliance on traditional methods.
KCP Phase I Operational (T-II)	Canal construction and full operation	Increase in agricultural productivity, economic growth	Community collaboration improved; technology adoption; formal land records introduced.
KCP Post-Flood 2022 (T-III)	Severe flood damage to the canal	Return to water scarcity, economic downturn	Lack of maintenance was blamed; conflicts resurfaced; and reliance on tubewells through the solar system.

Source: Authors' compilation.

Layered Impact

The layered impact analysis is presented in Table 3. The layered impact analysis refers to a multistage complex impact that unfolds over time as a result of a specific project, which, in this case, is the construction and operationalisation of the Kachhi Canal, in this case. Such analysis reflects negative and positive changes across various phases.

Table 3 indicates the evolving consequences of the KCP on four main thematic areas: agriculture, water management, socioeconomic conditions, and land record management. These thematic areas unfolded in three distinct stages over time, reflecting positive and negative impacts.



Table 3: Layered Impact

Thematic Area	Pre-KCP Time (T-I)	KCP Phase I Operational (T-II)	KCP Post-Flood 2022 (T-III)	Annotations
Agriculture	Rainfed agriculture; limited crop variety; drought-resistant crops	Increased productivity; change in crop patterns; livestock	Productivity decline; Reversion to drought-resistant varieties, but to a lesser extent	Shifts in agricultural practices due to water availability and subsequent scarcity
Water Management	Tubewells; Limited water for livestock; lower water table	Groundwater replenishment; effective irrigation	Water scarcity; return to rainwater agriculture; tubewells with solar systems	Impact of irrigation on crop choices and socioeconomic activities
Socioeconomic Conditions	Migration along with livestock; economic disparity; fewer economic opportunities	Economic development; decline in migration (return migrations); improved income sources; lower food inflation	Migration resumed; economic stress and downturn	How water availability influences socioeconomic dynamics
Land Record Management	Informal/verbal land dealings; Lack of formal documentation	Formalised land records; dispute resolution mechanisms introduced	Increase in land disputes; erosion of formal land record management (land record confusion)	The role of irrigation in formalising or complicating land ownership and management

Source: Authors' compilation.



Economic and Financial Analysis

This section provides a detailed discussion of cropping intensity, land utilisation, crop production expenses, gross production values, and economic and financial analysis.

Cropping Intensity

The cropping intensity increased in the Sui region of Dera Bugti when the canal became operational. During the rainfed era, the cropping intensity was substantially low, with a total of 1,948 acres of land being cultivated, whereas after the water availability from the canal system, the cropping intensity significantly increased, which is evident from Figures 6 and 7. According to the Agriculture Extension Department of Balochistan, the total area under cultivation increased from 1,948 to 55,200 acres from 2016 to 2021. The increase in area under cultivation is also evident from Figures 6 and 7, indicating the project's capability to supply water to the command area, highlighting the project's success in enhancing water accessibility and showcasing its wider benefits in terms of agriculture output, employment and other benefits.

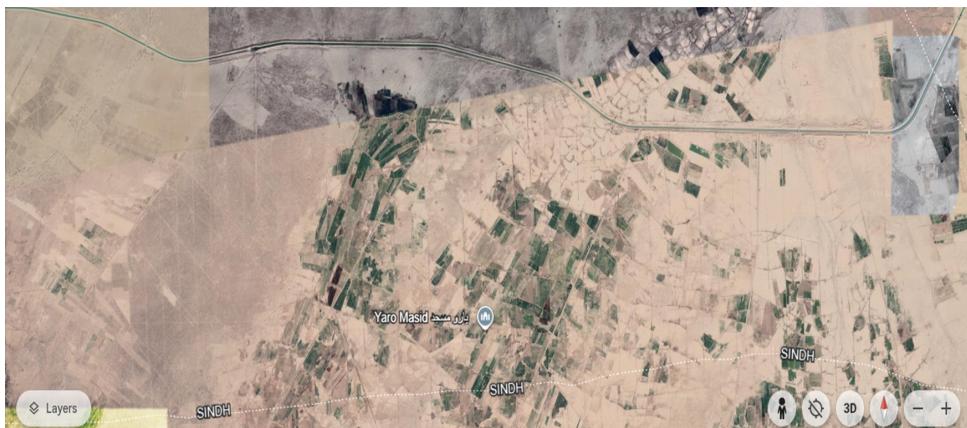
Figure 6: Satellite Image of KCP Part 1 (Phase-A) for the Year 2015



Source: Agriculture Extension Department of Balochistan.

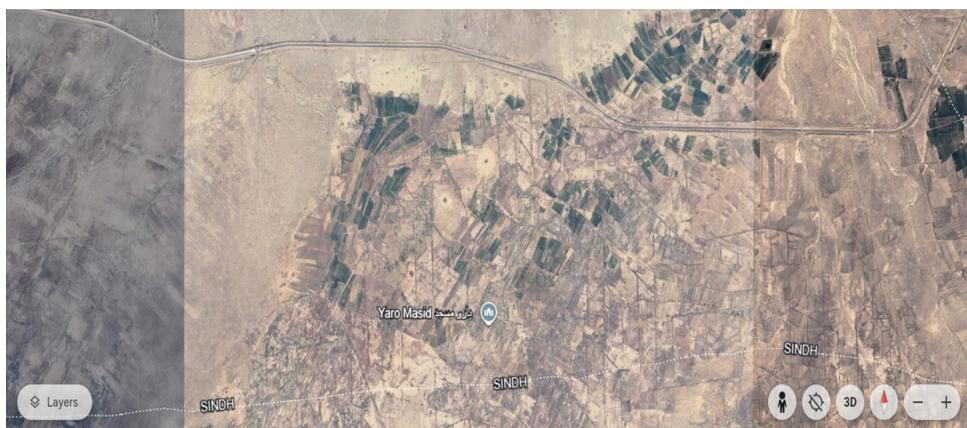


Figure 7: Satellite Image of KCP Part 1 (Phase-A) for the Year 2020



Source: Google Earth.

Figure 8: Satellite Image of KCP Part 1 (Phase-A) for the Year 2023



Source: Google Earth.

However, these benefits did not last long enough, as severe hill torrents damaged the Kachhi Canal in 2022, and these benefits were no longer available to the local populace. Figure 8 indicates that the command area is not green anymore, as the cultivation of crops vanished with the damage to the Kachhi canal, which resulted in severe water scarcity. Moreover, as evident in Figure 8, some parts of the land are green, which is because of calotropis gigantea (a wild plant) covering the land, as shown in Figures 9 and 10. Thus, the destruction of the Kachhi Canal has resulted in the loss of all the benefits once realised.

Figure 9: Massive Presence of *Calotropis Gigantea* (a Wild Plant)



Source: Authors' picture.

Figure 10: Massive Presence of *Calotropis Gigantea*



Source: Authors' picture.

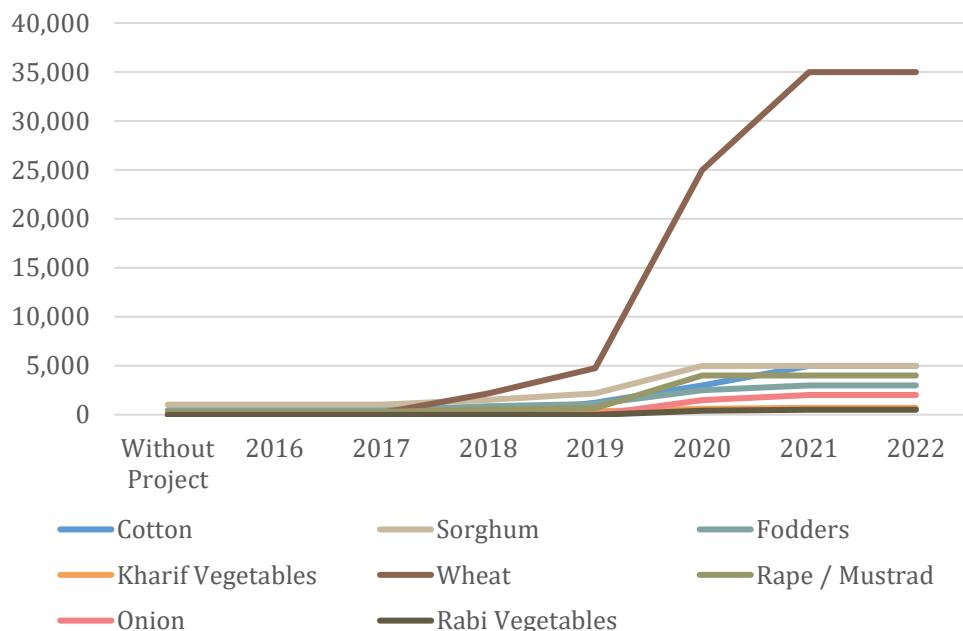
Land Utilisation, Crop Production Expenses, and Value

The trends in land utilisation for growing different crops during the rainfed time and subsequent years when the Kachhi Canal became operational are indicated in Figure 11. Initially, all crops grown in the region had limited land utilisation. However, after 2018, there was a sharp increase in land utilisation, especially for wheat. By 2020, wheat utilised the maximum cultivable



command area of the Kachi Canal, reaching approximately 35,000 acres of land during 2021 and 2022. This phenomenal growth featured large-scale wheat cultivation enabled by the project. Other crops, including cotton, onion, mustard, rabi, and kharif vegetables, also registered a gradual and consistent rise in land utilisation. However, their growth remained comparatively low compared to wheat.

Figure 11: Land Utilisation – Rabi & Kharif (Acres)



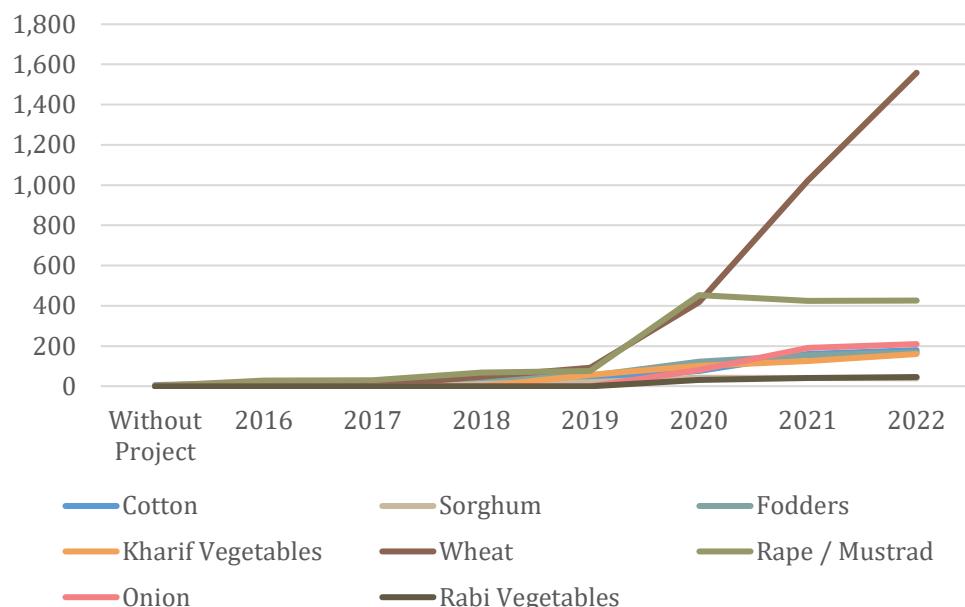
Source: Agriculture Extension Department of Balochistan.

Figure 12 presents total crop production expenses at wholesale prices over time. Before the Kachhi Canal, in the rainfed irrigation system, expenses were minimal. With the initiation of the project, expenses began to rise with a substantial spike starting in 2019 as more area came under cultivation, as evident in Figure 11. The total wheat expenses reached PKR 1,600 million in 2022, reflecting large-scale wheat cultivation. Notably, other crops showed minimal expenses due to limited land utilisation and crop production.

Gross production value indicates the total value of production in a given year. It is estimated by multiplying the economic price by total crop production in per-acre terms. Figure 13 illustrates the progression in the total value of production per acre for various crops from the rainfed irrigation system to the operationalisation of the Kachhi Canal from 2015 to 2022. The trend indicates that with the enhanced availability of water through the implementation of the project, productivity increased for all crops. The significant rise in gross production values, especially in cotton, mustard, rabi and kharif vegetables, underscores the benefits of the project along with its role in transforming the agricultural output in the area.

Together trend analysis emphasises the significant effect of the KCP on land utilisation, production expenses, and gross value production, with wheat being the most dominant crop in terms of land utilisation and financial expenses.

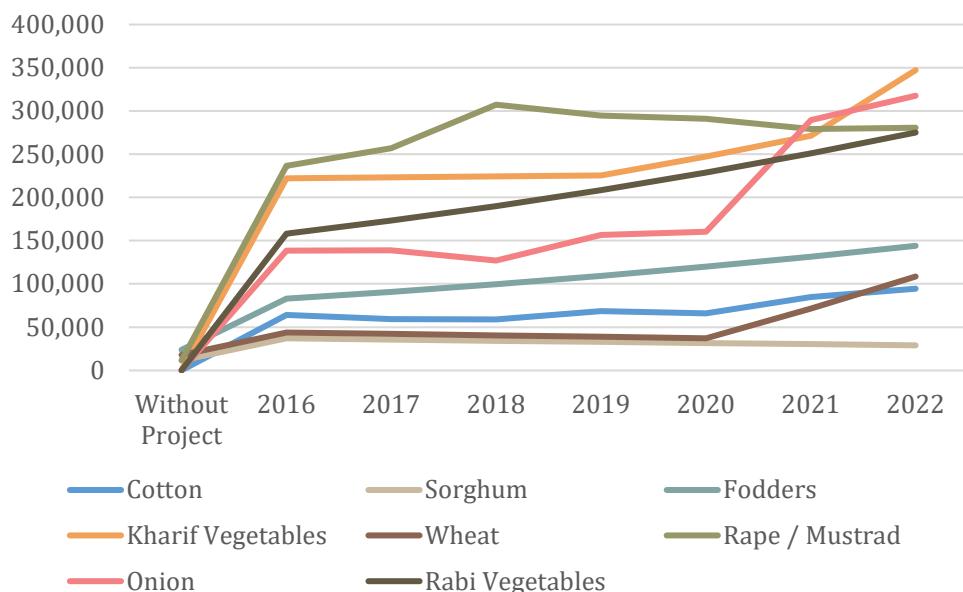
Figure 12: Total Crop Production Expenses- Economic Prices (PKR Million)



Source: Agriculture Extension Department of Balochistan.



Figure 13: Gross Production Values (GPV) Per Acre - Economic Prices (PKR Million)



Source: Agriculture Extension Department of Balochistan.

Economic Analysis

The objective of economic analysis is to assess the economic viability of the project. The results are compared with the economic analysis conducted by the agricultural extension department of Balochistan. This enabled us to reexamine the potential risks involved in the long-term sustainability of the project.

The standard economic analysis approach was employed to compute the present worth of benefits and costs using different time horizons compared against a threshold period of twenty years, discounted at the opportunity cost of capital. A conservative approach was adopted to compare the performance of the project with the estimate available previously, even though the project's total life cycle is much more than twenty years. Nonetheless, the period was also increased to thirty years to account for the project's performance over a longer span.



The data for the benefit and cost of projects came from the Agriculture Extension Department of Balochistan, which is based on quantifiable physical inputs and outputs. The benefits were estimated based on changes that have occurred and other conditions expected to occur in the region. The analysis is based on wholesale prices. Costs consist of actual costs incurred on the development of cultivable command areas, which include civil works, management of the project, and technical assistance. The financial cost includes PKR 1,779.051 million for the development of cultivable command area and PKR 4,570.88 million for the construction of Kachhi Canal Phase-1 (Part A). These estimates were converted to economic costs by applying the conversion of 0.914, providing PKR 1,517.848 million and PKR 4,178.271 million for the development of the CCA and construction costs.

The economic analysis involves the determination of costs and benefits in terms of economic prices, computation of benefit-cost ratios, net present worth, the EIRR, and finally carrying out sensitivity analysis.

Table 4 gives the estimates of economic analysis, which include the EIRR, benefit-cost ratio, and NPV. Appendix B provides details on the computation of these estimates. The estimates of the Agriculture Extension Department indicate that the IRR was 33.65% for the cropping area of 46,500 acres for the Rabi season and 8,700 acres for the Kharif season. The economic estimates at the project appraisal indicate an IRR of 16.04%, assuming an increase of 24,031 and 19,129 acres in the CCA of Phase 1 (Part A). This study repeated the analysis based on land utilisation, and the CCA of only 25% of the CCA during the rainfed times, which is a very optimistic estimate. The results show that EIRR would be 18.18% if the construction of the Kachhi Canal had started as planned after the damage in the financial year 2022. Unfortunately, the construction did not start as planned. Therefore, another scenario was assumed, i.e., the repair work starts in 2024-25 and pre-flood agricultural production levels are reached immediately after the restoration of the canal. Based on this scenario, the EIRR turns out to be 16.59%, which is still higher than the estimates at the project appraisal. The benefit-cost ratio indicates that the project is beneficial if the restoration work of the project starts immediately, i.e., in 2024-25. The project, however, does not remain economically viable if there is a gradual increase in agricultural production after the restoration of the canal.



Table 4: Economic Analysis (Economic Prices)

Scenario	NPV (PKR Million)				Benefit-Cost Ratio				EIRR (%) After Comple- tion	
	Interest Rate				Interest Rate					
	10%	12%	15%	18%	10%	12%	15%	18%		
Agri. Extension Dept. Estimates	25,466	19,513.16	13,103.92	...	2.01	1.94	1.81	...	33.65	
Scenario A: 25% of Rainfed	5,393.28	3,403.28	1,364.32	60.91	1.29	1.22	1.11	1.01	18.18	
Scenario B: If repair starts in 2024-25	3,580.29	2,087.34	566.88	-403.72	1.23	1.15	1.05	0.96	16.59	
Scenario C: Gradual prod increase	-1,378.77	-1,623.04	-1,861.58	-2,013.63	0.89	0.86	0.80	0.75	0.17	
Scenario C1: Gradual prod increase extended till 2039-40	773.46	-221.18	-1,113.29	-1,607.15	1.05	0.98	0.89	0.81	11.48	
Scenario C2: Gradual prod increase extended till 2044-45	2109.83	574.27	-741.25	-1,429.48	1.14	1.05	0.93	0.83	13.07	

Source: Authors' computations.

Financial Analysis

The estimates for financial analysis are reported in Table 5. Financial estimates are based on the financial internal rate of return (FIRR), benefit-cost ratio, and NPV. The results indicate that FIRR significantly reduced from 35.46%, i.e., Agriculture Extension Department's estimates, to 21.25% in the case reconstruction of the canal starts in 2024-25 and is completed within the postulated timeframe of 3 years. Cost-Benefit estimates also indicate that the project is still financially viable if the restoration of the Kachhi Canal is complete in 2027-28 and production approaches peak immediately.



Table 5: Financial Analysis (Financial Prices)

Scenario	NPV (PKR Million)				Benefit-Cost Ratio				FIRR (%) at completion	
	Interest Rate				Interest Rate					
	10%	12%	15%	18%	10%	12%	15%	18%		
Agri. Extension Dept. Estimates	29,833.70	23,055.85	15,719.85	-	2.03	1.96	1.84	-	35.46	
Scenario A: 25% of Rainfed	20,706.61	15,028.54	9,161.60	5,369.38	1.93	1.80	1.61	1.43	27.24	
Scenario B: If repair starts in 2024-25	11,584.20	7,742.42	3,921.23	1,567.61	1.51	1.41	1.26	1.13	21.25	
Scenario C: Gradual prod increase	-3,390.98	-3,363.82	-3,260.52	-3,141.97	0.81	0.79	0.75	0.72	0.17	
Scenario C1: Gradual prod increase extended till 2039-40	-626.64	-1,563.27	-2,299.40	-2,619.89	0.97	0.91	0.83	0.77	9.08	
Scenario C2: Gradual prod increase extended till 2044-45	1,089.79	-541.58	-1,821.56	-2,391.68	1.05	0.97	0.87	0.80	11.21	

Source: Authors' computations.

Sensitivity Analysis

Sensitivity analysis is a crucial step to determine how sources of uncertainty impact the project. The sensitivity analysis was conducted by assuming the changes in the project's costs and benefits. Specifically, analysis was undertaken by increasing the project cost by 10%, reducing the benefits by 10%, and a simultaneous increase and decrease in project costs &and benefits by 10%, respectively.

Table 6 shows the results of the sensitivity analysis based on economic prices. The detailed estimates of sensitivity analysis for both economic and financial approximations are provided in Tables 7 and 8, respectively. EIRR estimates indicate that the project rate of return reduces as the conditions become adverse. However, no substantial impact is visible in terms of EIRR. Thus, the results indicate that if the restoration of the canal is complete in 2027-28, the project remains economically feasible.



Table 6: Sensitivity Analysis

Scenario	EIRR (%) (At Appraisal)	EIRR (%) After Completion (Agri. Extension Dept. Estimates)	EIRR (%) After Completion (Current Study Estimates)
Base case	16.04	33.65	18.18
Sensitivity Analysis			
10% increase in project costs	15.11	32.14	17.04
10% decrease in project benefits	15.02	30.77	18.14
Benefits reduction & cost overrun by 10% occurring simultaneously	14.13	29.34	13.89

Source: Authors' computations.

Table 7: Sensitivity Analysis (Calculations Based on Economic Prices)

Scenario	NPV (PKR Million)				Benefit-Cost Ratio				EIRR (%)	
	Interest Rate				Interest Rate					
	10%	12%	15%	18%	10%	12%	15%	18%		
Agri. Extension Dept. Estimates	25,466	19,513.16	13,103.92	-	2.01	1.94	1.81	-	33.65	
Scenario A: 25% of Rainfed	5,393.28	3,403.28	1,364.32	60.91	1.29	1.22	1.11	1.01	18.18	
Scenario B: If repair starts in 2024-25	3580.29	2087.34	566.88	-403.72	1.23	1.15	1.05	0.96	16.59	
10% Increase in Project costs										
Scenario A: 25% of Rainfed	4,933.54	2,957.01	936.46	-350.38	1.26	1.18	1.07	0.97	17.04	
Scenario B: If repair starts in 2024-25	3,111.56	1,633.50	133.14	-819.60	1.19	1.12	1.01	0.92	15.35	
Scenario C: Gradual prod increase	-1,847.50	-2,076.88	-2,295.32	-2,429.51	0.86	0.82	0.77	0.72	3.70	
Scenario C1: Gradual prod increase extended till 2039-40	304.73	-675.02	-1,547.02	-2,023.03	1.02	0.95	0.85	0.77	10.53	
Scenario C2: Gradual prod increase extended till 2044-45	1,641.09	120.44	-1,174.98	-1,845.36	1.10	1.01	0.89	0.79	12.21	
10% Decrease in Project benefits										
Scenario A: 25% of Rainfed	5,390.61	3,400.65	1,361.77	58.42	1.16	1.09	1.00	0.91	18.17	
Scenario B: If repair starts in 2024-25	1,609.64	503.98	-601.37	-1,288.90	1.10	1.04	0.95	0.86	13.19	



Scenario	NPV (PKR Million)				Benefit-Cost Ratio				EIRR (%)	
	Interest Rate				Interest Rate					
	10%	12%	15%	18%	10%	12%	15%	18%		
10% Decrease in Project benefits										
Scenario C: Gradual prod increase	-2,526.94	-2,590.98	-2,626.99	-2,631.73	0.80	0.77	0.72	0.68	0.42	
Scenario C1: Gradual prod increase extended till 2039-40	-732.73	-1,422.32	-2,003.17	-2,292.87	0.95	0.89	0.80	0.73	8.58	
Scenario C2: Gradual prod increase extended till 2044-45	2,109.83	574.27	-741.25	-1,429.48	1.03	0.94	0.83	0.75	13.07	
Benefit Reduction and Cost Overrun (each by 10%) Occurring Simultaneously										
Scenario A: 25% of Rainfed	2,538.20	1,034.45	-475.75	-1412.56	1.13	1.06	0.96	0.87	13.89	
Scenario B: If repair starts in 2024-25	1,140.91	50.15	-1,035.10	-1,704.79	1.07	1.00	0.91	0.84	12.11	
Scenario C: Gradual prod increase	-2,995.67	-3,044.81	-3,060.72	-3,047.61	0.78	0.74	0.69	0.65	-0.27	
Scenario C1: Gradual prod increase extended till 2039-40	-1,201.46	-1,876.15	-2,436.91	-2,708.76	0.92	0.85	0.77	0.69	7.85	
Scenario C2: Gradual prod increase extended till 2044-45	-87.40	-1,213.02	-2,126.76	-2,560.64	0.99	0.91	0.80	0.72	9.88	

Source: Authors' computations.

Table 8: Sensitivity Analysis (Calculation Based on Financial Prices)

Scenario	NPV (PKR Million)				Benefit-Cost Ratio				FIRR (%)	
	Interest Rate				Interest Rate					
	10%	12%	15%	18%	10%	12%	15%	18%		
Agri. Extension Dept. Estimates	29,833.70	23,055.85	15,719.85	-	2.03	1.96	1.84	-	35.46	
Scenario A: 25% of Rainfed	20,706.61	15,028.54	9,161.60	5,369.38	1.93	1.80	1.61	1.43	27.24	
Scenario B: If repair starts in 2024-25	11,584.20	7,742.42	3,921.23	1,567.61	1.51	1.41	1.26	1.13	21.25	
10% Increase in Project costs										
Scenario A: 25% of Rainfed	20,203.66	14,540.33	8,693.52	4,919.43	1.89	1.75	1.56	1.56	25.98	
Scenario B: If repair starts in 2024-25	10,745.61	6,971.26	3,232.88	945.04	1.46	1.35	1.20	1.07	19.83	
Scenario C: Gradual prod increase	-4,229.56	-4,134.99	-3,948.87	-3,764.55	0.78	0.75	0.72	0.68	-0.94	



Scenario	NPV (PKR Million)				Benefit-Cost Ratio				FIRR (%)	
	Interest Rate				Interest Rate					
	10%	12%	15%	18%	10%	12%	15%	18%		
10% Increase in Project costs										
Scenario C1: Gradual prod increase extended till 2039-40	-1,465.23	-2,334.43	-2,987.75	-3,242.47	0.93	0.87	0.79	0.73	8.03	
Scenario C2: Gradual prod increase extended till 2044-45	251.20	-1,312.74	-2,509.91	-3,014.26	1.01	0.93	0.83	0.75	10.26	
10% Decrease in Project benefits										
Scenario A: 25% of Rainfed	20,706.61	15,028.54	9,161.60	5,369.38	1.74	1.62	1.45	1.29	27.24	
Scenario B: If repair starts in 2024-25	8,174.75	5,059.73	2,002.76	157.21	1.36	1.27	1.13	1.01	18.34	
Scenario C: Gradual prod increase	-5,976.96	-5,370.90	-4,685.10	-4,195.33	0.67	0.66	0.65	0.62	*	
Scenario C1: Gradual prod increase extended till 2039-40	-626.64	-1,563.27	-2,299.40	-2,619.89	0.87	0.82	0.75	0.70	9.08	
Scenario C2: Gradual prod increase extended till 2044-45	1,089.79	-541.58	-1,821.56	-2,391.68	0.95	0.87	0.78	0.72	11.21	
Benefit Reduction and Cost Overrun (each by 10%) Occurring Simultaneously										
Scenario A: 25% of Rainfed	15,908.15	11,149.94	6,266.05	3,139.76	1.70	1.58	0.40	1.40	23.38	
Scenario B: If repair starts in 2024-25	7,336.17	4,288.57	1,314.41	-465.36	1.31	1.22	1.08	0.96	1706	
Scenario C: Gradual prod increase	-5,721.75	-5,392.85	-4,943.39	-4,567.49	0.70	0.68	0.64	0.47	-4.26	
Scenario C1: Gradual prod increase	-3,418.12	-3,892.38	-4,142.46	-4,132.42	0.84	0.78	0.71	0.66	5.39	
Scenario C2: Gradual prod increase extended till 2044-45	-1,987.75	-3,040.97	-3,744.25	-3,942.25	0.91	0.84	0.75	0.68	7.96	

Source: Authors' computations.



Financial Viability

The financial viability of the project is based on certain financial indicators. These indicators include NPV, benefit-cost ratio, and FIRR. Furthermore, estimates of the current are compared with the estimates at the appraisal of the project and the estimates of the Agriculture Extension Department of Balochistan. The results indicate that the project is financially viable in all scenarios, including scenarios A & B of the current study, as shown in Table 9.

Table 9: Financial Viability

Financial Indicators	Estimates at the time of Appraisal at 12% Interest Rate	Agri. Extension Dept. Estimates at 12% Interest Rate (After Completion)	Current Study Estimates at 12% Interest Rate (After Completion) Scenario A	Current Study Estimates at 12% Interest Rate (After Completion) Scenario B
Net Present Value (PKR Million)	3174.41	23,055.85	15,028.54	2,087.34
Benefit-Cost Ratio	1.52:1	1.96	1.80	1.15
FIRR (%)	15.75	35.46	27.24	16.59

Source: Authors' computations

5. CONCLUSION

Kachhi Canal is in the most underdeveloped province of Pakistan. It originates from the Taunsa Barrage of Punjab province, enters the Dera Bugti district of Balochistan province and stretches to the Jhal Magsi District. This project irrigates 713,000 acres of CAA in the Kachhi plain of Balochistan with a total length of 194 kilometres in the province. It has been envisioned as a lifeline for Balochistan agriculture.

The project has faced multiple challenges in terms of cost and time overruns since its inception in 2002. The KCP has been revised twice. Following the second revision, the project was split into three distinct phases. The approved cost of the project increased from PKR 31.204 billion to PKR 80.352 billion, and a delay of at least 10 years in Phase-1 only. However, Phase-1 (Part A) was inaugurated in 2018, which irrigates 72,000 acres of CAA.

This study examined the socioeconomic impacts of the Kachhi Canal and carried out the economic and financial viability analyses of Phase 1 (Part A). Mixed methods, both qualitative and quantitative approaches, were utilised in the study. For qualitative analysis, FGDs were held with the stakeholders, which included landowners and farmers who had access to and benefited from canal irrigation water. The quantitative data were obtained from the Agriculture Extension Department of Balochistan to calculate NPV, benefit-cost ratio, EIRR, and FIRR, and to carry out sensitivity analysis.

In the initial field survey, it was found that the land is completely barren, with some land being cultivated using tubewells. This is because the Kachhi Canal has become non-functional as a result of severe hill torrents that occurred in the DG Khan and Rajanpur areas. The severe floodwater of the Koh-e-Suleman badly damaged the canal, and it has become inoperable. An annual benefit of PKR 3.82 billion was expected from Phase I, while a contribution of PKR 19.66 billion was expected from the whole KCP to the national economy against the total cost of PKR 80.352 billion (PKR 77.246 billion of expenditures have already been made). The amount required for emergent restoration work amounts to PKR 1.5 billion to realise the annual benefits, while PKR 10.572 billion are required for the complete restoration.

Despite the investment, total benefits were realised only for 2 to 3 years, and a massive amount is required to make the canal operational again. This raises questions about the adequacy of initial project planning, super passages, and climate considerations. The impact of rainfall and natural hazards was either underestimated or not accounted for. As a result, more expenditure is required to restore the KCP. Given the nature of flash floods and rainfall above the historic averages in the area, not only restoration but also replanning/restructuring of the project is necessary in order to cater to the megafloods in the future. During restoration, super passages must be constructed in such a way that they can handle massive amounts of water flow, ensuring the canal remains operational.

Additionally, the quantity of tubewells was very limited due to saline underground water, and houses were abandoned by the farmers because of severe water scarcity. The socioeconomic impacts of the KCP ascertained through FGDs fall into three main themes, namely, Pre-KCP Time (T-I), KCP Phase I Operational (T-II), and KCP Post-Flood 2022 (T-III). These themes are further divided into agriculture, water management, socioeconomic conditions, and land record management.



The result indicates that before the KCP, rainfed agriculture was practised in the area, which has low output, yield, and agricultural productivity. Along with the existence of water scarcity, traditional farming methods, which have very low cropping intensity and land utilisation, were practised in the region. The socioeconomic conditions were characterised by a sparse population, limited employment, and economic opportunities. The operational phase of the KCP is characterised by the cultivation of sandy and barren lands, higher crop variety, enhanced agricultural output, productivity, and yield. The sustained water availability enabled the farmers to focus on crop diversity, fostering economic stability, improved food security and sustained agricultural growth. The operationalisation of KCP profoundly improved the socioeconomic conditions, and the social and armed conflict was significantly reduced. This period brought widespread prosperity to the region.

In contrast to the operational phase of the KCP, the post-flood phase of the KCP is characterised by significant socioeconomic challenges, severe water scarcity, migration of farmers to other provinces, damage to agricultural output, productivity, yield, and making land infertile as land levelling has damaged the rainfed system. The socioeconomic conditions have deteriorated significantly, and the social and armed conflicts have resurged in the region.

The economic and financial analysis was carried out using NPV, benefit-cost ratio, and internal rates of return (EIRR and FIRR). The sensitivity analysis was also carried out. The findings of economic and financial analysis indicate that the canal is economically and financially viable only if the reconstruction starts in 2024-25. This study concludes that any delay in restoration work or in the case of any massive flooding would make this project financially unviable.

6. RECOMMENDATIONS

Canals have historically been a substantial contributor to improving socioeconomic indicators. The KCP project was conceived with the right intent to transform the socioeconomic landscape of Balochistan. However, cost overruns and project delays have substantially enhanced the cost-effectiveness and delayed the promised returns. Even after its completion, the project has suffered a major setback due to flash flooding, making the project non-operational. Being an agriculture-based economy, Pakistan is likely to undertake numerous such initiatives in the future as well. Cholistan Canal is also in the offing as part of the Green Pakistan Initiative.



Therefore, it is imperative to take the right policy decisions in the future before the commencement of such major undertakings. The gist of a few policy implications from our study is as follows:

1. In order to keep the KCP financially feasible, the restoration work needs to be completed on a priority basis. There should be special emphasis to make it climate resilient to subsequent flash flooding by devising flood control and resilience strategies, for instance, the construction of protective structures, embankments, and floodwater diversion systems.
2. Before initiating any future project, the expected impact of climate change should be studied in detail, and suitable safeguards should be put in place to make the project climate resilient.
3. The KCP is a classic case of project mismanagement, as the project costs have increased considerably, and timelines for completion have been delayed by almost two decades. Although the reasons for these delays were not deliberated as they were out of the scope of the study objectives, there is a need to identify the root cause of these delays for future reference.
4. The raison d'être for the KCP was to reduce the backwardness of the area by improving socioeconomic indicators, which has yet to materialise. The GoB should undertake socioeconomic support programmes in the region, such as financial aid, subsidised inputs, and interest-free loans to encourage farmers and landowners to invest in tubewells and rehabilitate their lands.
5. Offer skill development programmes, training, and alternative livelihood options to attract farmers, reduce the outflow of farmers, and mitigate economic distress.
6. Upon completion of the project, land disputes between tribes are likely to emerge as a major challenge in the future, which may result in conflicts. Therefore, there is a need to address the issue of social and armed conflicts by promoting dialogue among stakeholders and involving law enforcement agencies and tribal leaders.



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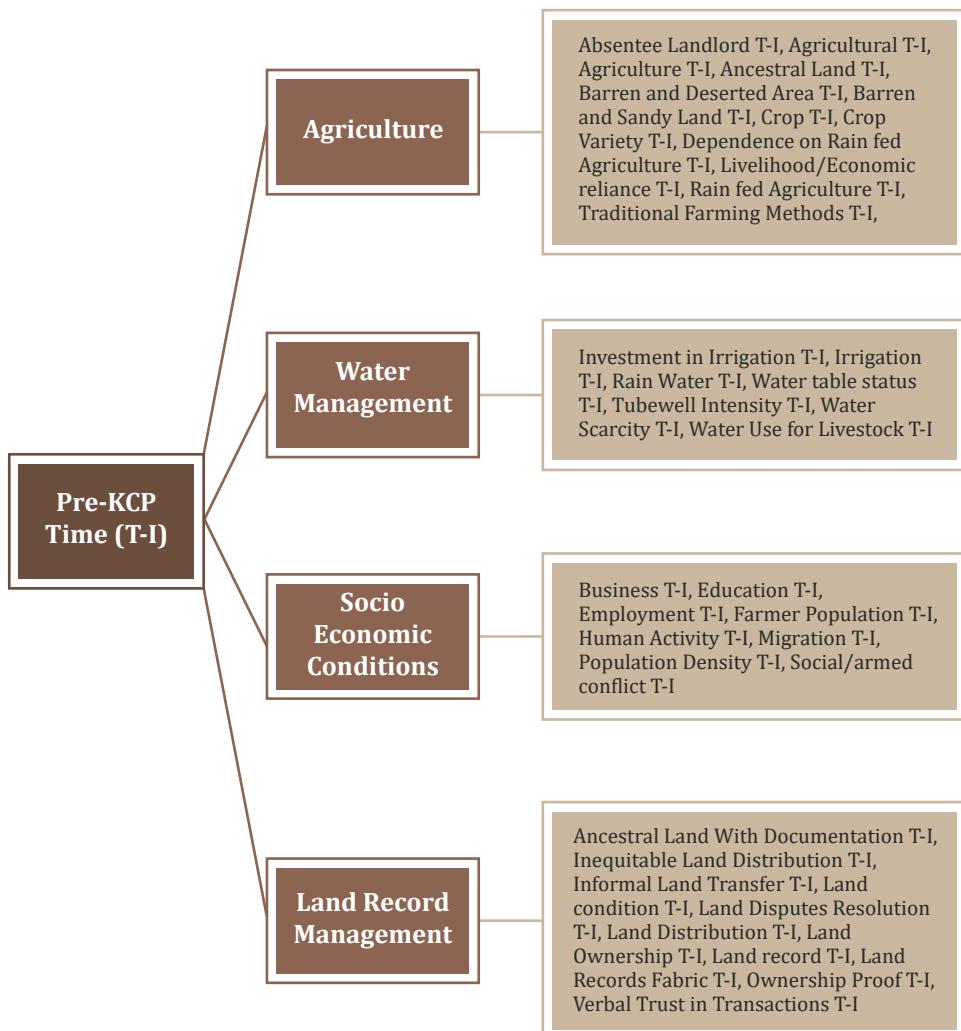


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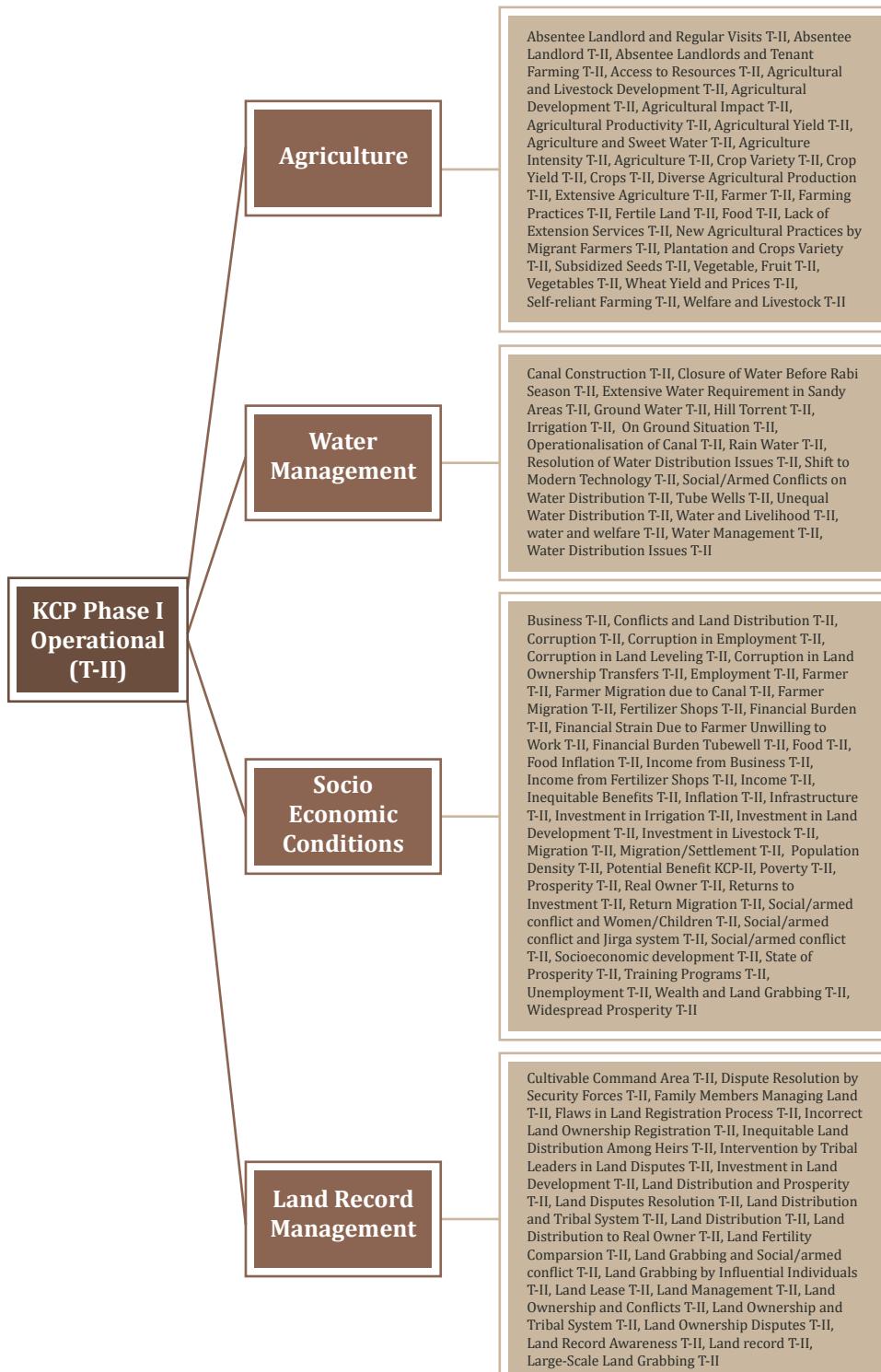
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APPENDICES

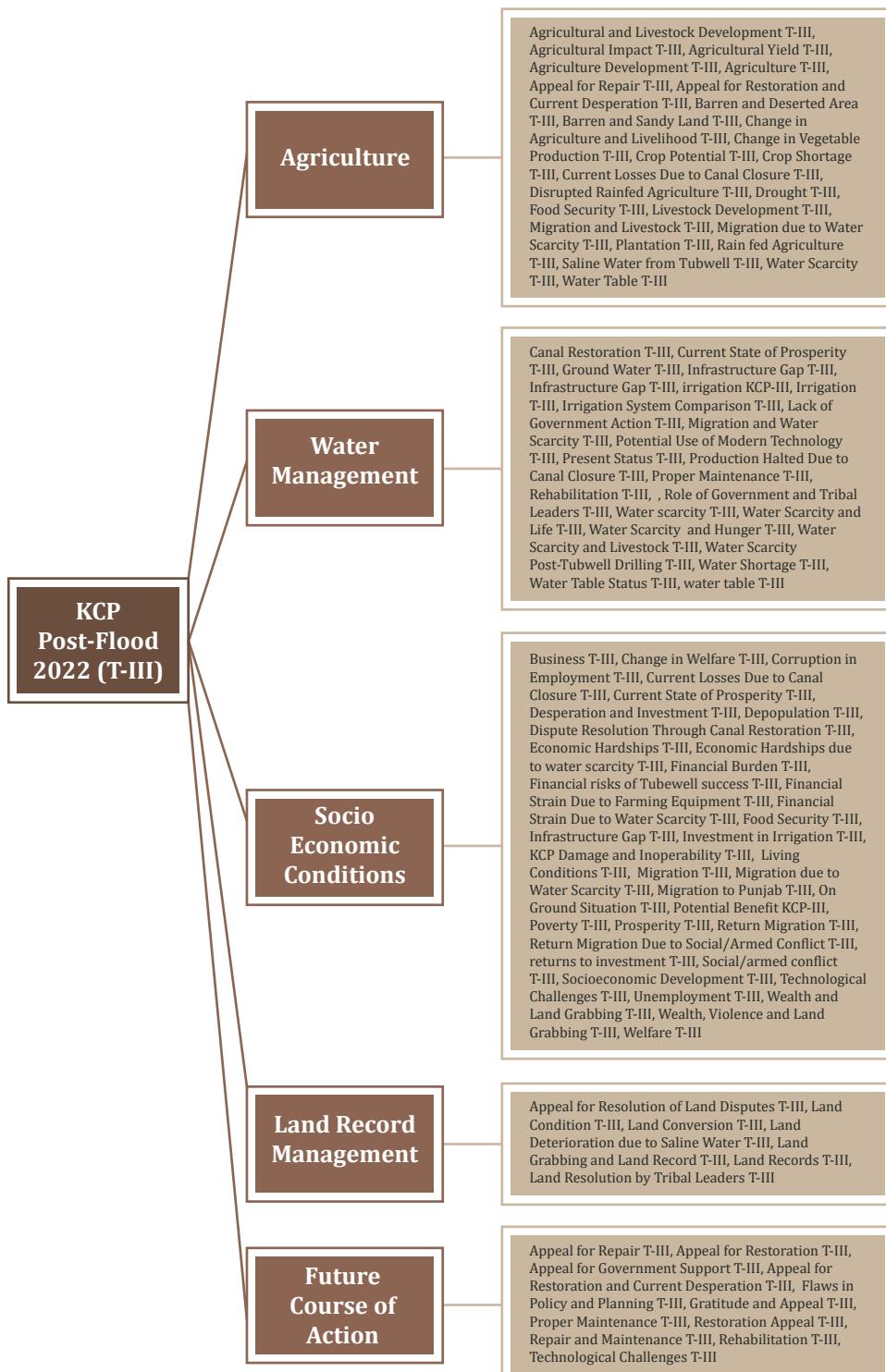
Appendix A: Thematic Map for Each Sub-Theme



Source: Authors' illustration.



Source: Authors' illustration.



Source: Authors' illustration.



Appendix B: Benefit-Cost Ratio, IRR and NPV Analysis

Agriculture Extension Department of Balochistan Estimates

Calculation of Economic Internal Rate of Return (PKR Million)

Years	Costs		Total Cost	Benefits	Net Benefits
	Production	Investment			
0	14.755	4,178.27	4,193.03	29.418	-4,163.61
1	63.578	91.4	154.98	151.263	-3.72
2	65.343	252.835	318.18	158.806	-159.37
3	171.547	109.68	281.23	400.553	119.33
4	331.401	265.06	596.46	733.39	136.93
5	1,330.15	137.1	1,467.25	3,228.95	1,761.70
6	2,160.67	274.2	2,434.87	5,475.12	3,040.26
7	2,787.68	162.61	2,950.29	6,989.18	4,038.90
8	3,582.02	83.293	3,665.31	8,909.86	5,244.55
9	4,719.31	141.67	4,860.98	11,798.19	6,937.21
10	5,385.47	-	5,385.47	13,320.30	7,934.84
11	5,385.47	-	5,385.47	13,320.30	7,934.84
12	5,385.47	-	5,385.47	13,320.30	7,934.84
13	5,385.47	-	5,385.47	13,320.30	7,934.84
14	5,385.47	-	5,385.47	13,320.30	7,934.84
15	5,385.47	-	5,385.47	13,320.30	7,934.84
16	5,385.47	-	5,385.47	13,320.30	7,934.84
17	5,385.47	-	5,385.47	13,320.30	7,934.84
18	5,385.47	-	5,385.47	13,320.30	7,934.84
19	5,385.47	-	5,385.47	13,320.30	7,934.84
20	5,385.47	-	5,385.47	13,320.30	7,934.84
Benefit-Cost Ratio					
	10%	2.01			
	12%	1.94			
	15%	1.81			
Net Present Value					
	10%	25,466.00	(PKR Million)		
	12%	19,513.16	(PKR Million)		
	15%	13,103.92	(PKR Million)		
Economic Internal Rate of Return					
	EIRR	33.65%			

Source: Authors' computations.



Calculation of Financial Internal Rate of Return (PKR Million)

Years	Costs		Total Cost	Benefits	Net Benefits
	Production	Investment			
0	14.755	4,570.88	4,585.64	29.418	-4,556.22
1	69.56	100	169.56	165.496	-4.064
2	75.128	276.625	351.753	182.562	-169.192
3	209.84	120	329.84	487.518	157.677
4	445.728	290	735.728	976.168	240.44
5	1,900.93	150	2,050.93	4,574.76	2,523.83
6	2,732.18	300	3,032.18	6,903.32	3,871.15
7	3,597.30	177.91	3,775.21	8,993.73	5,218.53
8	4,818.15	91.13	4,909.28	11,928.58	7,019.30
9	5,892.15	155	6,047.15	14,573.50	8,526.35
10	5,892.20	-	5,892.20	14,573.64	8,681.44
11	5,892.20	-	5,892.20	14,573.64	8,681.44
12	5,892.20	-	5,892.20	14,573.64	8,681.44
13	5,892.20	-	5,892.20	14,573.64	8,681.44
14	5,892.20	-	5,892.20	14,573.64	8,681.44
15	5,892.20	-	5,892.20	14,573.64	8,681.44
16	5,892.20	-	5,892.20	14,573.64	8,681.44
17	5,892.20	-	5,892.20	14,573.64	8,681.44
18	5,892.20	-	5,892.20	14,573.64	8,681.44
19	5,892.20	-	5,892.20	14,573.64	8,681.44
20	5,892.20	-	5,892.20	14,573.64	8,681.44
Benefit-Cost Ratio					
	at 10%	2.03			
	at 12%	1.96			
	at 15%	1.84			
Net Present Value					
	at 10%	29,833.70	(PKR Million)		
	at 12%	23,055.85	(PKR Million)		
	at 15%	15,719.85	(PKRMillion)		
Financial Internal Rate of Return					
	IRR	35.46%			

Source: Authors' computations.

**Scenario A: 25% of Rainfed***Calculation of Economic Internal Rate of Return (PKR Million)*

Years	Costs		Total Cost	Benefits	Net Benefits
	Production: 25% of Rainfed	Investment			
Without Project_Rainfed Agri Sys	14.755	4,178.27	4,193.03	29.418	-4,163.61
2015-16	63.578	91.4	154.98	151.263	-3.72
2016-17	65.343	252.835	318.18	158.806	-159.37
2017-18	171.547	109.68	281.23	400.553	119.33
2018-19	331.401	265.06	596.46	733.39	136.93
2019-20	1,330.15	137.1	1,467.25	3,228.95	1,761.70
2020-21	2,160.67	274.2	2,434.87	5,475.12	3,040.26
2021-22	2,787.68	162.61	2,950.29	6,989.18	4,038.90
2022-23	3.69	3,761.22	3,764.91	7.35	-3,757.56
2023-24	3.69	3,819.6	3,823.29	7.35	-3,815.93
2024-25	3.69	3,677.93	3,681.62	7.35	-3,674.26
2025-26	2,787.68		2,787.68	6,989.18	4,201.51
2026-27	2,787.68		2,787.68	6,989.18	4,201.51
2027-28	2,787.68		2,787.68	6,989.18	4,201.51
2028-29	2,787.68		2,787.68	6,989.18	4,201.51
2029-30	2,787.68		2,787.68	6,989.18	4,201.51
2030-31	2,787.68		2,787.68	6,989.18	4,201.51
2031-32	2,787.68		2,787.68	6,989.18	4,201.51
2032-33	2,787.68		2,787.68	6,989.18	4,201.51
2033-34	2,787.68		2,787.68	6,989.18	4,201.51
2034-35	2,787.68		2,787.68	6,989.18	4,201.51
Benefit-Cost Ratio					
	10%	1.29			
	12%	1.22			
	15%	1.11			
Net Present Value					
	10%	5,393.28	(PKR Million)		
	12%	3,403.28	(PKR Million)		
	15%	1,364.32	(PKR Million)		
Economic Internal Rate of Return					
	EIRR	18.18%			

Source: Authors' computations.



Calculation of Financial Internal Rate of Return (PKR Million)

Years	Costs		Total Cost	Benefits	Net Benefits
	Production: 25% of Rainfed	Investment			
Without Project_Rainfed Agri Sys	14.755	4,570.88	4,585.64	29.418	-4,556.22
2015-16	69.56	100	169.56	165.496	-4.06
2016-17	75.128	276.625	351.75	182.562	-169.19
2017-18	209.84	120	329.84	487.518	157.68
2018-19	445.728	290	735.73	976.168	240.44
2019-20	1,900.93	150	2,050.93	4,574.76	2,523.83
2020-21	2,732.18	300	3,032.18	6,903.32	3,871.15
2021-22	3,597.30	177.91	3,775.21	8,993.73	5,218.53
2022-23	3.69	4115.13	4,118.82	7.35	-4,111.46
2023-24	3.69	4179	4,182.69	7.35	-4,175.33
2024-25	3.69	4024	4,027.69	7.35	-4,020.33
2025-26	3,597.30		3,597.30	14,573.64	10,976.34
2026-27	3,597.30		3,597.30	14,573.64	10,976.34
2027-28	3,597.30		3,597.30	14,573.64	10,976.34
2028-29	3,597.30		3,597.30	14,573.64	10,976.34
2029-30	3,597.30		3,597.30	14,573.64	10,976.34
2030-31	3,597.30		3,597.30	14,573.64	10,976.34
2031-32	3,597.30		3,597.30	14,573.64	10,976.34
2032-33	3,597.30		3,597.30	14,573.64	10,976.34
2033-34	3,597.30		3,597.30	14,573.64	10,976.34
2034-35	3,597.30		3,597.30	14,573.64	10,976.34
Benefit-Cost Ratio					
	at 10%		1.93		
	at 12%		1.80		
	at 15%		1.61		
Net Present Value					
	at 10%		20,706.61	(PKR Million)	
	at 12%		15,028.54	(PKR Million)	
	at 15%		9,161.60	(PKR Million)	
Financial Internal Rate of Return					
	IRR		27.24%		

Source: Authors' computations.

**Scenario B: If repairs start in 2024-25***Calculation of Economic Internal Rate of Return (PKR Million)*

Years	Costs		Total Cost	Benefits	Net Benefits
	Production: 25% of Rainfed	Investment			
Without Project_Rainfed Agri Sys	14.755	4,178.27	4,193.03	29.418	-4,163.61
2015-16	63.578	91.4	154.98	151.263	-3.72
2016-17	65.343	252.835	318.18	158.806	-159.37
2017-18	171.547	109.68	281.23	400.553	119.33
2018-19	331.401	265.06	596.46	733.39	136.93
2019-20	1,330.15	137.1	1,467.25	3,228.95	1,761.70
2020-21	2,160.67	274.2	2,434.87	5,475.12	3,040.26
2021-22	2,787.68	162.61	2,950.29	6,989.18	4,038.90
2022-23	3.69	83.293	86.98	7.35	-79.63
2023-24	3.69	141.67	145.36	7.35	-138.00
2024-25	3.69	3677.93	3,681.62	7.35	-3,674.26
2025-26	3.69	3677.93	3,681.62	7.35	-3,674.26
2026-27	3.69	3677.93	3,681.62	7.35	-3,674.26
2027-28	2,787.68		2,787.68	6,989.18	4,201.51
2028-29	2,787.68		2,787.68	6,989.18	4,201.51
2029-30	2,787.68		2,787.68	6,989.18	4,201.51
2030-31	2,787.68		2,787.68	6,989.18	4,201.51
2031-32	2,787.68		2,787.68	6,989.18	4,201.51
2032-33	2,787.68		2,787.68	6,989.18	4,201.51
2033-34	2,787.68		2,787.68	6,989.18	4,201.51
2034-35	2,787.68		2,787.68	6,989.18	4,201.51
Benefit-Cost Ratio					
	10%		1.22		
	12%		1.15		
	15%		1.05		
Net Present Value					
	10%		3,580.29	(PKR Million)	
	12%		2,087.34	(PKR Million)	
	15%		566.88	(PKR Million)	
Economic Internal Rate of Return					
	EIRR		16.59%		

Source: Authors' computations.



Calculation of Financial Internal Rate of Return (PKR Million)

Years	Costs		Total Cost	Benefits	Net Benefits
	Production: 25% of Rainfed	Investment			
Without Project Rainfed Agri Sys	14.755	4,570.88	4,585.64	29.418	-4,556.22
2015-16	69.56	100	169.56	165.496	-4.06
2016-17	75.128	276.625	351.75	182.562	-169.19
2017-18	209.84	120	329.84	487.518	157.68
2018-19	445.728	290	735.73	976.168	240.44
2019-20	1,900.93	150	2,050.93	4,574.76	2,523.83
2020-21	2,732.18	300	3,032.18	6,903.32	3,871.15
2021-22	3,597.30	177.91	3,775.21	8,993.73	5,218.53
2022-23	3.69	4115.13	4,118.82	7.35	-4,111.46
2023-24	3.69	4179	4,182.69	7.35	-4,175.33
2024-25	3.69	4024	4,027.69	7.35	-4,020.33
2025-26	3.69	4024	4,027.69	7.35	-4,020.33
2026-27	3.69	4024	4,027.69	7.35	-4,020.33
2027-28	3,597.30		3,597.30	14,573.64	10,976.34
2028-29	3,597.30		3,597.30	14,573.64	10,976.34
2029-30	3,597.30		3,597.30	14,573.64	10,976.34
2030-31	3,597.30		3,597.30	14,573.64	10,976.34
2031-32	3,597.30		3,597.30	14,573.64	10,976.34
2032-33	3,597.30		3,597.30	14,573.64	10,976.34
2033-34	3,597.30		3,597.30	14,573.64	10,976.34
2034-35	3,597.30		3,597.30	14,573.64	10,976.34
Benefit-Cost Ratio					
	at 10%	1.51			
	at 12%	1.41			
	at 15%	1.26			
Net Present Value					
	at 10%	11,584.20	(PKR Million)		
	at 12%	7,742.42	(PKR Million)		
	at 15%	3,921.23	(PKR Million)		
Financial Internal Rate of Return					
	FIRR	21.25%			

Source: Authors' computations.



REDEFINING URBAN SPACES: HARNESSING THE POTENTIAL OF PUBLIC-PRIVATE PARTNERSHIP FOR SUSTAINABLE CITY REGENERATION

Shoaib Khalid¹, Fariha Zameer², and Muhammad Irfan Gill³

ABSTRACT

This study aimed to develop an urban redevelopment plan for Faisalabad City by utilising underutilised state-owned lands. It focused on identifying the most suitable parcels, taking into account the perspectives of key stakeholders, and exploring opportunities for public-private partnerships. Urban areas in Pakistan are expanding horizontally at a fast pace, with fertile farmlands on city fringes being converted into low-rise built-up areas. Conversely, large tracts of valuable state-owned lands within city cores remain underutilised, restricting crucial economic activities. Urban redevelopment is essential to harness the economic and social value of these lands. Data on state-owned land parcels in Faisalabad City were collected from various organisations and government departments, documenting the ownership status, land use, land cover, economic status, and area of each parcel. Prices from recently sold commercial properties were used to determine the commercial values of these parcels. Additionally, Euclidean distances from the city centre were calculated for each parcel. A priority score was then assigned to each parcel based on seven attributes, which helped identify the most suitable parcels for urban regeneration. The analysis revealed that the underutilised state-owned land parcels closest to the city centre were the best candidates for regeneration efforts. A moderate negative correlation (-0.715) between distance from the city centre and property prices underscored the importance of proximity in regeneration planning. Stakeholder feedback on

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the redevelopment of three selected state-owned parcels indicated strong public support for sustainability, mixed-use development, and high-rise buildings. The public was optimistic about economic growth and investment, emphasising the need for improved public spaces, transportation, and cultural preservation. Builders and developers viewed mixed-use projects as the most profitable, though they anticipated challenges such as land acquisition and regulatory hurdles, with most expecting the project timeline to exceed five years. There was widespread support for high-rise buildings, with priority given to aesthetic appeal, connectivity, and sustainability. Public-private partnerships (PPPs) were favoured, with incentives like tax breaks and land leasing seen as attractive, though legal risks remained a concern. Government officials supported the redevelopment but stressed the need for transparency, regulatory reforms, and improved infrastructure to ensure long-term success. All three sites show positive NPVs, indicating financial feasibility. However, the railway land site appears to be the most promising in terms of profitability with a strong revenue-to-cost ratio, followed by the GOR site, which also offers a solid return on investment. The PCBL Land site, while smaller in scale, still shows a favourable cost-benefit ratio and can be considered a viable investment, especially if there are capital constraints or if a smaller-scale project is preferable. Key risks across all sites include inflation, market fluctuations, and potential delays, which should be carefully managed to ensure the success of these redevelopment projects. For the redevelopment of the selected sites, we propose adopting a PPP approach that may combine a joint venture (JV) model for planning and governance with a design-build-finance-operate (DBFO) approach for construction and long-term management. This hybrid model aligns with the preferences of stakeholders, ensuring efficient execution, risk-sharing, and balanced public-private involvement. The focus should be on mixed-use developments, public amenities, and environmental sustainability while addressing challenges like inter-agency coordination and funding.



1. INTRODUCTION

More than 70% of Pakistan's population lives in densely populated areas that must be counted as urban. Most of the city managers are inexperienced and not trained enough to run the urban areas. Moreover, there is no public participation in city management. While urban planners dream of garden city designs, more and more agricultural land is being converted to low-rise residential buildings and colonies. On the other hand, large tracts of precious land in city cores are locked up unnecessarily in unproductive uses that provide little space for economic activity, which is the basic function of a city. Lahore portrays the classical example where only 5% of the urban land is available for commercial activity, while 54% is occupied by single-family residential properties (Ali, 2002; Haque, 2015; Salman & Haque, 2016). Several public properties, such as the Government Officers Residences (GORs), Railway lands, and properties held by the evacuee trust and the Auqaf Department, etc., are lying idle or are not being utilised to their full potential in terms of commercial usage. The sprawling Governor's House, Lahore, which occupies the most expensive 100 acres of land in the city, for example, serves merely as the residence of the Governor of Punjab. The public sector owns urban properties worth trillions of rupees in the entire Pakistan, without being utilised properly. Consequently, the precious land is being wasted in the form of locked-up capital since it cannot be used for wealth generation (Malik 2013; Mehmoond 2021).

Urban redevelopment is crucial due to the economic and social value of urban land. The transformation of brownfield areas is vital for economic growth, and governments worldwide are adopting frameworks to manage these sites effectively. Urban transformation ensures the wise use of government resources and addresses the increasing value of land due to rapid urbanisation (Sun et al., 2022). Although the concept of urban redevelopment has been realised in Pakistan and the work has started in the form of the Lahore CBD project, the authorities are still focusing on the easy targets and looking for large tracts of vacant lands only, neglecting the smaller dead parcels in and around the city cores as well as the patches occupied by influential departments and persons. Therefore, a multi-pronged approach is needed to detect the dead urban parcels in the big cities of Pakistan, assess their commercial economic value, and redevelop the maximum of these high-value but dead parcels (Nadeem et al. 2021).

Enhancing urban vitality and productivity involves the judicious use of land through intensive construction, coupled with the strategic repurposing of abandoned and underutilised land resources (Li et al. 2022). Blending public and private components can establish an effective and sustainable redevelopment strategy. By combining public ownership, private management, and financing to efficiently leverage public assets, a model inspired by organisations like the Copenhagen City & Port Development Corporation can address concerns about inefficiencies in public entities and profit accumulation in the private sector. This approach focuses on maximising yield while avoiding political interference, creating a balanced and resilient redevelopment framework (Noring, 2019). Leveraging underutilised government land for high-rise mixed-use building projects through public-private partnerships (PPPs) can not only meet the housing needs but also the commercial requirements, stimulating economic growth in the big cities of Pakistan. Promoting green building practices, as this study proposes, aligns with worldwide sustainability trends, attracting environmentally conscious investors and residents.

Faisalabad is experiencing rapid population growth and urbanisation driven by its industrial prominence. The city's attraction for migrants seeking livelihoods is enhanced by its reputation for a better quality of life, positioning it among the top districts in the Punjab Province (GOP, 2019; Haq et al., 2010). The urban footprint has increased from 84 square kilometers in 1995 to 183 square kilometers by 2015, with a projected growth of 270 square kilometers by 2025 (Javed et al., 2018). (Haq et al., 2010; GOP, 2019). The urban footprint has increased from 84 sq. km to 183 sq km between 1995 and 2015, with a projected growth of 270 sq. km by 2025. (The Urban Unit, 2018). The city's rapid horizontal expansion, sprawling across once-fertile land designated for crop farming, is a conspicuous manifestation of urban sprawl. This phenomenon exhibits both linear and clustered patterns, with the northeastern sector being particularly impacted by this extensive urban growth. The deficiency in government-led construction and housing initiatives has given rise to a proliferation of private housing colonies, often disregarding the city master plan. This uncontrolled urbanisation has created myriad challenges.

The repercussions of rapid population growth, the swift pace of urbanisation, the sprawling expansion, an acute shortage of housing units, and the dilemma of the urban poor are among the major issues of the city. Faisalabad is facing a substantial disparity between the supply and demand for housing, resulting in a critical shortage of available units. To address these pressing issues, there is an urgent need for a focused approach to implementing effective housing



initiatives and policies. These policies should address the existing housing backlog while simultaneously enhancing the overall supply of housing units in the city (Javed & Qureshi, 2019; Mazhar & Jamal, 2009; Planning & Development Board, Punjab 2016). (Javed & Qureshi, 2019; Mazhar & Jamal, 2009; Planning & Development Board, Punjab, 2016).

Faisalabad is the third most significant contributor to Pakistan's national gross domestic product (GDP), trailing only Karachi and Lahore. At the heart of this city's economic prowess is the textile industry, a major player in generating foreign exchange and a pivotal force driving Faisalabad's economy. This thriving sector positions Faisalabad among the foremost export-oriented industrial hubs and foreign exchange earners in Pakistan. The city's economic landscape is characterised by a substantial concentration of employment in wholesale trade, closely followed by retail, hospitality, and manufacturing sectors (Javed & Qureshi, 2019; Rasool et al., 2017). In 2019, a member of the District Planning and Design Committee identified at least 15 pieces of state land within Faisalabad city. These large parcels have remained vacant for decades, providing no benefit to the national exchequer. However, they present a valuable opportunity for the establishment of various building projects (Mubarak, 2019). The city's economic landscape is characterised by a substantial concentration of employment in wholesale trade, closely followed by retail, hospitality, and manufacturing sectors (Javed & Qureshi, 2019; Rasool et al., 2017). In 2019, a member of the District Planning and Design Committee identified at least 15 pieces of state land within Faisalabad city. These large parcels have remained vacant for decades, providing no benefit to the national exchequer. However, they present a valuable opportunity for the establishment of various building projects (Mubarak, 2019).

The general objective of this study is to propose an urban redevelopment plan for Faisalabad. The specific objectives are:

- To identify and estimate the commercial value of the urban dead capital owned by various government departments.
- To evaluate the economic feasibility of redeveloping the city parcels through public-private partnership initiatives.
- To recommend policy proposals essential for the implementation of the redevelopment plan proposed in this study.

2. LITERATURE REVIEW

Cities act as engines that pull the whole freight train of economic growth (Inman & Swanson, 2007). Above 80% of the world's GDP is generated in cities. Cities have a more significant role in the Global South than in the Global North (Zhang, 2012). In Pakistan, for example, the city of Karachi alone produces one-fifth of the national GDP (Hasan et al., 2022). National economic development depends on economic growth in cities, which are the pivots of innovation and entrepreneurship. Thus, a country can only achieve sustainable economic growth by making its urban centres more dynamic (Zhang, 2016).

The land is a limited resource, and its allocation to competing uses needs to be judicious (Smit & Rodd, 1982). Land resources in urban space should be used efficiently to not only improve the city's productivity but also to avoid unnecessary transformation of fertile farmland into built-up areas on the peripheries. Due to urban sprawl, dead edges emerge in the urban landscape, which hampers the activity and efficiency of the urban environment. These impediments can be transformed into active and resilient patches of the cityscape through some regenerative strategies such as adaptive reuses, mixed-use redevelopments, pedestrianisation, biophilic designs, and the development of hybrid working spaces (Leete, 2022; Murray, 2008). Urban land utilisation through intensive construction and optimised reuse of abandoned and underutilised land resources can make a city more vibrant and prolific (Li et al., 2022).

Redevelopment of dead urban parcels is so complex and expensive that state financing and managerial planning seem to fail to achieve the goal, especially in a developing country. Therefore, public participation and the inclusion of finance from the private sector are inevitable (Nallathiga, 2017; O'Flaherty, 1994; Wilson, 1963; Zukin, 2018). Leasing urban land to private investors and developers is a proven land monetisation approach to deal with this issue.

Several examples of PPPs in the redevelopment of dead urban parcels can be found. One such example is that of the Xintiandi project in Shanghai, China, which shows the working of property-led urban redevelopment for monetising and maximising the urban land value through the transformation of land-use functions. The local government engaged the private developers in a pro-growth coalition where the capital was provided by the private sector, and the government regulated the pace of redevelopment through policy intervention, land leasing governance, and financial leverage (He & Wu, 2005). Cities act as engines that pull the whole freight train of economic growth



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Another example may be Addis Ababa, the capital of Ethiopia, where the urban land leasing policy was adopted in 1991 to relocate the low-income population from the downtown slums to the low-cost high-rise residential

buildings at the city peripheries. The evacuated spaces in the city centre were turned into high-performing skyscrapers (Weldegebriel et al., 2022). (Weldegebriel et al. 2022).

Pakistan's first mega project of urban redevelopment has been launched in Lahore by the Government of Punjab with the setting up of the Lahore Central Business District Development Authority (LCBDDA) and leasing 295 acres of the Walton Airport's underutilised land to LCBDDA for 99 years. Skyscrapers are expected to be constructed, providing 0.5 million jobs and a revenue of more than PKR 2 trillion under this project. The project is divided into two phases. The work on the first phase has started and is expected to be completed within five years. So far, 12 commercial plots have been auctioned for PKR 56 billion, where 70-storeyed and higher buildings will be constructed. The LCBDDA has been renamed as the Punjab Central Business District Development Authority (PCBDDA) and entrusted to plan and develop CBD projects in other big cities of the province (Rasheed, 2021; Talib, 2022). The LCBDDA has been renamed as the Punjab Central Business District Development Authority (PCBDDA) and entrusted to plan and develop CBD projects in other big cities of the province (Rasheed, 2021; Talib, 2022).

Vertical urban development is the need of the hour for economic and environmental urban sustainability, especially in densely populated and agrarian countries. Though the construction of tall buildings is cost-intensive, these buildings are essential to reduce automobile dependency, save energy, diminish the carbon footprint, and conserve precious farmland. Although due consideration must be given to the social problems associated with tall residential buildings, such development should not be overly criticised so that it may mask the potential benefits as they adapt to the prevailing environmental and economic challenges (Al-Kodmany, 2012, 2018; M. M. Ali & Al-Kodmany, 2012; Gonçalves & Umakoshi, 2010).

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Exclusive features of a PPP, outlining the degree of involvement of both public and private partners, can significantly influence the nature of financial evaluations. Addressing these nuances requires a robust and equitable assessment model (Ke et al., 2008).. (Wang et al., 2008). The application of discounted cash flow (DCF) analysis in assessing the financial viability of construction projects under PPPs is well-supported by an expanding body of literature, highlighting its efficacy in guiding both the public sector decision-makers as well as private investors. Rigorous financial analysis is imperative for the successful implementation and sustainable outcomes of a project. DCF analysis provides a comprehensive framework for estimating future cash flows, incorporating project costs, revenues, and financing structures. Consequently, it offers a holistic perspective on financial performance (Beatrice, 2014).(Anamari-Beatrice, 2014). Moreover, uncertainties in cash flow projections pose a substantial threat to the overall financial viability of a project. Therefore, risk factors must be precisely accounted for in DCF assessments (Liang & Hu, 2017).

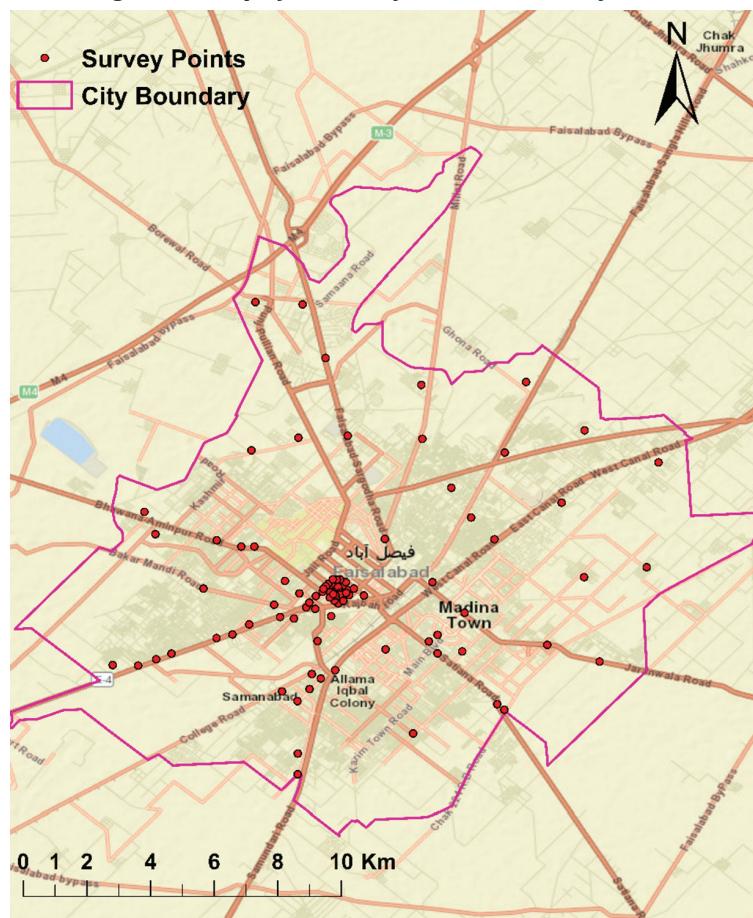
3. RESEARCH METHODOLOGY

Data

We collected data on state land parcels in Faisalabad City from multiple organisations and government departments, including the Revenue Department, Faisalabad Development Authority (FDA), Metropolitan Corporation, the Urban Unit, and the Punjab Land Record Authority. After analysing the data, 10,171 land parcels were identified, each with defined ownership status, land use status, land cover, land type (economic status), and area of parcels (measured in marlas). Prices from 93 recently sold commercial properties across various parts of the city were also documented.

To understand the complexities and potential of this initiative, a diverse range of stakeholders was engaged, including government officials, local communities, and industry professionals. Through this process, we gathered valuable insights into the opportunities, challenges, and strategic considerations that could guide the successful redevelopment of these state-owned assets.

Figure 1: Map of the Study Area and Survey Sites

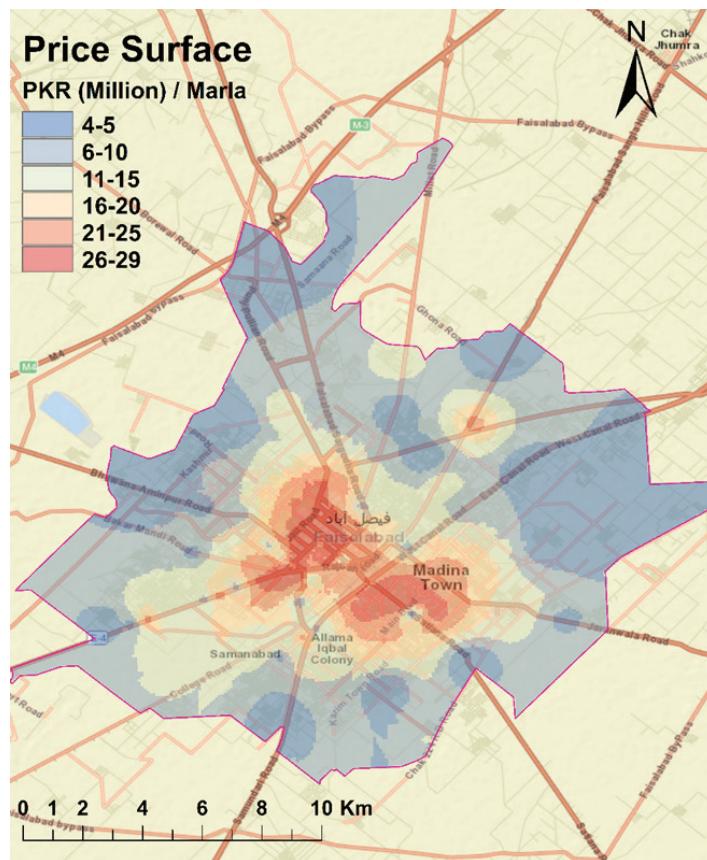


Source: Authors' illustration.

Processing and Analysis

Suitable Sites Identification and Valuation: We utilised ArcGIS to calculate the Euclidean distance of these parcels from the Clock Tower. This spatial analysis method computes straight-line distances, providing insights into the geographic proximity of each parcel to the central landmark. We determined the commercial value per marla (in Pakistani Rupees) by surveying the property agents in the city to record commercial property prices per marla and documented prices from 93 recently sold commercial properties across various parts of the city. The following figure maps the survey points in the city.

Figure 2: Map of the Commercial Land Values in the Study Area



Source: Authors' illustration.

A raster price surface was generated using these georeferenced commercial property points as input, using inverse distance weighted (IDW) interpolation. The resulting price surface was then used to assess the commercial value of the 10,171 state-owned parcels. Each of the state-owned land parcels was assigned priority scores based on seven attributes. These scores act as weights to compute an aggregate priority score for each parcel that can be used to identify the best-fit parcels for urban regeneration planning in the city.

Stakeholder Insights on Redevelopment: We conducted both qualitative and quantitative analyses of the stakeholder insights on redevelopment.

4. IDENTIFICATION OF SUITABLE SITES

The results reveal a significant concentration of land ownership by the provincial government, with diverse land uses and economic potential. Key areas for urban regeneration included underutilised fallow land parcels, especially those near the city centre with mid-range commercial values. To prioritise parcels, seven attributes, such as ownership status, land use, land cover, economic status, area, distance to the city centre, and commercial value, were assessed. Local entity-owned parcels scored highest, while national organisations' parcels scored lower. The moderate negative correlation of -0.715 between distance from the city centre and property price per marla underscores the importance of proximity in land value and regeneration planning. The following three sections discuss the findings of this study in detail.

Description of the Attribute Characteristics

This section provides a detailed description of seven key attributes of government-owned land parcels in Faisalabad.

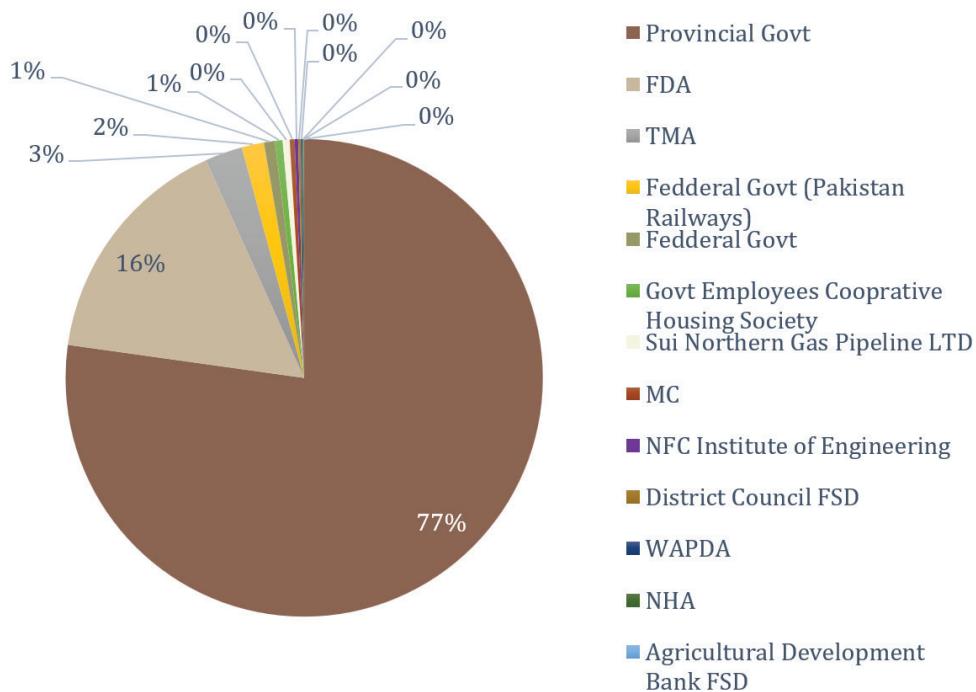
Land Ownership Distribution: The land ownership distribution of the government-owned parcels shows a significant concentration under the provincial government, which holds 7,853 parcels. The FDA follows with 1,630 parcels, indicating a substantial amount of land under their jurisdiction. The Tehsil Municipal Administration (TMA) owns 260 parcels, and the federal government (including Pakistan Railways (PR)) owns 228 parcels. Other notable landowners include the Government Employees Cooperative Housing Society with 53 parcels, Sui Northern Gas Pipeline Limited with 48 parcels, and the MC with 34 parcels. The NFC Institute of Engineering and the District Council of Faisalabad hold 24 and 17 parcels, respectively. Additionally, WAPDA owns 13 parcels, the National Highway Authority (NHA) owns 9 parcels, and both the Agricultural Development Bank of Faisalabad and the Bank of Punjab own 1 parcel each.

Table 1: Land Parcels Held by Various Government Organisations

Land Ownership	No. of Land Parcels	Land Area (in Acres)	Per Cent
Provincial government	7,853	8,393.77	71.81
FDA	1,630	1,649.68	14.90
TMA	260	250.04	2.38
Federal government (Pakistan Railways)	153	107.12	1.40
Federal government	75	75.90	0.69
Employees Cooperative Housing Society	53	57.76	0.48
Sui Northern Gas Pipeline Ltd.	48	28.97	0.44
Municipal Corporation	34	30.62	0.31
NFC Institute of Engineering	24	24.47	0.22
District Council Faisalabad	17	17.78	0.16
WAPDA	13	13.56	0.12
NHA	9	4.69	0.08
Agricultural Development Bank	1	1.07	0.01
Bank of the Punjab	1	1.11	0.01

Source: Authors' calculations.

Figure 3: Per Cent Share of Land Parcels Held by Government Departments



Source: Authors' calculations.



Land Use Status: The land use status of government-owned parcels indicates a wide variety of uses. The majority of land parcels, i.e., 5,596, are occupied by public housing without formal allotment. Agricultural land makes up the next largest category with 1,559 parcels. A significant number of parcels, 958, are reserved for roads. There are 916 unused land parcels, which represent an opportunity for future development. Parcels occupied by shops and godowns without allotment total 498, while 173 parcels have been allotted to the public (for various purposes), NGOs, and religious institutions like mosques. Government buildings occupy 154 parcels, while 112 parcels are reserved for various community-centric purposes such as community centres, green belts, parks, public buildings, schools, and solid waste sites. Multiple government departments, including Auqaf, audit, fire brigade, irrigation, NHA, PWD, revenue, and SNGPL, occupy 80 parcels collectively. Government servant housing occupies 38 parcels, while the NFC Institute of Engineering occupies 24 parcels. Industry, bus stands, restaurants, and CNG stations without formal allotment occupy 19 parcels. There are also 13 electricity grid stations and another 13 parcels with unconfirmed status. Graveyards occupy 12 parcels, and disposal works, MC schools, and workshops each occupy 2 parcels.

Table 2: Use of the Government-Owned Land in the Study Area

Land Use	Parcel Count	Per Cent
Occupied by public housing (without allotment)	5,596	50.92
Agricultural land	1,559	14.18
Reserved for roads	958	8.72
Unused land	916	8.33
Occupied by shops and/or godowns (without allotment)	498	4.53
Allotted to the public, NGOs, FCC, and/or mosques	173	1.57
Government Buildings	154	1.40
Reserved for community centres, green belts, mosques, parks, public buildings, schools, and/or solid waste	112	1.02
Occupied by Auqaf, audit, fire brigade, irrigation, NHA, PWD, Revenue, and/or SNGPL	80	0.73
Government servant housing	38	0.35
NFC Institute of Engineering	24	0.22
Occupied by industry, bus stands, restaurants, and/or CNG Stations (without allotment)	19	0.17
Electricity grid station	13	0.12
Status not confirmed	13	0.12



Land Use	Parcel Count	Per Cent
Graveyard	12	0.11
Disposal works	2	0.02
MC schools	2	0.02
Workshop	2	0.02

Source: Authors' calculations.

Land Cover: The following distribution provides insights into the current land use/land cover patterns of state lands in the city and highlights potential areas of focus for urban regeneration efforts. The data reveals a predominant presence of built-up areas, accounting for a significant portion of the total with 7,420 parcels. Agricultural land constitutes the second-largest category, with 1,587 parcels, indicating the presence of significant agricultural activity within the city. Open land, comprising 1,131 parcels, highlights areas that are potentially available for future development. The 'Other' category, with 13 parcels, includes various miscellaneous land uses that do not fit into the primary categories. The presence of 12 graveyard parcels underscores the allocation of land for burial purposes. There were also 8 parcels with a partially built-up status.

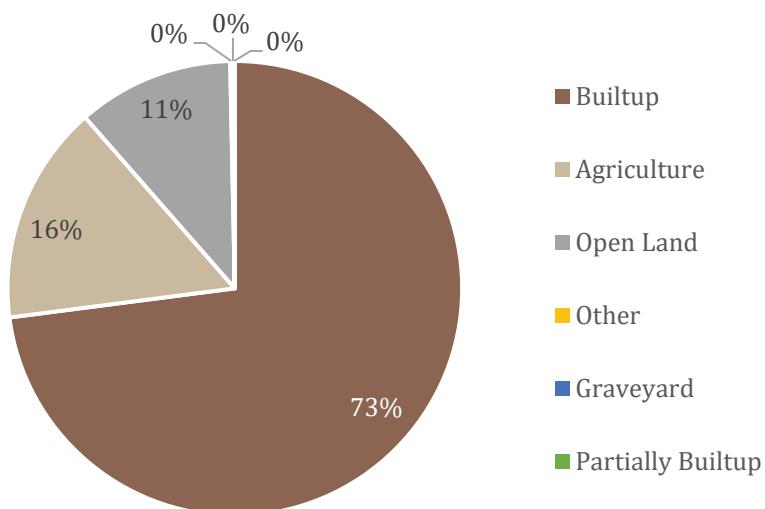
Table 3: Land Cover of the Government-Owned Land in the Study Area

Land Cover	Land Parcels Count	Land Area (Acres)	Per Cent
Built-up	7,420	7,727.87	72.92
Agriculture	1,587	1,716.51	15.61
Open land	1,131	1,175.13	11.12
Other	13	11.78	0.13
Graveyard	12	11.57	0.12
Partially built-up	8	13.69	0.08

Source: Authors' calculations.



Figure 4: Land Cover of the Public Lands in the Study Area



Source: Authors' calculations.

Commercial Utilisation of Public Lands: The classification of the land parcels based on the width of the facing road consists of three categories, namely, parcels facing roads wider than 60 feet are considered commercial, those facing roads between 40 to 60 feet wide are classified as semi-commercial, and parcels facing roads less than 40 feet wide are categorised as non-commercial. This categorisation indicates that, with 7,307 parcels, the majority of the land parcels fall into the semi-commercial category. There are 2,847 commercial parcels are 2,847, while non-commercial parcels are the least common, with only 17 parcels. This distribution underscores that most of the state land has high economic importance, being predominantly commercial or semi-commercial.

Table 4: Land Type of Government-Owned Parcels in the Study Area

Land Utilisation	Parcel Count	Area (Acres)	Per Cent
Semi-commercial	7,307	7,377.03	71.84
Commercial	2,847	3,270.36	27.99
Non-commercial	17	9.15	0.17
Total	10,171	10,171	10,171

Source: Authors' calculations.



Distribution of Public Lands According to Area: The section provides an insightful snapshot of how land parcels are distributed across different sizes. With a total of 10,171 parcels and a combined land area of 1.71 million marlas (or 10,655 acres), it is clear that the majority of the land is concentrated in specific ranges, which tells us a great deal about land use and availability. Starting with the smallest land parcels, those ranging from 0-20 marlas, there are 310 of these small plots, which make up about 3% of the total land area. These parcels are likely used for small residential homes or tiny commercial ventures. While they make up a small percentage of the total land, they are crucial for providing space for more modest needs. Table 5 shows the distribution of these public lands in terms of area in the study area.

The analysis of the land parcel areas reveals that a significant concentration of parcels is in specific size categories. Notably, a majority of the parcels fall within the 160-200 marla category, accounting for 70.9% of the total. Smaller parcels, such as those in the 1-20 marla and 20-60 marla categories, constitute 2.34% and 4.8% of the total, respectively. Parcels sized between 60-100 marlas are relatively more common, making up 9.91% of the total. As the parcel size increases beyond 200 marlas, the number of parcels decreases significantly. For example, the 201-220 marla category represents only 0.65% of the total, and the 241-260 marla category drops to 0.28%. This trend continues, with very few parcels in the larger-sized categories, reflecting less frequent occurrences of large land parcels. For parcels sized from 601 to 1000 marlas, a 100-marla interval was used. This interval adjustment was necessary due to fewer parcels falling within these larger size ranges and a noticeable shift in parcel sizes. The 1000-2000 marla category, comprising 0.25% of the total, and the 2001-4000 marla category, with 0.10%, were grouped with larger intervals to account for the sparse distribution and abrupt changes in parcel sizes in these ranges. The final category, 4001-4967 marla, represents 0.09%, indicating a very small number of extremely large parcels.

Table 5: Distribution of Public Lands in terms of Area

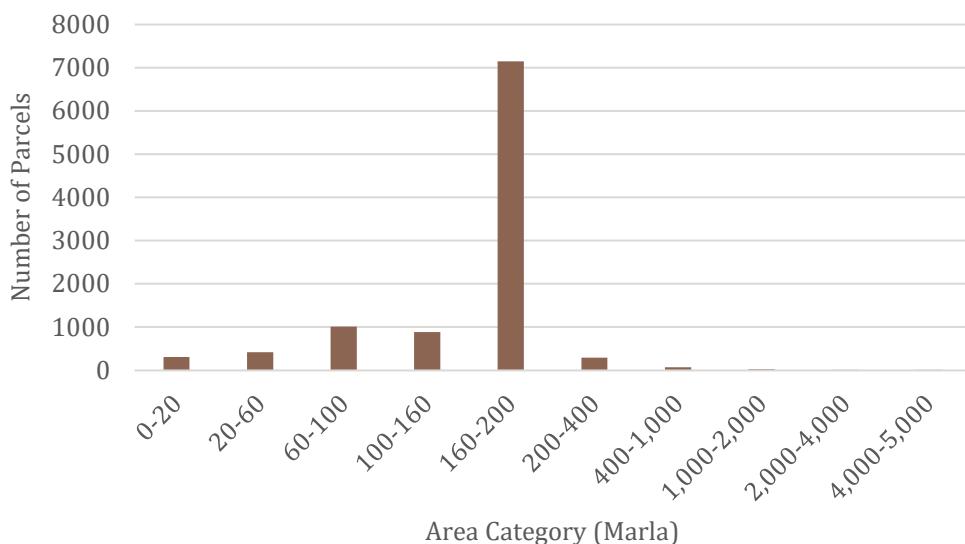
Area Class	Parcel Count	Land Area (Marlas)	Land Area (Acres)	Per Cent
0-20	310	2,605.70	16	3.05
20-60	415	16,803.33	105	4.08
60-100	1,008	84,634.82	529	9.91
100-160	882	117,209.60	733	8.67
160-200	7,149	1,268,354.69	7927	70.29
200-400	294	75,112.88	469	2.89



Area Class	Parcel Count	Land Area (Marlas)	Land Area (Acres)	Per Cent
400-1,000	69	39,572.89	247	0.68
1,000-2,000	25	34,306.55	214	0.25
2,000-4,000	10	27,362.54	171	0.10
4,000-5,000	9	39,084.47	244	0.09
Total	10,171	1,705,047	10,655	100

Source: Authors' calculations.

Figure 5: Distribution of Public Lands According to Area (Marlas)



Source: Authors' calculations.

Distance from the City Centre: The distribution of land parcels based on their distance from the city centre exhibits a notable concentration within specific distance ranges. We classified the distance from the city centre into 500, 1,000, and 2,000 metres. The data reveals that most of the land parcels are located within 4,500 to 8,500 metres from the city centre, making this area a prime spot for urban development and regeneration projects. As we move further out, the number of parcels gradually decreases, indicating lower density in the outskirts. Interestingly, the highest concentration is found between 6,500 and 8,500 metres, with 1,933 parcels, showing a significant cluster in this zone. The 4,500- to 6,500-metre range also has a high count of 1,847 parcels. There are also several mid-range categories. For example, the 3,500- to 4,500-metre range has 1,628 parcels, and the 2,500- to 3,500-metre

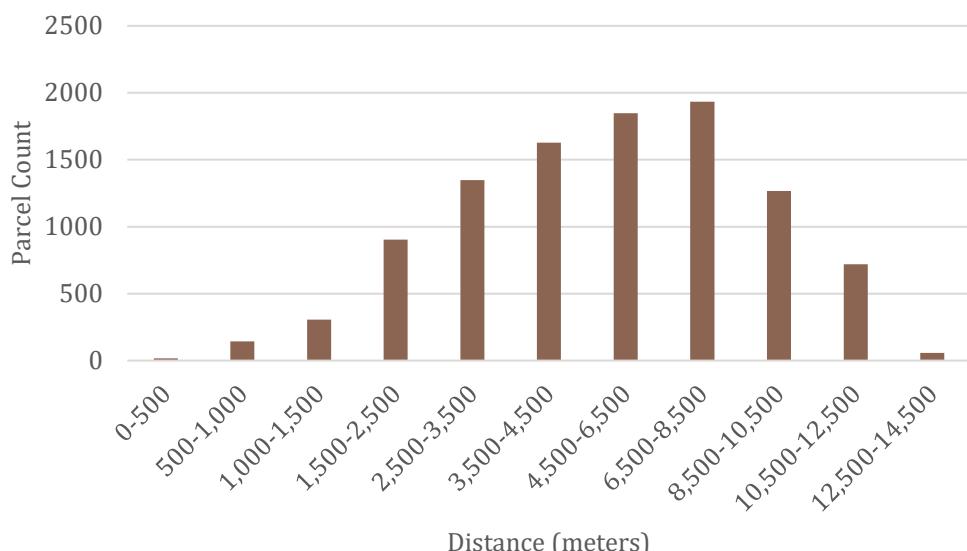
range has 1,348 parcels. This pattern of gradually decreasing parcel numbers continues the further we move away from the city centre. Table 6 shows the distribution of public lands and their distances from the city centre in the study area.

Table 6: The Distance of Public Lands from the City Centre

Distance from City Centre (Metres)	No. of Parcels	Land Area (Acres)	Per Cent
0-500	18	80.8	0.18
500-1,000	144	232.3	1.42
1,000-1,500	305	368.7	3.00
1,500-2,500	904	1,098.6	8.89
2,500-3,500	1348	1,355.4	13.25
3,500-4,500	1628	1,716.4	16.01
4,500-6,500	1847	1,835.8	18.16
6,500-8,500	1933	1,947.3	19.01
8,500-10,500	1266	1,190.7	12.45
10,500-12,500	720	782.9	7.08
12,500-14,500	58	47.6	0.57
Total	10,171.0	10,656.5	100.00

Source: Authors' calculations.

Figure 6: Distance of Public Land Parcels from the City Centre



Source: Authors' calculations.



Notably, there are still substantial numbers of parcels in the 8,500- to 10,500-metre range (1,266 parcels) and the 10,500- to 12,500-metre range (720 parcels). The number of parcels drops significantly beyond the distance of 12,500 metres from the city centre. For instance, there are only 58 parcels that are between 12,500 and 14,500 metres from the city centre. Close to the city centre, the density is also quite low, with just 18 parcels within 500 meters. This distribution highlights how parcel density varies with distance from the city centre, suggesting that the mid-range distances are particularly attractive for land development.

Commercial Land Values: The distribution of commercial values per marla shows a concentration in mid-range values, particularly PKR 6 to 8 million per marla, which collectively accounts for a significant portion of the parcels. Specifically, there are 1,971 parcels priced at PKR 6 million per marla, 1,442 parcels at PKR 7 million per marla, and 1,290 parcels at PKR 8 million per marla. As prices deviate from this range, the number of parcels decreases, indicating fewer commercial properties available at both lower and higher price points.

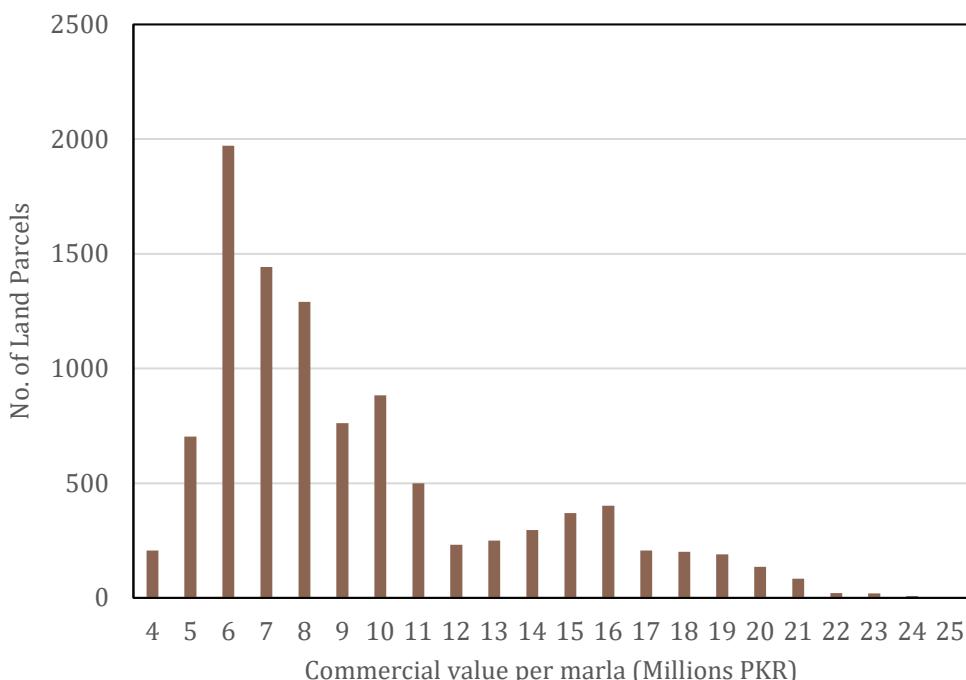
Table 7: Distribution of Commercial Land Values of Public Lands in the Study Area

Commercial Land Value (Million)	No. of Parcels	Land Area (Marlas)	Land Area (Acres)	Per Cent
3-4	207	29,612.8	185.1	2.04
5-6	2,674	431,510.9	2,696.9	26.29
7-8	2,732	446,778.0	2,792.4	26.86
9-10	1,644	263,552.3	1,647.2	16.16
11-12	732	125,969.9	787.3	7.20
13-14	544	100,956.8	631.0	5.35
15-16	771	119,152.2	744.7	7.58
17-18	407	86,823.8	542.6	4.00
19-20	325	60,303.0	376.9	3.20
21-22	104	34,728.8	217.1	1.02
23-25	31	5,659.0	35.4	0.30
Grand Total	10,171.0	1,705,047.5	10,656.5	100

Source: Authors' calculations.

Table 7 gives us a clear picture of the distribution of commercial land according to its value. Most of the land parcels are in the PKR 7-8 million value range, with 2,732 parcels covering 2,792.4 acres, making up 26.86% of the total land area. Similarly, the PKR 5-6 million range is also significant, with 2,674 parcels spread over 2,696.9 acres of land, or 26.29% of the total land. At the lower end, the PKR 3-4 million range has just 207 parcels, which is only 2.04% of the total land area. A look at higher value ranges shows that the number of parcels and the total land area generally decrease. For example, there are 1,644 parcels in the PKR 9-10 million range, covering 1,647.2 acres, which is 16.16% of the total land. In the PKR 11-12 million range, there are 732 parcels on 787.3 acres, making up 7.20%. The highest value categories, i.e., PKR 21-22 million and PKR 23-25 million, have the fewest parcels and smallest land areas. For instance, the PKR 23-25 million range has only 31 parcels, covering just 35.4 acres, which is a tiny 0.30% of the total land area. Overall, it is clear that the majority of commercial land falls in the middle range value of PKR 5-10 million, while both the lower and higher ends of the value spectrum have many fewer parcels.

Figure 7: Distribution of Public Land Values



Source: Authors' calculations.



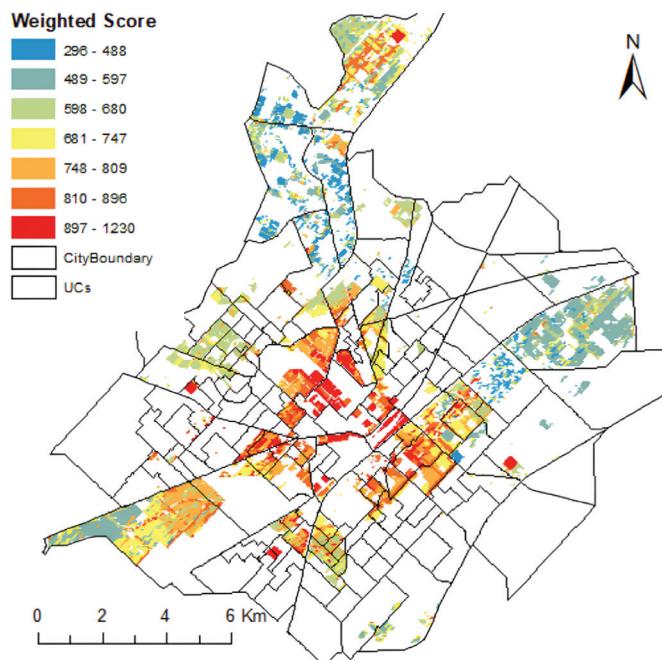
5. PRIORITY SCORE MODEL

The following seven attributes of the parcels were considered to calculate their priority score:

- Ownership status
- Land use status
- Land cover type
- Economic status
- Area
- Distance from the city centre
- Commercial value of the parcel.

Each attribute has a maximum score of 200. Thus, with seven attributes per parcel, the highest possible score for a parcel is 1,400 if a parcel achieves a score of 200 on each attribute. This scoring system allowed us to effectively prioritise parcels for urban regeneration. Parcels owned by local entities like the FDA, TMA, and Municipal Corporation (MC) received the highest scores for urban regeneration. Scores were progressively lower for parcels requiring more departmental involvement: provincial government parcels scored slightly lower, followed by federal government parcels. National organisation-owned parcels, such as those of PR, Sui Northern Gas Pipeline Ltd., WAPDA, NHA, and the Agricultural Development Bank FSD, scored even lower. Parcels of those entities that are unlikely to provide land for regeneration, such as the NFC Institute of Engineering and the Government Employees Cooperative Housing Society, received zero scores.

Figure 8: Map of the Priority Score Model for Site Selection



Source: Authors' calculations.

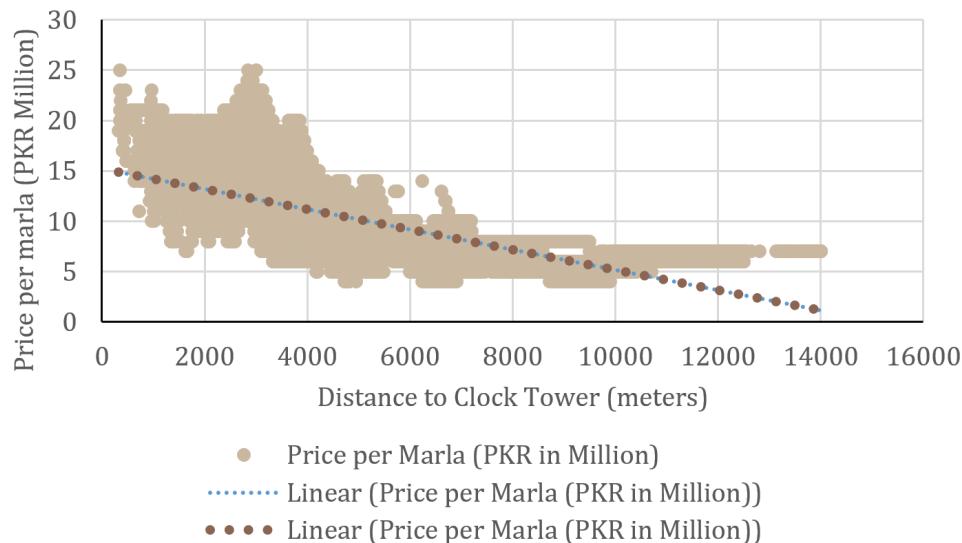
6. CITY CENTRE PROXIMITY AND PRICE DYNAMICS

We calculated the correlation between distance to the city centre (measured in metres) and price per marla (in PKR million) of 10,171 state land parcels, yielding a correlation coefficient of -0.7155384. This indicates a moderately strong negative relationship between these variables, i.e., as the distance from the city centre increases, property prices per marla generally decrease. This finding underscores the impact of location on land values.

In urban regeneration planning, particularly concerning underutilised state-owned lands, the correlation underscores the importance of proximity to the city centre. Areas closer to urban cores typically command higher property prices due to better access to amenities, transportation networks, and economic opportunities. By strategically revitalising areas closer to the city centre, planners can stimulate economic growth, improve urban livability, and maximise the value of public assets for sustainable development. This approach not only supports economic revitalisation but also promotes equitable urban development by leveraging existing infrastructure and enhancing community connectivity.



Figure 9: Correlation of City Centre Proximity and Land Value Per Unit



Source: Authors' calculations.

7. SITES SELECTED FOR REGENERATION

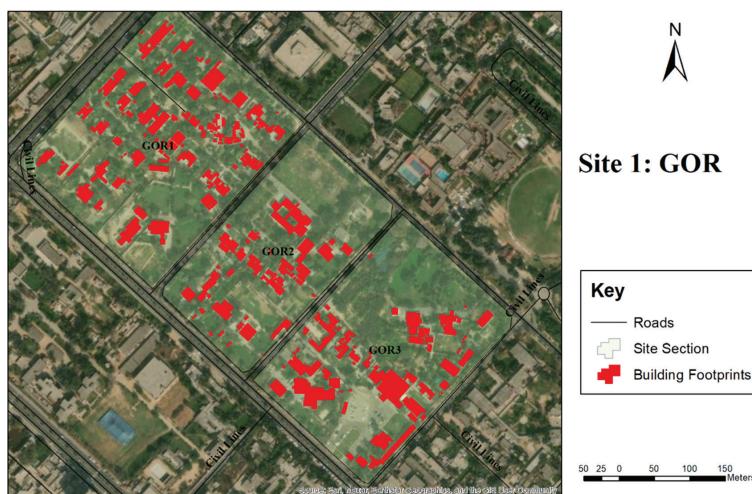
This section discusses site selection for urban regeneration projects in Faisalabad city. After analysing various potential sites, we have selected three key areas for urban regeneration, each offering distinct opportunities for transformation. These sites are the GOR, Pakistan Railway Land, and the land held by the Punjab Cooperative Board for Liquidation (PCBL).

Site 1. Government Officers' Residences (GOR)

GOR stands out as the most valuable site among the three. It consists of single-storey residential buildings, a circuit house, and the commissioner's office, reflecting its importance and high land value. The high value of the land underscores its potential for high-impact regeneration projects. Revitalising GOR could involve upgrading existing structures and integrating modern developments to capitalise on its prime location, thereby enhancing its role as a central urban hub. Figure 10 shows the location and whereabouts of this potential site.



Figure 10: GOR - Potential Site for Regeneration 1

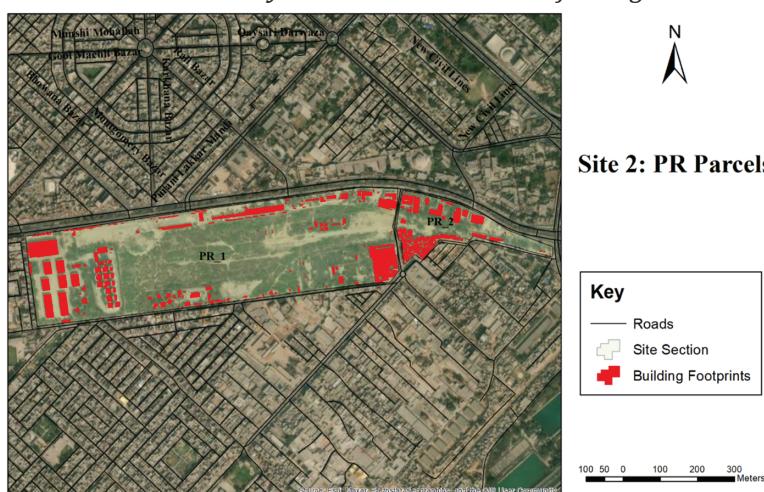


Source: Authors' calculations.

Site 2. Pakistan Railways Land

Pakistan Railway Land is a significant site that has remained vacant since the independence of Pakistan. A large portion of this land is currently under encroachment, presenting both challenges and opportunities. Its proximity to the city centre enhances its strategic value, making it a prime candidate for redevelopment. Addressing encroachment issues and revitalising this site could unlock substantial potential for new development projects, improving connectivity, and enhancing the city's overall infrastructure.

Figure 11: Pakistan Railways Land – Potential Site for Regeneration 2



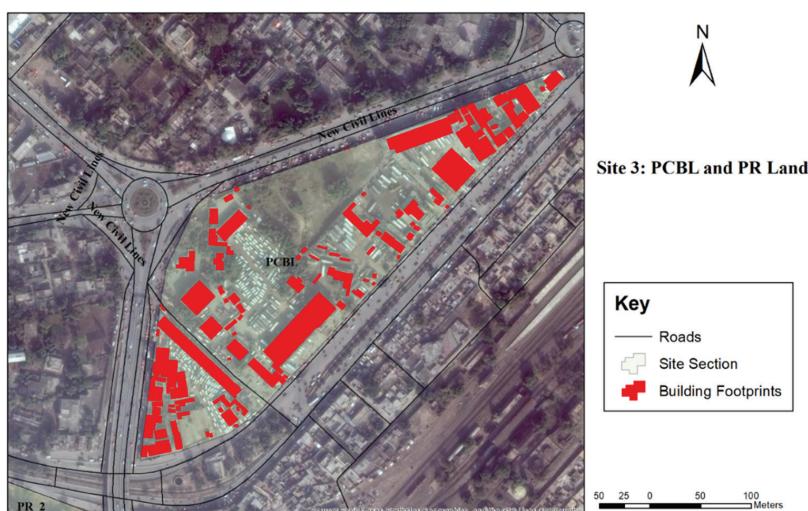
Source: Authors' calculations.



Site 3. Punjab Cooperative Board for Liquidation Land

The PCBL Land is another valuable site located near the railway station and within one kilometre of the city centre. This parcel is partially vacant and underutilised, indicating a substantial opportunity for redevelopment. Its central location makes it ideal for projects that aim to boost urban activity and connectivity. Transforming the PCBL Land could not only enhance its utility but also contribute to the revitalisation of the surrounding areas, creating a more dynamic and accessible urban environment.

Figure 12: PCBL Land - Potential Site for Regeneration 3



Source: Authors' calculations.

These sites were selected based on their strategic locations, current conditions, and potential for significant impact, ensuring that the regeneration projects will contribute meaningfully to the city's growth and development.

Table 8 shows the characteristics of these selected sites in the study area for city regeneration projects. It presents a comparative analysis of three sites chosen for urban regeneration, revealing key insights into their potential for development. The GOR sites owned by the Punjab Provincial Government are relatively close to the city centre, with areas ranging from 13.3 to 20.4 acres and land values between PKR 45 billion and PKR 69 billion. Their proximity to the city centre and high land values contribute to their high priority scores, making them prime candidates for redevelopment. Among these, GOR-1



stands out with the highest priority score of 1,095. In contrast, PCBL, also owned by a governmental entity but situated farther from the city centre at 1,167 metres, has a lower priority score of 997, despite its considerable land value of PKR 38 billion. The PR sites, PR-1 and PR-2, present a varied picture. PR-1, with its large area of 62.2 acres and proximity of 435 metres from the city centre, has a higher priority score of 1,230, reflecting its substantial land value of PKR 179 billion. PR-2, while closer to the city centre than PCBL, is smaller in size and has a lower land value, resulting in a lower priority score of 1,035. This prioritisation underscores the importance of proximity to the city centre and land value in determining the suitability of these sites for regeneration projects.

Table 8: Characteristics of Selected Sites for Regeneration

Site	Ownership	Total Area (Acre)	Distance from City Centre (Metres)	Land Value (PKR Billion)	Priority Score
GOR-1	Punjab Provincial Government	20.4	910	69	1,095
GOR-2	Punjab Provincial Government	13.3	771	45	1,035
GOR-3	Punjab Provincial Government	17.2	664	58	1,065
PCBL	Punjab Cooperative Board for Liquidation	14.8	1167	38	997
PR-1	Pakistan Railways	62.2	435	179	1,230
PR-2	Pakistan Railways	9.0	761	22	1,035

Source: Authors' calculations.



8. STAKEHOLDER INSIGHTS ON REDEVELOPMENT

The redevelopment of the selected state-owned land parcels in Faisalabad city presents a unique opportunity to reshape the urban landscape. To understand the complexities and potential of this initiative, we engaged a diverse range of stakeholders, including government officials, local communities, and industry professionals. Through this process, valuable insights into the opportunities, challenges, and strategic considerations were gathered that could guide the successful redevelopment of these state-owned assets.

Public Perception Survey

Perception of the public from around the proposed sites regarding the redevelopment of three state-owned land parcels (Railway Mall Godown, GOR, and GTS areas) was gathered through a survey using a structured questionnaire administered to 104 respondents who were selected through random sampling.

Participant Demographics

The sample consisted of both genders, with 83.65% of the respondents being male and 16.35% female. The respondents represented a wide range of ages, with the 46-60 years group forming the largest segment, accounting for 32.69%, followed by the 26-35 years group (25.96%), the 36-45 years group (19.23%), and the 18-25 years group (16.35%). Respondents over 60 years made up the smallest category, accounting for 5.77%. This broad age distribution suggests diverse perspectives from different life stages, with an emphasis on mature, middle-aged participants.

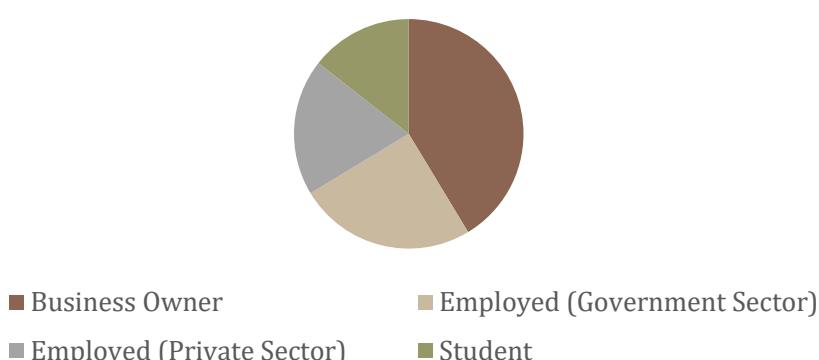
The respondents were categorised into four occupational groups. The business owners group was the largest, accounting for 41.35%, reflecting strong input from individuals potentially concerned with the economic implications of redevelopment. Government sector employees accounted for 25%, while private sector employees represented 19.23% of the sample. Moreover, 14.42% of respondents were students, providing insights from a younger, and potentially more progressive demographic. The following table presents the complete demographic breakdown of the participants:

Table 9: Demographic Breakdown of the Participants

Category	Sub-Category	Count	Per Cent
Gender	Male	87	83.65
	Female	17	16.35
Age group (Years)	18-25	17	16.35
	26-35	27	25.96
	36-45	20	19.23
	46-60	34	32.69
	60 and above	6	5.77
Occupation	Business owner	43	41.35
	Employed (government sector)	26	25.00
	Employed (private sector)	20	19.23
	Student	15	14.42

Source: Authors' calculations.

Figure 13: Demographics of the Participants



Source: Authors' calculations.

Site Awareness among the Local Community

Participants were asked a series of questions to gauge their awareness and current usage of the land parcels under consideration for redevelopment. First, they were asked whether they lived or worked near the areas, offering a simple "yes" or "no" as possible responses. Next, their awareness of the current condition of the three land parcels was assessed, with options including "Yes, I'm aware," "Somewhat aware," or "No, I'm not aware." Participants were then asked to describe how they perceived the current use of the land parcels, with choices such as "Vacant and underutilised," "Poorly maintained," "Used effectively for existing purposes," or "Not sure." Lastly, they were asked how often they visited or passed by the parcels, with possible answers being "Daily," "Weekly," "Occasionally," or "Never."

The results show that a dominant majority, i.e., 76.92% of respondents lived or worked near the land parcels being considered for redevelopment, while 23.08% did not. Most of the participants, 70.19%, were fully aware of the current condition of the land parcels, whereas 29.81% were somewhat aware. Regarding current use, 43.27% believed the parcels were "vacant and underutilised," 31.73% viewed them as "poorly maintained," and 25% considered them both vacant and poorly maintained. In terms of visitation, 59.62% passed by or visited the parcels "occasionally," 25.96% did so "daily," and 14.42% visited or passed by "weekly."

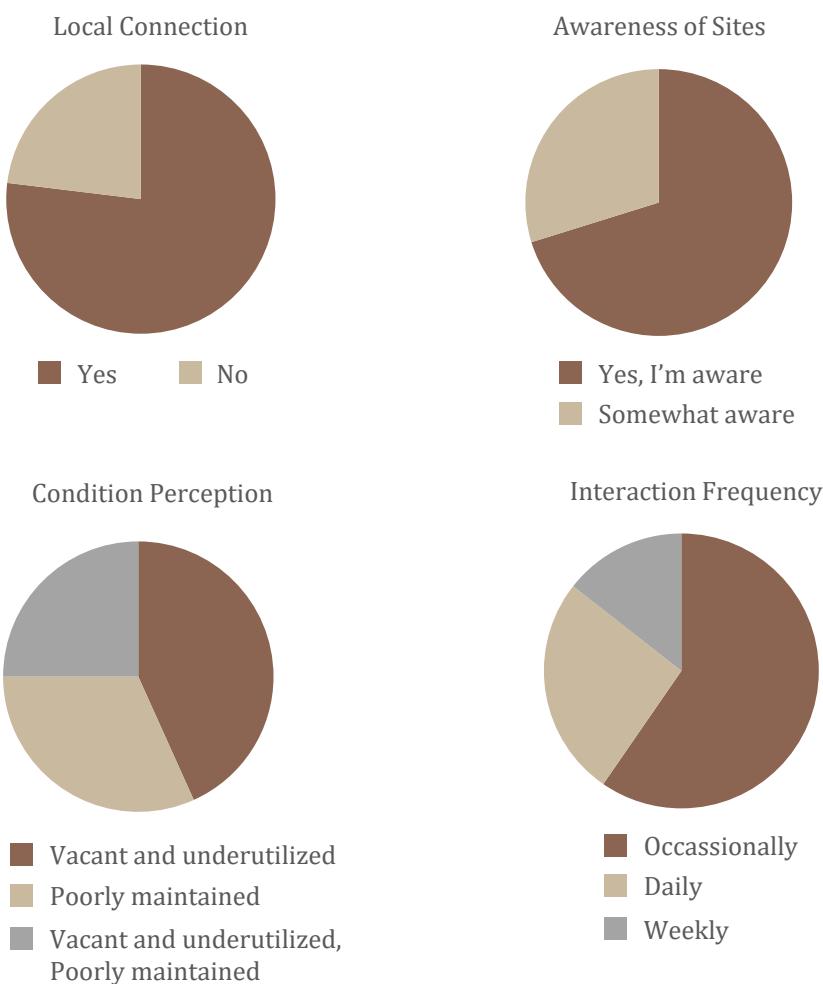
Table 10: Breakdown of the Site Awareness of the Local Community

Investigation	Response	Count	Per Cent
Local connection	Yes	80	76.92
	No	24	23.08
Awareness about sites	Yes, I'm aware	73	70.19
	Somewhat aware	31	29.81
Condition perception	Vacant and underutilised	45	43.27
	Poorly maintained	33	31.73
	Vacant and underutilised, poorly maintained	26	25.00
Interaction frequency	Occasionally	62	59.62
	Daily	27	25.96
	Weekly	15	14.42

Source: Authors' calculations.

The analysis shows a strong local connection, with most respondents living or working nearby, indicating potential for community involvement in the future of the area. Many were aware of the current state of the land parcels and mostly saw the parcels as "vacant and underutilised" or "poorly maintained," underlining their concerns about neglect and the need for redevelopment. Visitation patterns varied, with most visiting occasionally, while some engaged daily, suggesting opportunities for community input in the planning process. Overall, the community appeared aware, concerned, and ready to support revitalisation efforts.

Figure 14: Site Awareness Level of the Local Community



Source: Authors' calculations.

Community Support and Redevelopment Preferences

We asked participants a series of questions to understand their preferences for the redevelopment of the site. First, we inquired about their support for redeveloping the land parcels, offering options of "Strongly support," "Support," "Neutral," "Oppose," and "Strongly oppose." Next, we asked them to rank the following elements in order of priority for the redevelopment: commercial spaces (shops, offices, etc.), residential housing (apartments, flats), recreational spaces (parks, playgrounds, etc.), environmental sustainability (green building design, energy efficiency), walkability and pedestrian access, and public transport integration. We also asked what types of businesses or facilities they would like to see included in the redevelopment, allowing them to choose from options such as retail shops, restaurants/cafes, offices, fitness centres, educational institutions, healthcare facilities, and hotels. Lastly, we inquired about their stance on the construction of high-rise buildings in these parcels, with options for "Yes," "No," or "Not sure."

The analysis of the public response reveals strong support for the redevelopment of the proposed sites, with 63.46% of respondents expressing strong approval for the initiative and only 18.27% remaining neutral, indicating uncertainty or a lack of strong feelings. Another 18.27% showed support for the redevelopment, contributing to an overall positive sentiment. When asked to prioritise elements for redevelopment, respondents identified environmental sustainability, including green building design and energy efficiency, as the highest priority, followed closely by commercial spaces (shops and offices) and residential housing (apartments and flats). Recreational spaces, such as parks and playgrounds, were also deemed important. In terms of desired business types and facilities, respondents expressed a preference for a combination of retail shops, restaurants or cafes, offices, healthcare facilities, and hotels. Other popular facilities included fitness centres and educational institutions, while a smaller number of respondents selected various combinations, including recreational spaces and healthcare facilities. Furthermore, support for high-rise construction was notably strong, with 94.23% favouring the development of high-rise buildings within the redeveloped parcels, indicating significant community backing for vertical development.



Table 11: Level of Community Support and Redevelopment Preferences

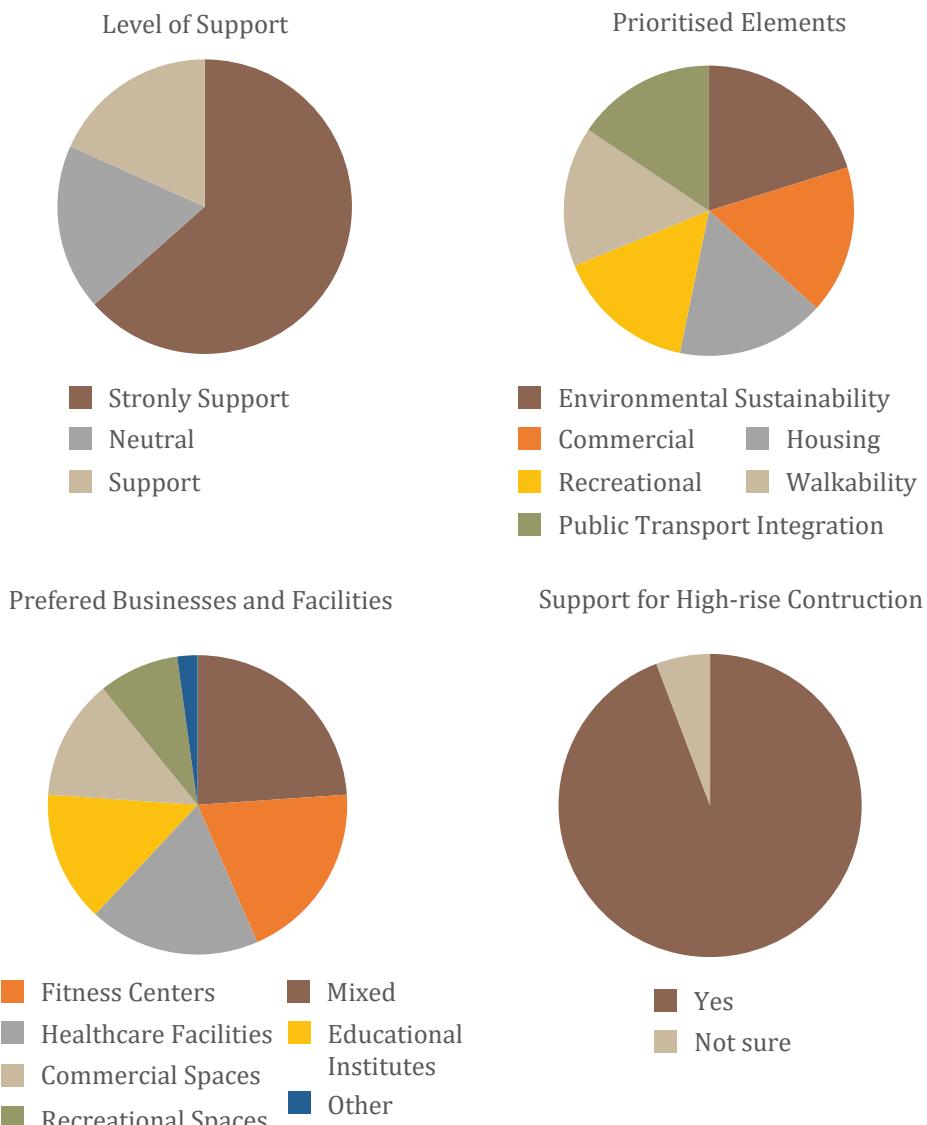
Investigation	Response	Count	Per Cent
Level of support	Strongly support	66	63.46
	Neutral	19	18.27
	Support	19	18.27
Prioritised elements	Environmental sustainability	22	21.15
	Commercial spaces	18	17.31
	Residential	18	17.31
	Recreational spaces	17	16.35
	Walkability and pedestrian access	17	16.35
	Public transport integration	17	16.35
Preferred businesses and facilities	Mixed	22	21.15
	Fitness centres and educational institutions	18	17.31
	Healthcare facilities	17	16.35
	Educational institutions only	13	12.50
	Commercial spaces only	12	11.54
	Recreational spaces only	8	7.69
	Other combinations	2	1.92
Support for high-rise construction	Yes	98	94.23
	Not sure	6	5.77

Source: Authors' calculations.

The findings point out strong community support for the redevelopment initiative, suggesting a clear mandate for planners to proceed. Respondents emphasised the importance of sustainability, reflecting a community preference for environmentally friendly practices in urban development. The diverse interest in various business types points to a demand for mixed-use development that could boost the local economy and enhance community amenities. Moreover, the acceptance of high-rise construction indicates a willingness among community members to embrace urban density as a viable solution to spatial constraints, potentially facilitating diverse commercial and residential opportunities.



Figure 15: Community Support and Redevelopment Preferences



Source: Authors' calculations.

Opinions on the Environmental and Social Impacts

Participants were asked for their opinions on the environmental and social impacts of the redevelopment plan. First, we inquired about the importance of environmental sustainability in the redevelopment, offering options such as "Very important," "Important," "Neutral," and "Not important." Next, they were asked whether they believed the redevelopment would improve



economic activity and the overall quality of life in Faisalabad City, with responses being "Yes," "No," or "Not sure." They were also asked if they had concerns about any negative impacts, such as traffic congestion, noise, or displacement, providing space for them to specify concerns. Lastly, we asked how they thought the redevelopment could improve public spaces and walkability, offering options like wider sidewalks, more pedestrian crossings, dedicated bike lanes, improved street lighting, landscaping and greenery, seating areas and benches, and public safety measures.

Opinions of participants reveal a strong emphasis on environmental sustainability, economic impact, and suggestions for enhancing public spaces and walkability. A significant majority, 67.31%, viewed environmental sustainability encompassing green spaces, energy efficiency, and waste management as very important for the redevelopment, while 27.88% considered it important, and 4.81% remained neutral. The redevelopment was also perceived to have a positive economic and quality-of-life impact, with 91.35% of respondents believing it would boost economic activity and improve overall living conditions in Faisalabad City. However, 8.65% were uncertain about these potential benefits. Concerns about the potential negative effects of the redevelopment, such as displacement, remain mixed. A slight majority of 54.81% were unsure whether there would be a negative impact, while 45.19% had no concerns in this regard.

Suggestions for improving public spaces and walkability included a range of ideas, with 31 respondents recommending a combination of wider sidewalks, more pedestrian crossings, dedicated bike lanes, improved street lighting, landscaping and greenery, seating areas, and public safety measures. They selected all the provided options in the questionnaire. Furthermore, 11 respondents considered the importance of landscaping and greenery alone. Other frequently suggested improvements included wider sidewalks and enhanced street lighting, greenery, and seating areas. These insights reflect a community interest in creating a more walkable and environmentally friendly urban space.

The following table offers a breakdown of the key survey results regarding the public perceptions of sustainability, economic impact, potential risks, and suggested infrastructure improvements.

Table 12: Opinions on Environmental and Social Impacts

Investigation	Response	Count	Per Cent
Importance of environmental sustainability	Very important	70	67.31
	Important	29	27.88
	Neutral	5	4.81
Improvement in the economy and quality of life	Yes	95	91.35
	Not sure	9	8.65
Concerns about negative impacts	Not sure	57	54.81
	No	47	45.19
Expected improvements in public spaces	Choose all the provided options	31	29.80
	Landscaping and greenery	11	10.58
	Wider sidewalks	6	5.77
	Improved street lighting, landscaping, and seating areas	5	4.81
	Other combinations (various)	2, 3	1.92-2.88

Source: Authors' calculations.

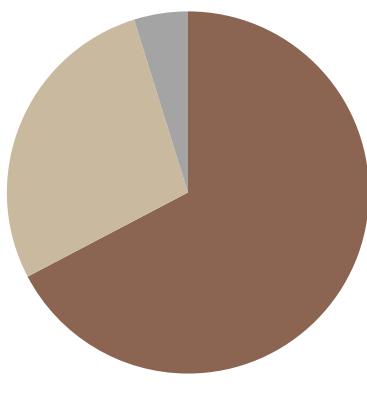
The community places a strong emphasis on environmental sustainability, considering it essential for the project and aligning with green urban planning trends. There is extensive optimism about the potential of the project to boost economic activity and quality of life, indicating belief in its role in urban renewal. Concerns about social issues like displacement were unclear, with over half of the respondents unsure. Preferences for public space enhancements were varied, with many prioritising pedestrian infrastructure, greenery, and safety, reflecting a desire for more accessible and eco-friendly public spaces.

Public Engagement in Decision Making

This section evaluates respondents' perspectives on the significance of public input in the final redevelopment plans, their willingness to attend public meetings, and their preferred methods for community engagement. Participants were asked about public engagement and decision-making in the redevelopment process. They were asked whether they believed the public should have a say in the final redevelopment plan with "Yes," "No," or "Not sure" options. Participants were also asked if they would attend public meetings or forums to discuss the redevelopment. Finally, they were requested to indicate the best ways to involve the community, with options including public consultations or meetings, online surveys, community workshops, information booths in public areas, social media updates, and an option for other suggestions.

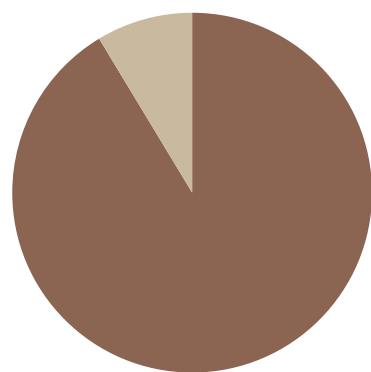
Figure 16: Opinions on Environmental and Social Impacts

Importance of Environmental Sustainability



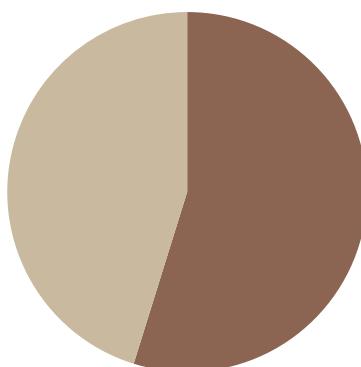
■ Very important
■ Important

Improvement in Economy and Quality of Life



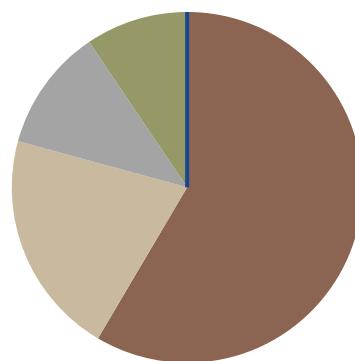
■ Yes
■ Not sure

Having Concerns about Negative Impacts



■ Not sure
■ No

Expected Improvements in Public Spaces



■ Choose all the provided options
■ Landscaping & Greenery
■ Wider Sidewalks
■ Improved Street Lighting, Landscaping and Seating Areas
■ Other Combinations (various)

Source: Authors' calculations.

A substantial majority, 82.69%, believed that the public should have a say in the final redevelopment plan, indicating a strong desire for community involvement in decision-making processes. A smaller portion, 11.54%, were uncertain about the necessity of public input, while only 5.77% opposed it. Regarding participation in public meetings, an overwhelming 90.38% expressed a willingness to attend discussions about the redevelopment plan, reflecting a robust community interest in engaging with local development issues. Only 5.77% indicated they would not attend, and 3.85% were unsure. When it comes to preferred methods for community involvement, respondents proposed various strategies. Social media updates emerged as the most favoured method, supported by 25% of respondents. The use of online surveys was favoured by 15.38%, while public meetings accounted for 7.69%. Other suggested methods included information booths in public areas (8.65%) and community workshops (3.85%). Notably, 36.54% preferred a combination of various engagement methods, demonstrating a strong inclination for a multi-faceted approach to community involvement in the redevelopment process.

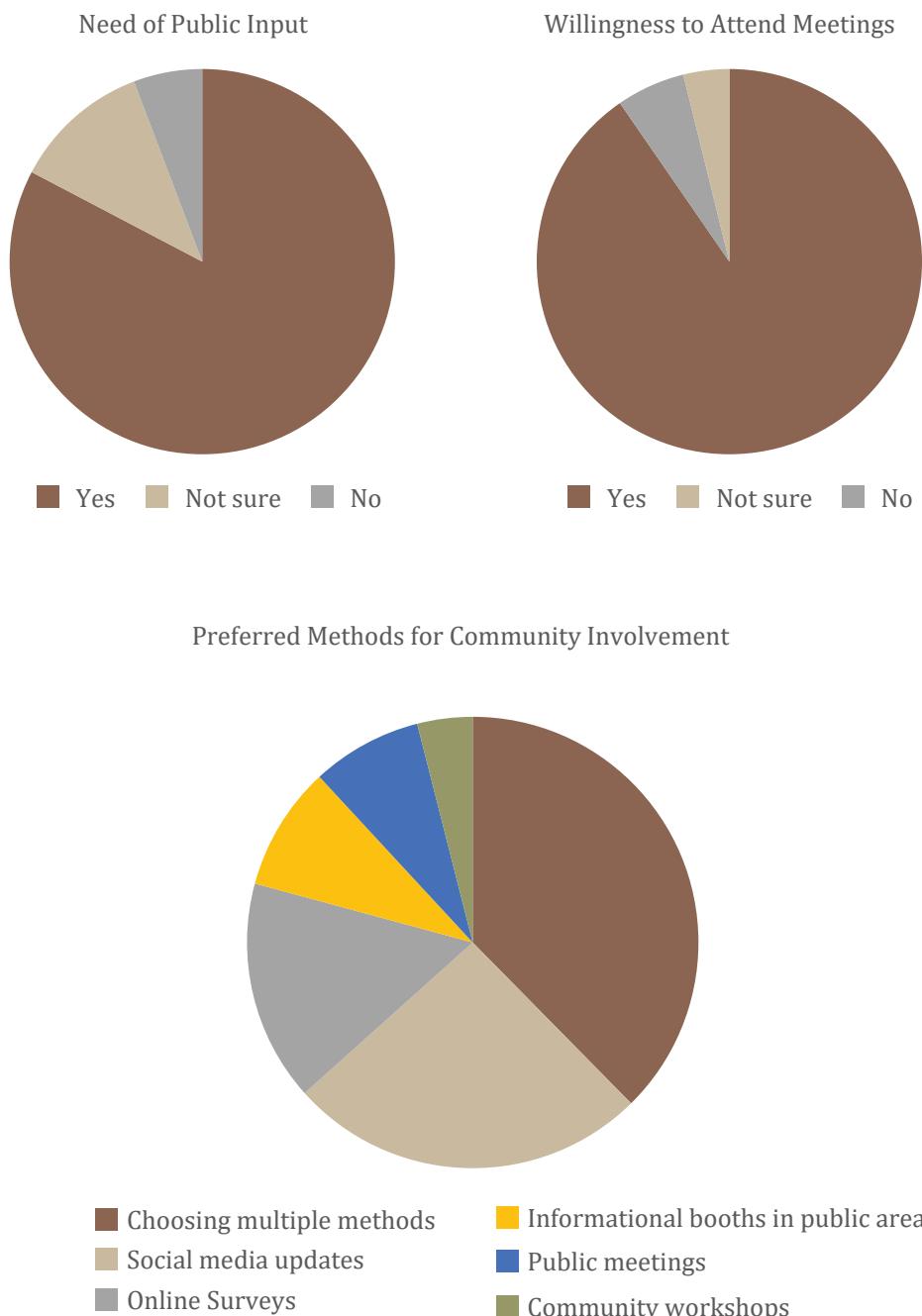
Table 13: Public Engagement Perceptions

Investigation	Response	Count	Per Cent
Need for public input in redevelopment plans	Yes	86	82.69
	Not sure	12	11.54
	No	6	5.77
Willingness to attend public meetings	Yes	94	90.38
	No	6	5.77
	Not sure	4	3.85
Preferred methods for community involvement	Choosing multiple methods	38	36.54
	Social media updates	26	25.00
	Online surveys	16	15.38
	Information booths in public areas	9	8.65
	Public meetings	8	7.69
	Community workshops	4	3.85

Source: Authors' calculations.



Figure 17: Public Engagement Perceptions



Source: Authors' calculations.

Views about the Economic and Social Impacts

This segment examines public perceptions regarding the anticipated impacts of redevelopment on local businesses, interest in residential or commercial investment in the redeveloped area, and the necessary transportation improvements. Participants were asked about the economic and social impacts of the redevelopment. First, they were asked how they believed the redevelopment would impact local businesses in the surrounding area, with response options of "Positively (more customers, better opportunities)," "Negatively (displacement, increased competition)," "No significant impact," and "Not sure." Additionally, participants were asked if they would be interested in moving to or investing in a residential or commercial unit within the redeveloped area, with options of "Yes, I would consider it for residential purposes," "Yes, I would consider it for commercial purposes," "No, I'm not interested," and "Not sure."

A substantial majority, 84.62%, believed that the redevelopment would positively impact local businesses, as they expected increased customer footfall and better opportunities. In contrast, a small minority, 7.69%, anticipated a negative impact, primarily due to concerns about displacement and increased competition, while only 3.85% perceived no significant impact, and another 3.85% were unsure about the effects. Interest in investing in the redeveloped area is noteworthy, with 38.46% considering investing for residential purposes and 30.77% interested in commercial investment opportunities. However, 20.19% expressed uncertainty about their interest, and 10.58% indicated they were not interested in such options. Respondents also identified various transportation improvements that should be enhanced or integrated into the redevelopment plan. The most common suggestions included public buses, metro or rail services, parking facilities, ride-sharing, and bicycle sharing, with 36.54% of respondents supporting these options. Specifically, 21.15% highlighted the need for improved metro or rail services, while 14.42% called for better public bus services, and 6.73% emphasised the importance of parking facilities for cars. Additionally, 3.85% mentioned the need for bicycle-sharing programmes, indicating a community focus on enhancing transportation options in conjunction with the redevelopment.



Table 14: Views on Economic and Social Impacts

Investigation	Response	Count	Per Cent
Anticipated impact on local businesses	Positive Impacts	88	84.62
	Negative Impacts	8	7.69
	No significant impact	4	3.85
	Not sure	4	3.85
Willingness and preference to invest in the redeveloped area	Yes, I would consider it for residential purposes	40	38.46
	Yes, I would consider it for commercial purposes	32	30.77
	Not sure	21	20.19
	No, I'm not interested	11	10.58
Transportation options to be integrated	Multiple Options	38	36.54
	Metro or rail services	22	21.15
	Public buses	15	14.42
	Parking facilities for cars	7	6.73
	Bicycle-sharing programs	4	3.85

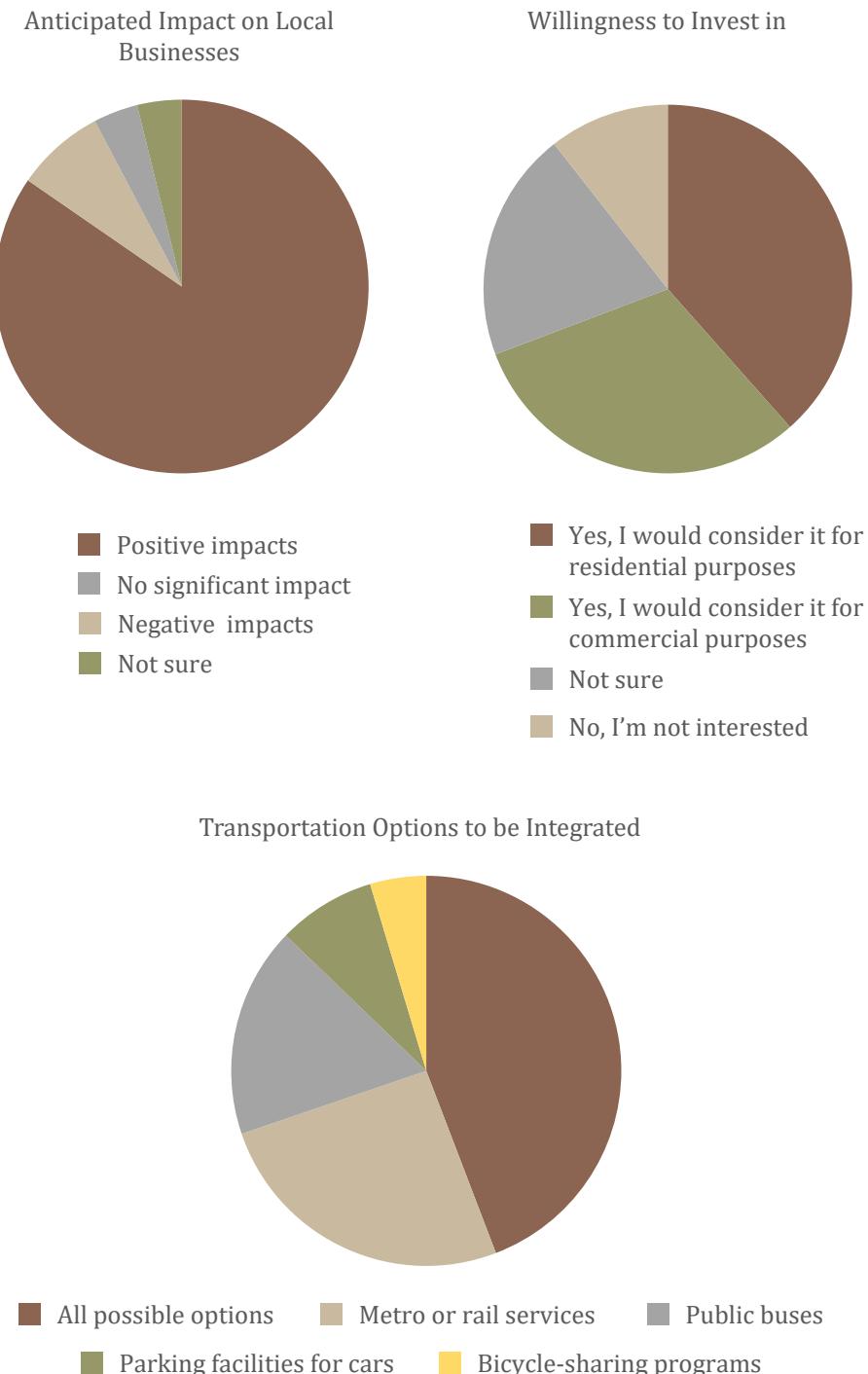
Source: Authors' calculations.

The data reveals a strong belief in the benefits of redevelopment, suggesting that the community anticipates positive changes for local businesses. There is significant interest in investing in the redeveloped area, indicating confidence in its potential growth and attractiveness. Additionally, the respondents' focus on improving transportation options underscores the importance of accessibility in successful redevelopment, highlighting the need for a multi-modal transportation plan.

Cultural and Community Considerations

This section captures public sentiment on the importance of preserving cultural and historical elements in the redevelopment of three state-owned land parcels, as well as the level of support for incorporating community spaces. Participants were asked about cultural and community considerations in the redevelopment. They were asked about the importance of preserving cultural and historical elements, such as architecture, public spaces, and landmarks, with response options ranging from "Very important" to "Not important." Additionally, participants were asked whether they would support the inclusion of community spaces, such as community centres, cultural halls, or libraries, within the redeveloped area, with the options "Yes," "No," or "Not sure."

Figure 18: Views about Economic and Social Impacts



Source: Authors' calculations.

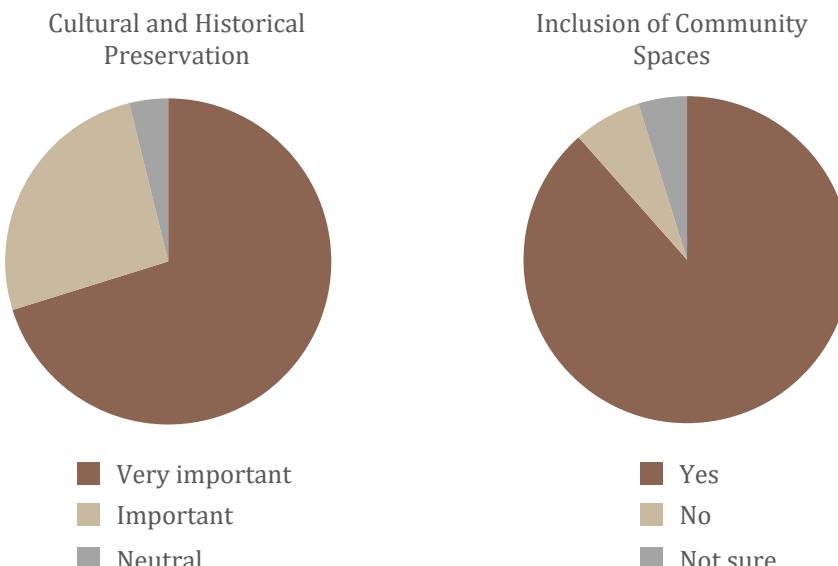
A significant majority, 70.19%, believed it was very important to preserve cultural and historical features, such as architecture, public spaces, and landmarks, during the redevelopment process. Additionally, 25.96% found this aspect important, highlighting widespread support for heritage preservation, while only 3.85% were neutral. Regarding the inclusion of community spaces, 88.46% of respondents strongly supported the idea of adding facilities such as community centres, cultural halls, and libraries within the redeveloped area. A small minority, 6.73%, opposed this, while 4.81% were uncertain, reflecting strong overall community backing for spaces that encourage social and cultural engagement. The table below provides a concise summary of public opinion regarding the preservation of cultural elements and the inclusion of community spaces.

Table 15: Views on Cultural and Community Considerations

Investigation	Response	Count	Per Cent
Preservation of cultural and historical elements	Very important	73	70.19
	Important	27	25.96
	Neutral	4	3.85
Inclusion of community spaces	Yes	92	88.46
	No	7	6.73
	Not sure	5	4.81

Source: Authors' calculations.

Figure 19: Views on Cultural and Community Considerations



Source: Authors' calculations.

There is a strong cultural preservation sentiment, with a high percentage of respondents emphasising the importance of preserving cultural and historical elements, indicating a shared value placed on heritage and tradition. Additionally, widespread support for the inclusion of community spaces reflects the community's desire for social and cultural infrastructure within the redevelopment.

Supplementary Comments

Participants were invited to offer additional insights, recommendations, suggestions, and comments on the redevelopment plan. The feedback revealed a nuanced perspective, with respondents generally supporting the plan while expressing concerns about key issues such as governance, affordability, environmental sustainability, transportation, and inclusivity. One of the primary themes emphasised was the need for PPPs and transparent governance to avoid political interference and ensure effective execution. Although many respondents favoured the initiative, their support was contingent on its successful implementation. Social inclusion and affordability were highlighted as essential for ensuring equitable access to the benefits of redevelopment. Additionally, there was a strong emphasis on incorporating environmentally sustainable practices, such as prioritising green spaces, promoting public transportation, and reducing congestion through eco-friendly infrastructure.

Transportation infrastructure also emerged as an important area of focus, with suggestions for enhancing public transit and introducing sustainable options like electric vehicles. Respondents offered ideas for optimising land use, proposing mixed-use developments and transforming key areas into commercial zones. Community involvement was another recurrent theme, with respondents advocating for the active participation of residents to foster a sense of ownership and ensure a positive impact of the project. A few respondents also proposed a more comprehensive redevelopment strategy for the entire city, addressing urban growth, disorganisation, and future housing needs.

Insights from Local Builders and Developers

We engaged real estate development and construction sector professionals to gather insights on the proposed redevelopment of three government-owned land parcels. Utilising a structured questionnaire, we approached prominent builders and developers to obtain their feedback. Responses from 30



individuals were received. The respondents included CEOs, directors, general managers, and project managers. The objective was to gain their expert perspectives and explore potential collaboration opportunities through a PPP.

Respondents' Profile Overview

In the first section of the questionnaire, general information was gathered from respondents, including details such as company name, position within the company, and years of experience in real estate development. Participants were categorised by their experience, ranging from less than 5 years to more than 20 years. Additionally, respondents were asked to specify the types of real estate projects their companies specialise in, with options including residential, commercial, mixed-use, industrial, infrastructure development, and any other project types not listed.

The majority of respondents held positions as directors, representing 43% of the total, followed by project managers at 37%, CEOs at 13%, and general managers at 7%. In terms of experience in real estate development, 4 % of respondents had between 10 to 20 years of experience, 33% had 5 to 10 years, and 23 %had more than 20 years of experience. Regarding the types of real estate projects their companies specialised in, 23 % of respondents indicated their companies handled all types of projects, 27% focused on residential and commercial, 7% on residential, commercial, and industrial, 3% on residential, commercial, and infrastructure development, and 40% specialised in residential, commercial, and mixed-use projects.

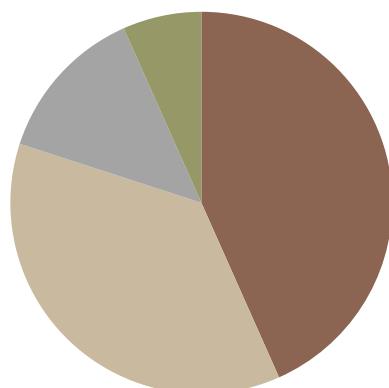
Table 16: Respondents' Profile

Profile Element	Response	Count	Per Cent
Type of project specialisation	Residential, commercial, mixed-use	12	40
	Residential, commercial	8	27
	All types	7	23
	Residential, commercial, industrial	2	7
	Residential, commercial, and infrastructure development	1	3
Position	Director	13	43
	Project manager	11	37
	CEO	4	13
	General manager	2	7
Years of experience	10-20 years	13	43
	5-10 years	10	33
	More than 20 years	7	23

Source: Authors' calculations.

Figure 20: Respondents' Profile

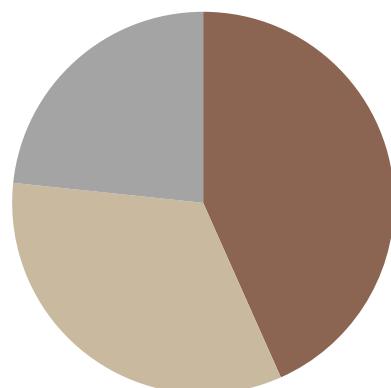
Position-wise Breakdown



■ Director
■ CEO

■ Project Manager
■ General Manager

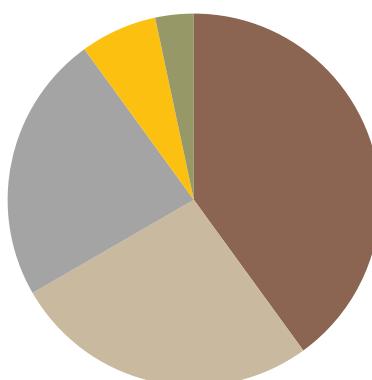
Experience Range



■ 10-20 years
■ 5-10 years
■ More than 20 years

Specialisation

■ Residential, Commercial, Mixed-use
■ Residential, Commercial
■ All types
■ Residential, Commercial, Industrial
■ Residential, Commercial, Infrastructure Development



Source: Authors' calculations.

Interest in the Urban Redevelopment Projects

In the second section of the questionnaire, respondents were asked about their companies' interest in participating in the redevelopment of the identified land parcels. They were given options to express varying levels of interest from "very interested" to "not sure yet." Additionally, the respondents were asked to indicate the type of development they believed would be most profitable for these parcels, with choices including residential, commercial,



mixed-use, hospitality, and recreational facilities. Key challenges or risks anticipated by the participants were also identified, such as land acquisition issues, regulatory approvals, financing concerns, infrastructure limitations, and market demand uncertainty, with an option to specify other challenges. Moreover, the respondents provided their opinion on the minimum period required for completing a full-scale redevelopment project, with options ranging from less than 2 years to more than 5 years.

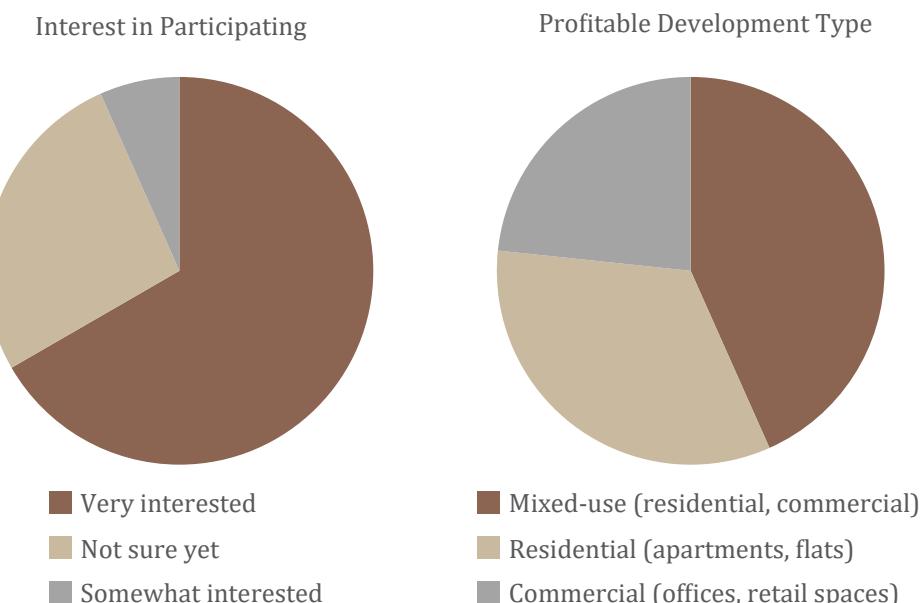
The majority of the respondents, i.e., 67% of the companies, indicated that they were "very interested" in participating in the redevelopment of the land parcels. Another 27% were "not sure yet," while 7% were "somewhat interested." Regarding the type of development that respondents believed would be most profitable, 43% favoured mixed-use development combining residential, commercial, and office spaces. Residential developments were seen as the most profitable by 33%, while 23% believed that commercial developments, such as offices and retail spaces, would be the most lucrative.

Table 17: Interest in Project, Preferences, and Perceived Challenges

Theme	Response	Count	Per Cent
Interest in participating	Very interested	20	67
	Not sure yet	8	27
	Somewhat interested	2	7
Profitable development type	Mixed-use (residential, commercial)	13	43
	Residential (apartments, flats)	10	33
	Commercial (offices, retail spaces)	7	23
Key challenges/risks	Land acquisition issues, Regulatory approvals, and compliance	14	47
	Regulatory approvals and compliance	9	30
	Land acquisition issues, Regulatory approvals, and market demand uncertainty	5	17
	Land acquisition issues	1	3
	Land acquisition issues, Regulatory approvals, and financing concerns	1	3
Minimum period for completion	More than 5 years	18	60
	3-5 years	12	40

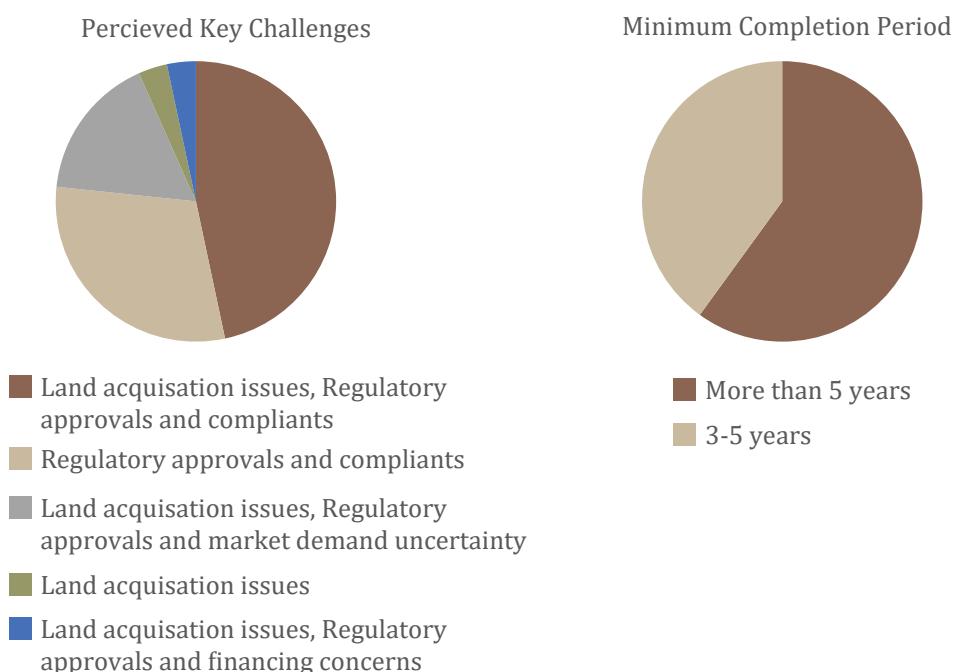
Source: Authors' calculations.

Figure 21: Interest in Project and Development Preferences



Source: Authors' calculations.

Figure 22: Perceived Challenges and Completion Period



Source: Authors' calculations.



Forty-seven per cent of the respondents identified "Land acquisition issues and regulatory approvals and compliance" as key challenges in redeveloping the land parcels, while 30% only mentioned "Regulatory approvals and compliance." Additionally, 17% foresaw challenges related to "Land acquisition issues, regulatory approvals and compliance, and "Market demand uncertainty." Regarding the timeline for project completion, 60% of respondents believed that it would take "more than 5 years," while 40% thought a timeframe of "3 to 5 years" would be sufficient.

Design and Development Considerations

In the third section, respondents were asked to provide their views on design and development considerations for the redevelopment project. Specifically, they were asked about their support for the inclusion of high-rise buildings, with responses ranging from "strongly support" to "strongly oppose." They were also asked to prioritise key architectural and urban design elements, such as aesthetic appeal, environmental sustainability, walkability, connectivity, and accessibility for differently-abled individuals, with an option to specify additional priorities. Furthermore, the respondents were asked to evaluate the demand for mixed-use development (combining commercial, residential, and office spaces) in the targeted area of Faisalabad. Options ranged from affirming strong demand to uncertainty, with the possibility of needing more research to determine the viability.

The majority of respondents, 83.3%, strongly supported the inclusion of high-rise buildings, while 16.7% remained neutral. When asked about architectural and urban design priorities, 53.3% prioritised aesthetic appeal and modern design, 36.7% highlighted connectivity and transport integration, and 10% emphasised walkability and pedestrian-friendly spaces. Regarding the demand for mixed-use development in the city, 86.7% believed there was a strong demand, while 13.3% thought the market demand for such development was low.

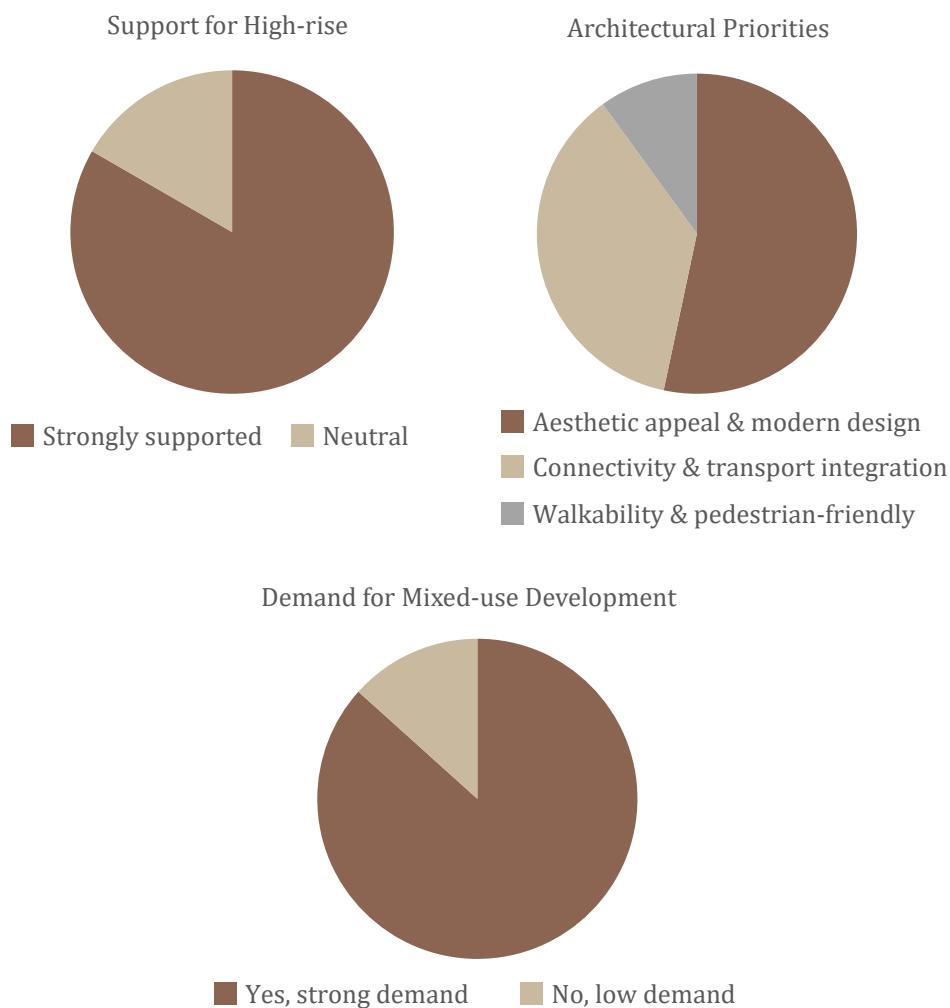


Table 18: Design and Development Considerations

Theme	Response	Count	Per Cent
Support for high-rise buildings	Strongly support	25	83.3
	Neutral	5	16.7
Architectural/design priorities	Aesthetic appeal and modern design	16	53.3
	Connectivity and transport integration	11	36.7
	Walkability and pedestrian-friendly	3	10.0
Demand for mixed-use development	Yes, strong demand	26	86.7
	No, low demand	4	13.3

Source: Authors' calculations.

Figure 23: Design and Development Considerations



Source: Authors' calculations.



Perceived Environmental and Social Impact

In the fourth section, the questionnaire focused on the environmental and social impact of the redevelopment. Respondents were asked to rate the importance of environmental sustainability in their development projects, with responses ranging from "very important" to "not important." They were also asked to identify sustainable building practices their company would incorporate if participating in the project. These included options such as green building certifications, renewable energy sources, water conservation systems, eco-friendly materials, and smart building technologies, with the flexibility to specify additional practices. Additionally, the respondents were asked to consider how the redevelopment could benefit the surrounding community, with choices like increased job opportunities, better housing options, improved infrastructure, enhanced public spaces, and a boost to the local economy, along with the option to suggest other community benefits.

In the responses regarding the importance of environmental sustainability, 73.3% of participants considered it to have been very important in their development projects, while 26.7% found it important. When asked about sustainable building practices, 70% of respondents indicated they would have incorporated a range of practices, including green building certifications, renewable energy, water conservation, eco-friendly materials, and smart building technologies. Additionally, 10% of respondents specifically mentioned they would have used renewable energy sources, while another 10% highlighted smart building technologies. A smaller %age, 3.3%, focused on the use of eco-friendly construction materials or water conservation systems, and another 3.3% suggested combining water conservation systems with smart technologies. Regarding the potential community benefits of the redevelopment, 33.3% of participants emphasised a combination of increased job opportunities, better housing options, improved infrastructure, enhanced public spaces, and an economic boost. A further 26.7% identified increased job opportunities, improved infrastructure, and an economic boost as key benefits. Meanwhile, 23.3% prioritised better housing options along with an economic boost. Smaller groups of respondents, 6.7% each, mentioned either better housing alone or a combination of increased job opportunities and better housing options, while 3.3% cited improved infrastructure as the primary community benefit.



Table 19: Perceived Environmental and Social Impact

Theme	Response	Count	Per Cent
Importance of environmental sustainability	Very important	22	73.3
	Important	8	26.7
Sustainable building practices	Green building certifications, renewable energy, water conservation, eco-friendly materials, and smart technologies	21	70
	Renewable energy sources	3	10
	Smart building technologies	3	10
	Use of eco-friendly construction materials	1	3.3
	Water conservation systems	1	3.3
	Water conservation systems, Smart building technologies	1	3.3
Perceived community benefits	Increased job opportunities, better housing options, improved infrastructure, enhanced public spaces, and economic boost	10	33.3
	Increased job opportunities, improved infrastructure, and economic boost	8	26.7
	Better housing options, economic boost	7	23.3
	Better housing options	2	6.7
	Increased job opportunities, better housing options	2	6.7
	Improved infrastructure	1	3.3

Source: Authors' calculations.

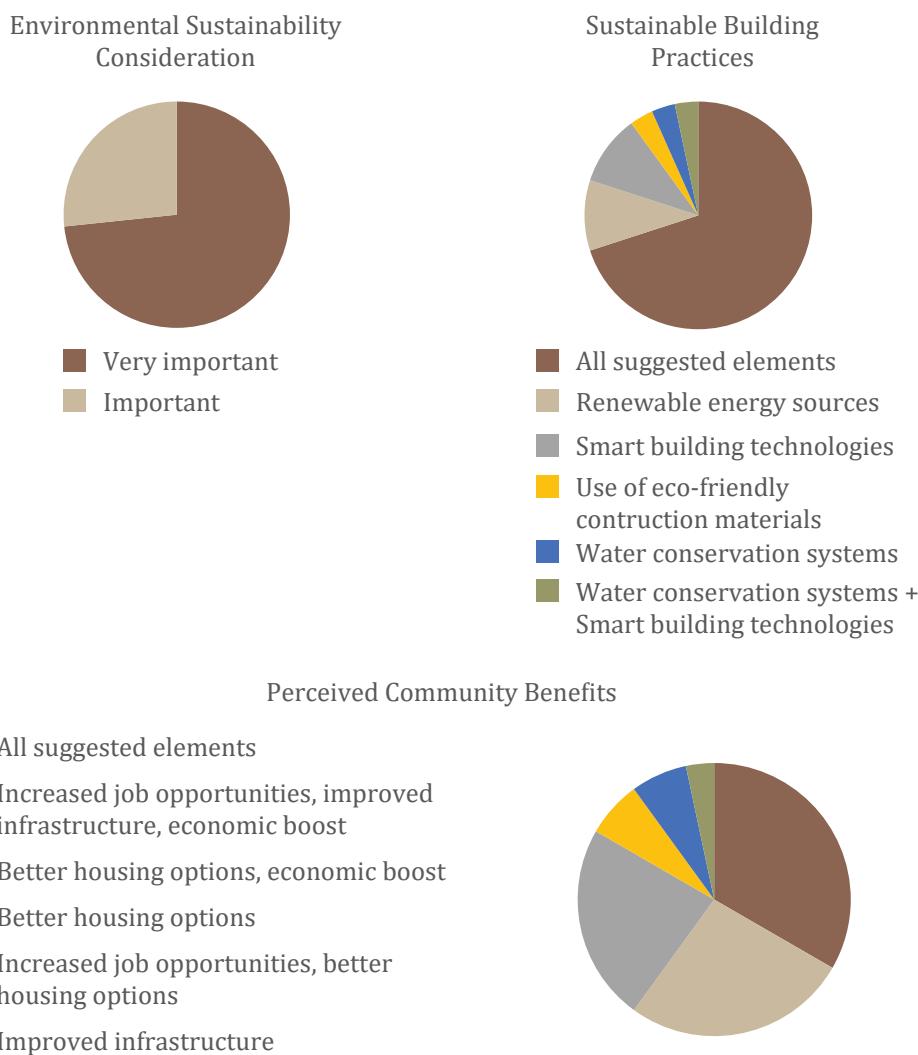
Possibilities of a Public-Private Partnership (PPP)

In the fifth section of the questionnaire, the focus was on exploring the possibilities of a PPP for the redevelopment project. Respondents were asked whether their company would be interested in collaborating with the government through a PPP, with options to express certainty or uncertainty. They were then invited to choose their preferred PPP models, with options including build-operate-transfer (BOT), build-own-operate (BOO), joint venture (JV), design-build-finance-operate (DBFO), and lease-develop-operate (LDO), as well as the ability to specify other models. To encourage participation, respondents were asked about the incentives, such as tax incentives, reduced regulatory hurdles, government-provided infrastructure, long-term land leasing, and subsidised financing options that would motivate their company to engage in a PPP. Furthermore, participants were asked about their desired level of control in the decision-making process, ranging from full control to shared or minor control, as well as the

risks they associate with PPP participation, including financial, legal, market demand, and coordination risks. An option to specify additional risks was also provided.

A significant majority, 80%, expressed interest in participating, while 17% were unsure, and only 3% said they would not participate. Regarding preferred PPP models, 30% favoured the BOO model, while 23% each preferred DBFO and JV models. The LDO model was supported by 20%, and BOT received the support of 3% of the respondents.

Figure 24: Perceived Environmental and Social Impact



Source: Authors' calculations.



Table 20: Possibilities of a Public-Private Partnership (PPP)

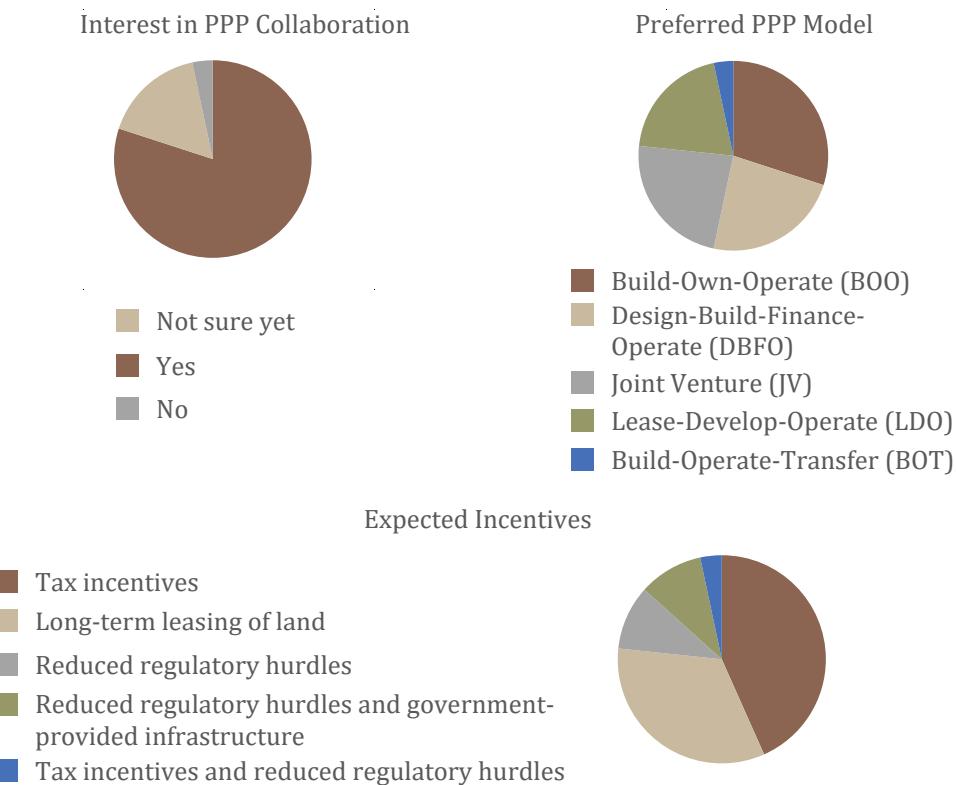
Theme	Response	Count	Per Cent
Interest in PPP collaboration	Yes	24	80
	Not sure yet	5	16.7
	No	1	3.3
Preferred PPP models	Build-Own-Operate (BOO)	9	30
	Design-Build-Finance-Operate (DBFO)	7	23.3
	Joint Venture (JV)	7	23.3
	Lease-Develop-Operate (LDO)	6	20
	Build-Operate-Transfer (BOT)	1	3.3
Incentives for engaging in a PPP	Tax incentives	13	43.3
	Long-term leasing of land	10	33.3
	Reduced regulatory hurdles	3	10
	Reduced regulatory hurdles and government-provided infrastructure	3	10
	Tax incentives and reduced regulatory hurdles	1	3.3
Level of control in PPP	Full control over design and construction	30	100
Risks associated with participating in a PPP	Legal and regulatory risks, coordination issues with the government	15	50
	Legal and regulatory risks	9	30
	Coordination issues with government agencies	3	10
	Market demand and revenue uncertainty	3	10

Source: Authors' calculations.

When asked about incentives that would encourage participation in the PPP, 43% indicated tax incentives as the most important factor. Long-term leasing of land was selected by 33%, and reduced regulatory hurdles by 10%. Another 10% cited a combination of reduced regulatory hurdles, government-provided infrastructure, and long-term leasing, while 3% highlighted both tax incentives and reduced regulatory hurdles as motivating factors.

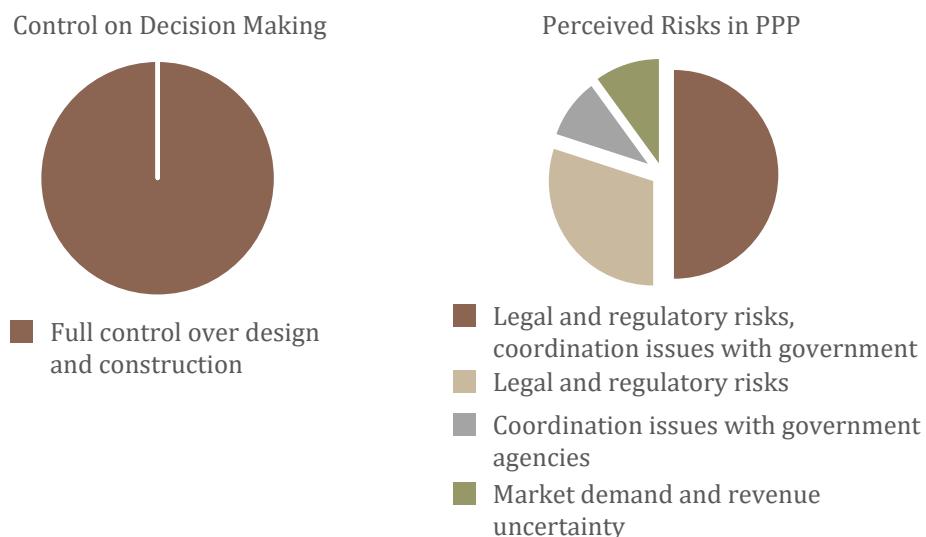


Figure 25: Interest in Collaboration, Preferred Model and Required Incentives



Source: Authors' calculations.

Figure 26: Level of Control on Decision Making and Perceived Risks in PPP



Source: Authors' calculations.



In response to the question about the required level of control in decision-making, all the respondents said that their company would require full control over design and construction decisions in a PPP model for the redevelopment project. When considering the risks associated with participating in the PPP, 50% of the respondents identified a combination of legal and regulatory risks, along with coordination issues with government agencies, as the primary risks. Another 30% cited only legal and regulatory risks, while 10% mentioned coordination issues with government agencies as a separate concern. Additionally, 10% highlighted market demand and revenue uncertainty as a key risk.

Supplementary Comments and Suggestions

In the final section, respondents were asked to provide additional comments or suggestions regarding the redevelopment plan and potential PPP opportunities. This open-ended question allowed participants to share any further insights, recommendations, or concerns that were not covered in the structured questions. The qualitative analysis of the comments provided by respondents revealed several interconnected themes regarding the redevelopment project. Most of the respondents emphasised the importance of a committed and stable government, pointing out that political instability and bureaucratic hurdles could significantly impact the timeline of projects and their success. Concerns about delays in land acquisition were also noted, as they could extend the project timeline beyond five years. Respondents stressed that ensuring high-quality infrastructure and integrating smart building technologies would make the project more attractive to investors. Furthermore, there were significant concerns regarding the consistency and reliability of government policies, with participants indicating a lack of confidence in long-term commitments from authorities. To mitigate risks, respondents expressed the need for concrete incentives, such as tax breaks and long-term leasing assurances. They also called for clarity on regulatory approvals, as it could hinder commitment to the projects. Moreover, traffic management emerged as a crucial consideration, with respondents identifying it as a major concern that could affect the usability of redeveloped spaces. Generally, while there was a recognition of the potential of the proposed projects to redefine urban living in Faisalabad, respondents emphasised the need for robust planning and a clear strategy to realise their benefits effectively.



Interviews with Government Officials

We conducted interviews with government officials from four departments, three of which are directly relevant to urban planning and development in Faisalabad: the FDA, the MC, and the Provincial Building Department, while the fourth, PR, owns some underutilised land parcels in the city. These discussions aimed at gathering valuable insights regarding the proposed redevelopment of three government-owned land parcels, ensuring a comprehensive understanding of the challenges, opportunities, and strategic considerations involved in this initiative.

Perspective of Faisalabad Development Authority (FDA)

Interviews with officials from the FDA, including a Director of Town Planning with more than 10 years of experience, a Deputy Director of GIS with 5-10 years of experience and an Assistant Director with less than 5 years of experience, provided valuable insights. The officials highlighted that these parcels were currently partially utilised but had significant potential for development. They identified several key challenges impeding progress, including political instability, poor decision-making processes, lack of funding, and inadequate planning. They expressed strong support for the redevelopment initiative, noting benefits such as improved land utilisation, economic development, job creation, and enhanced environmental and social benefits, including the creation of green spaces and walkable areas. They emphasised the importance of environmental sustainability, prioritising green building design, energy efficiency, and the integration of renewable energy sources in the redevelopment plans.

The officials pointed out that the current approval process for redevelopment was complicated and slow, primarily due to a lack of coordination among various government departments. They proposed that a comprehensive redevelopment policy be established to facilitate the process. The Deputy Director noted that a BOT model for the PPP could be effective, enabling faster project execution while ensuring streamlined regulatory approvals. However, concerns regarding potential corruption or favouritism in partner selection were raised. Additionally, they stressed the need to reserve a portion of the redeveloped land for affordable housing to address local housing shortages.

While responding to a question about whether their department was planning any redevelopment of underutilised state-owned land in the city, the Director of Town Planning stated that, as a predominantly regulatory body, the role of the FDA is limited to preparing the city master plan and does not extend to

initiating land redevelopment projects on its own. In the case of state-owned land, they require guidance and approval from the provincial government for any development or redevelopment. For privately owned land, their role is limited to approving maps and related documents. The Assistant Director highlighted the importance of public awareness in supporting the redevelopment efforts and pointed out the need for government-funded infrastructure improvements, including roads and utilities, to enhance project viability. They collectively recognised the necessity of creating pedestrian-friendly zones and improving public transportation connectivity to enhance safety and the overall urban experience.

Viewpoint of Municipal Corporation (MC)

Respondents included a Municipal Officer (Planning) with over 20 years of experience, a Building Surveyor with 10-20 years of experience, and a Building Inspector with 10-20 years of experience, involved in urban planning, infrastructure development, regulatory approvals, and property management. They described the current state of the land parcels as partially utilised but possessing significant potential for redevelopment. Key reasons for underutilisation were identified, which include a lack of funding, legal disputes over ownership, inadequate planning, and political instability. The officials strongly supported the redevelopment of mixed-use, high-rise projects, citing such benefits as economic development, improved urban infrastructure, and enhanced public spaces. They noted several challenges, including funding limitations and poor inter-agency coordination. Environmental sustainability was deemed very important, with a focus on green building design, energy efficiency, and increased public green spaces.

The official from the MC termed the current approval process for redevelopment as complicated and slow, with a lack of coordination among agencies. Suggested regulatory reforms included a comprehensive redevelopment policy, simplified land acquisition processes, and the inclusion of PPPs. While opinions on the suitability of PPP models varied, there was a consensus on the potential benefits of faster project execution and improved accountability. However, concerns were raised about legal complexities and the risk of favouritism in partner selection. The officials emphasised the need for transparent processes and incentives, such as long-term leases at discounted rates, to encourage private-sector participation in the redevelopment project. The response from the MC officials regarding whether their department was planning any redevelopment of underutilised state-owned land in the city was largely the same as that of the FDA officials.



They explained that, as a predominantly regulatory body, they were unable to take the initiative on their own.

The Opinions of the Provincial Building Department

In the interviews with officials from the Provincial Building Department, including an executive district officer (EDO) of Works and a Deputy Director of Building, valuable insights were gathered regarding the proposed redevelopment of three government-owned land parcels. Both officials, each with 10-20 years of experience in land use planning, zoning, infrastructure development, and regulatory approvals, described the current state of the parcels as partially utilised but full of potential. They identified key reasons for underutilisation, which include a lack of funding and inconsistent government policies. Both officials strongly supported the redevelopment, citing benefits such as economic development, job creation, improved urban infrastructure, and environmental and social advantages like green spaces and walkability.

Challenges mentioned included regulatory hurdles, funding limitations, and the need for better coordination among government agencies. Environmental sustainability was emphasised as very important, with priorities including green building design, waste management, water conservation measures, and renewable energy integration. The officials highlighted the importance of creating pedestrian-friendly zones, enhancing safety through better street lighting, and encouraging mixed-use developments that incorporate public art and cultural installations. The approval process for redevelopment was described as somewhat complex but manageable, though improvements in inter-agency coordination were deemed necessary.

Recommendations for regulatory reforms included modernising land use and building codes, and implementing an incentivised redevelopment policy. Both officials expressed support for PPP, identifying the DBFO model as particularly suitable due to its potential for accessing private-sector financing and expertise in large-scale infrastructure development. However, concerns regarding financial risks, legal complexities, and partner coordination were raised by the officials. They emphasised the need for streamlined regulatory approvals and government-funded infrastructure improvements to facilitate the redevelopment process. They concluded that identifying underutilised public assets for repurposing could enable the state to capitalise on its assets while allowing private partners to maximise their investment potential.

Insights from Pakistan Railways

Interviews conducted with officials from PR, specifically two Inspectors of Works with experience ranging from 10 to 20 years, provided important insights. Both officials, involved in land use planning and preparing proposals for the development and property management owned by PR in the region, noted that the railway land is currently partially utilised but holds considerable potential. They identified several challenges leading to underutilisation, including a lack of funding, legal disputes over ownership and usage rights, inconsistent government policies, and poor decision-making processes.

Both officials strongly supported the redevelopment initiative, emphasising the potential benefits such as economic development, job creation, improved urban infrastructure, and enhanced environmental and social benefits like green spaces and walkability. They acknowledged that coordination among multiple government agencies poses a significant challenge in advancing the redevelopment plans. The officials expressed that environmental sustainability is very important, with priorities focusing on green building design, energy efficiency, and increasing public green spaces. They highlighted the need for pedestrian-friendly zones, improved safety through better street lighting, and wider sidewalks with seating areas to enhance the overall urban experience.

They described the current approval process as complicated and slow, with a notable lack of coordination between departments. Suggested reforms included implementing a fast-track approval system and encouraging mixed-use developments. Both officials supported the LDO model for the PPP, recognising its advantages for faster project execution and access to private-sector financing. However, they cautioned about potential legal and regulatory complexities and the need for quality control and performance monitoring.

While answering a question about whether their department was planning any kind of redevelopment on the PR land in the city, the officials stated that they had submitted a plan for 17 high-rise commercial buildings on the 52-acre old Railway Mall Godowns parcel, with 20 to 25 stories, a 60-foot-wide road connecting to Rajbah Road, and 50-foot-wide internal roads. Moreover, another plan was under consideration to redevelop an old 7 kanal, Railway Police Station into a multistorey plaza with a total capacity of 37 commercial outlets. Additionally, there was another plan to redevelop the Railway Rest House on Tariqabad Road, but no final plan had yet been submitted for this parcel.



They mentioned that all the plans involved leasing the land for 33 years with the possibility of extension one year before the lease period expires, excluding the mobilisation period, which could last 1 to 3 years. They stressed the importance of ensuring that the redevelopment was well-connected to public transportation to improve accessibility and promote sustainable transport options. Additionally, they emphasised that incorporating parks and community centres into the plans would be vital for fostering social interaction and enhancing community well-being.

Identified Key Themes

The analysis of interviews with government officials from four key departments in the city reveals some common themes surrounding the redevelopment of government-owned land parcels. The officials uniformly acknowledged the potential for economic growth, improved infrastructure, and environmental benefits like green spaces and pedestrian-friendly zones. However, they also cited significant challenges, including political instability, lack of funding, inter-agency coordination issues, and legal complexities. All departments supported PPP as a strategy for redevelopment, though concerns about corruption and favouritism were raised. Environmental sustainability was emphasised across the board, with a focus on green building designs, renewable energy, and urban spaces that prioritise walkability. The PR officials shared detailed redevelopment plans for specific parcels, underlining the need for improved public transportation connections and community-focused spaces. The overall sentiment from all departments was positive, but reforms in regulatory processes and infrastructure development are necessary to realise the potential of these underutilised parcels.



9. PROPOSED LAND-USE PLANS

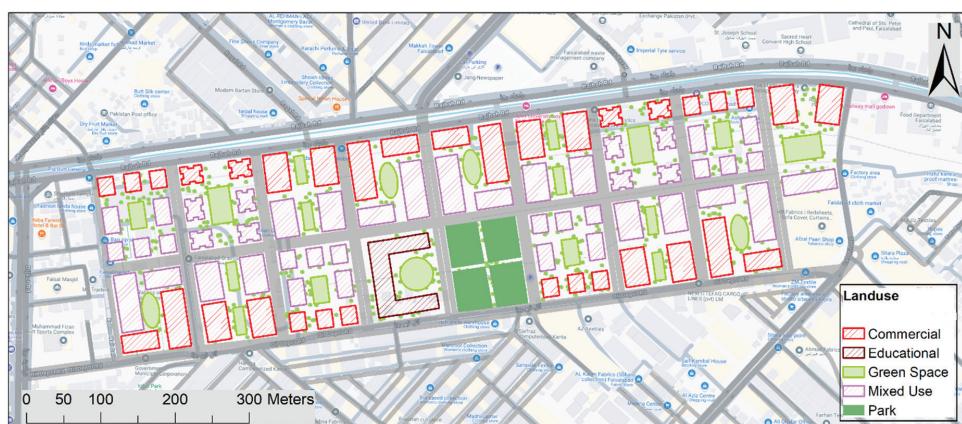
This section presents proposals for the redevelopment interventions at the three selected sites,

Railway Land Parcel

The land use plan for the railway land is designed to transform this underutilised and partially vacant area into a vibrant, sustainable, and economically productive urban space. The proposed land uses are categorised into six primary types, each fulfilling a specific role in the overall redevelopment strategy. These categories include:

Commercial Lots: Commercial zones are strategically designated along the primary arterial road, Rajbah Road, and within accessible areas to encourage business activity, trade, and commerce. These zones will host retail outlets, office spaces, restaurants, and markets, catering to both residents and city-wide visitors.

Figure 27: Proposed Land Use for Railway Land



Source: Authors' illustration.



Educational Zone: Educational zones provide dedicated spaces for schools, training centres, and higher education facilities. These areas are located close to residential neighbourhoods, ensuring ease of access for students and promoting educational growth.

Green Spaces: Scattered throughout the site, green spaces serve as buffer zones and provide environmental benefits, such as improving air quality, reducing urban heat islands, and enhancing aesthetics. These spaces will include community gardens, landscaped green areas, and small urban forests.

Mixed-Use Lots: Mixed-use zones integrate residential, commercial, and recreational activities, promoting a compact and dynamic urban environment. These areas are strategically placed to ensure connectivity and accessibility, fostering a live-work-play lifestyle.

Parks: Large parks are located centrally to provide recreational and fitness opportunities for the community. These parks will feature jogging tracks, playgrounds, and open lawns, contributing to the physical and mental well-being of the residents.

Spatial Distribution Rationale: The land use plan for the railway land integrates economic growth, environmental resilience, and social inclusivity. This regeneration project is set to transform the area into a thriving urban hub that serves as a model for sustainable urban development. The spatial distribution of the proposed land uses has been carefully planned to optimise functionality, accessibility, and sustainability. Commercial lots are concentrated along Rajbah Road and Oil Depot Road, where they may benefit from high visibility and accessibility. This placement leverages the road's traffic flow, making it ideal for businesses and retail outlets. Smaller commercial plots are scattered throughout the site to support local markets and neighbourhood-level businesses.

The educational zone is located near residential and mixed-use areas to promote inclusivity and accessibility for families and students. This may encourage the development of a learning hub, contributing to long-term social development. Parks and green spaces are strategically positioned in central and prominent locations to maximise access for the community. Smaller green spaces are integrated across the site to act as recreational nodes and buffer zones between different land uses. Parks act as lungs for the regenerated urban space, improving environmental quality and fostering social interaction.



Mixed-use zones are dispersed throughout the site to balance commercial, residential, and recreational needs. Their distribution ensures vibrant and compact development, reducing dependency on automobiles and promoting walkability. This spatial allocation fosters synergy between land uses, ensuring a balance between economic growth, social services, and environmental sustainability. The proximity of residential, commercial, and green areas creates a cohesive urban environment that prioritises quality of life.

GOR Site Land Use Plan

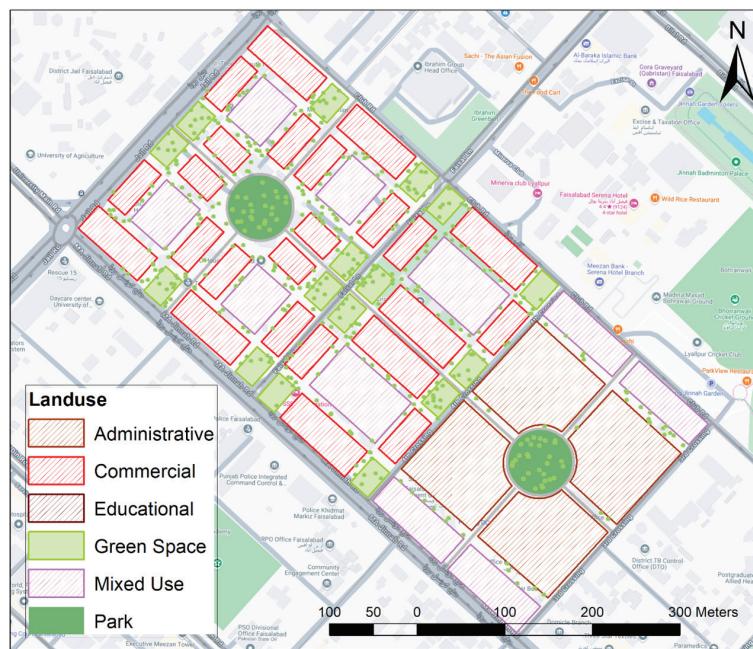
The proposed land use plan for the GOR site is designed to achieve a sustainable, inclusive, and functional urban regeneration project. The GOR area, characterised by its prime location and underutilised single-story residential structures, has been reenvisioned into a vibrant mixed-use urban hub. The plan integrates diverse land uses, including commercial, administrative, mixed-use, green spaces, and parks, to address the community's needs while ensuring environmental sustainability and economic development. The spatial distribution of the land use categories has been carefully planned to optimise accessibility, functionality, and aesthetic appeal:

Commercial Zones: The commercial areas (depicted in red in Figure 28) are strategically located along the major roads surrounding the site. These corridors provide high visibility and accessibility, fostering economic activity and retail development. The placement of commercial zones creates a buffer between the GOR site and adjacent neighbourhoods while encouraging local businesses, shopping centres, and service facilities.

Mixed-Use Development: The mixed-use blocks dominate the central sections of the site. This integration supports a combination of residential, commercial, and office functions within the same buildings, promoting walkability and reducing the dependency on private vehicles. Mixed-use developments are aligned along internal roads and green spaces to ensure easy access and connectivity to parks and other amenities.



Figure 28: Proposed Land Use Plan for GOR Site



Source: Authors' illustration.

Administrative Zones: Administrative spaces are concentrated in the southern section of the site. These zones are intended to accommodate the government offices, public services, and institutional headquarters, some of which are already stationed at the same place, such as the DC office etc. The clustering of administrative functions ensures efficient coordination and accessibility to the nearby city centre.

Green Spaces: Green spaces (highlighted in light green in Figure 28) are distributed throughout the site, ensuring a balanced urban environment. Smaller pockets of green spaces are interspersed within mixed-use and residential zones to provide recreational opportunities and environmental benefits. Larger green spaces, including tree-lined streets and gardens, enhance the visual quality of the site while serving as gathering points for residents.

Parks: Two significant park areas (depicted in dark green) form the core of the GOR site. These parks serve as focal points for urban design, offering ample space for recreational, cultural, and community activities. The circular design of the parks enhances connectivity and creates iconic landmarks within the regenerated urban fabric.

Expected Outcomes of the Regeneration Plan: The GOR site's land use plan aims to achieve several key outcomes. Firstly, the commercial and mixed-use zones will stimulate economic growth by creating opportunities for businesses, retail outlets, and service providers. Job creation in commercial, administrative, and educational sectors will contribute to reducing unemployment and boosting the local economy. The integration of parks, green spaces, and mixed-use developments enhances the overall urban environment, making it more livable, attractive, and vibrant for residents and visitors. The green infrastructure will promote healthier lifestyles, offering recreational spaces and walkable pathways. The land use plan prioritises environmental sustainability by incorporating green spaces, parks, and energy-efficient mixed-use buildings. Improved pedestrian accessibility and reduced vehicular dependence contribute to lower carbon emissions and a cleaner urban environment. The spatial organisation fosters social interaction and inclusivity through parks, educational facilities, and public spaces.

The design supports a diverse population by offering spaces for residential, educational, and commercial activities within proximity. By clustering administrative and commercial activities along major roads, the plan ensures efficient access and functionality for businesses, offices, and services. This layout minimises urban congestion and maximises connectivity. It strikes a balance between functionality, economic viability, and environmental sustainability. The strategic allocation of land uses ensures an efficient, livable, and vibrant urban space, enhancing its role as a key asset in the city's growth. The emphasis on mixed-use development, green infrastructure, and community-centred spaces positions the GOR site as a model for sustainable urban regeneration in Faisalabad.

PCBL Site Land Use Plan

The proposed layout for the PCBL land parcel is designed to create a balanced and efficient urban environment. It features three distinct zones, including two commercial high-rise buildings, one mixed-use high-rise building, and a central park, which serves as the focal point of the development, providing a recreational and social hub. The commercial areas are strategically placed along Station Road to maximise visibility and accessibility. The mixed-use zone integrates residential, retail, and office spaces, promoting a cohesive live-work-play environment. Green space ensures a harmonious blend of built and natural environments. The design also incorporates well-defined pathways and road networks, ensuring seamless connectivity across the development.



The layout is based on a strategic approach to optimise the functionality and sustainability of the land parcel. Placing commercial zones along Station Road leverages the high footfall and vehicular traffic, creating a prime location for business activities. Mixed-use zones are positioned to foster the integration of diverse activities, creating vibrant, self-sustaining neighbourhoods. Green spaces and a central park are prioritised to enhance environmental sustainability and improve the overall quality of life. The central park, acting as a landmark, anchors the development while providing a unique identity. The layout emphasises accessibility, community integration, and ecological balance to create a thriving urban space.

This urban regeneration plan offers significant benefits. Economically, it boosts property values, generates employment opportunities, and attracts investment in both commercial and residential sectors. Environmentally, the inclusion of green spaces promotes urban biodiversity, reduces the heat island effect, and encourages sustainable commuting through pedestrian-friendly pathways. Socially, the layout enhances community interaction, offering spaces like the central park and mixed-use areas where residents can connect and engage. The overall design combines aesthetic appeal with functional utility, ensuring an improved quality of life for residents and visitors while contributing to the broader goal of sustainable urban development.

Figure 29: Proposed Land Use Plan for PCBL Site



Source: Authors' illustration.



10. ECONOMIC ANALYSIS

This section presents the site overviews, proposed land-use distributions, construction details, building types, features, and financial feasibility of the proposed redevelopment of the three sites.

GOR Site

The proposed redevelopment project for the GOR site covers a total area of 2,336,242 sq ft, with 481,950 sq ft allocated to internal roads. Located just 270 metres from the city centre, the site offers a prime location with a current land price of PKR 77,135 per sq ft.

Table 21: GOR Site Overview

Category	Attribute	Value
Site overview	Total area of the site	2,336,242 sq ft
	Total area for internal roads	481,950 sq ft
	Distance of the site from the city centre	270 metre
	Land Price	PKR 77,135 per sq ft
Land-use distribution	Administrative	4 parcels
	Commercial	24 parcels
	Mixed-use	10 parcels
	Green space	16 parcels
	Parks	2 parcels
Construction areas	Administrative	448,586 sq ft
	Commercial	562,008 sq ft
	Mixed-use	436,760 sq ft
	Green space	166,784 sq ft
	Parks	90,016 sq ft
Building type	Administrative: High rise (4)	25 floors
	Commercial: Medium rise (8)	20 floors
	Commercial: Low rise (16)	15 floors
	Mixed-use: High rise (2)	25 floors
	Mixed-use: Medium rise (8)	20 floors
	Green Space and Park (18)	...

Source: Authors' calculations.

The project focuses on a mixed-use urban design, balancing administrative, commercial, residential, and recreational spaces. The administrative zone includes 4 parcels with high-rise buildings, each having 25 floors, while the commercial zone spans 24 parcels with medium-rise buildings of 20 floors



each. The mixed-use zone comprises 10 parcels, featuring both low-rise buildings with 15 floors and high-rise buildings with 25 floors. To enhance sustainability, 16 parcels are dedicated to green spaces and 2 parcels to parks, accounting for open areas that promote livability. The total construction area is allocated as 448,586 sq ft for administrative use, 562,008 sq ft for commercial purposes, 436,760 sq ft for mixed-use buildings, 166,784 sq ft for green spaces, and 90,016 sq ft for parks. This project aims to transform the GOR site into a modern, vibrant urban hub by combining residential comfort, economic activity, and recreational amenities, while ensuring sustainable and efficient land use.

Financial Feasibility

This analysis evaluates the project's financial feasibility, quantifying costs and benefits, calculating key financial metrics such as net present value (NPV) and cost-benefit ratio (CBR), and assessing risks and sensitivities. The findings demonstrate that this project offers significant benefits, making it a viable and impactful initiative.

Table 22: Financial Feasibility of GOR Site

Category	Attribute	Value (PKR Billion)
Total project cost	Buildings, roads, green spaces, and parks	223.4
Total project revenue	Constructed spaces	398.8
Road construction cost	Cost per sq ft = PKR 8,000	3.86
Building construction costs	Administrative: High Rise (per sq ft = PKR 10,000)	112.15
	Commercial: Mid-rise (per sq ft = PKR 5,000) Low rise (per sq ft = PKR 3,500)	43.64
	Mixed-Use: High rise (per sq ft = PKR 10,000) Mid-rise (per sq ft = PKR 5,000)	63.63
Green space and parks cost	Cost per sq ft = PKR 5,000	0.13
Revenues	Administrative	168.22
	Commercial	111.09
	Mixed-use	119.45
Key financial metrics	NPV (Discount rate = 12%, time = 5 years, and annual inflation rate = 8.6%)	137.85
	CBR	1.78

Source: Authors' calculations.



The total project cost, including road and building construction, is estimated at PKR 223.4 billion, while total projected revenue from the sale of administrative, commercial, and mixed-use spaces stands at PKR 398.8 billion. Road construction costs, calculated for an internal area of 0.48 million sq ft at PKR 8,000 per sq ft, amount to PKR 3.86 billion. Building construction costs are divided into administrative high-rise buildings (PKR 112.15 billion), commercial medium- and low-rise buildings (PKR 43.64 billion), and mixed-use high- and medium-rise buildings (PKR 63.63 billion), with green spaces and parks accounting for PKR 0.13 billion. The revenue breakdown highlights PKR 168.22 billion from administrative high-rise spaces, PKR 111.09 billion from commercial spaces, and PKR 119.45 billion from mixed-use spaces. Financial viability is confirmed with a positive NPV and a CBR of 1.78.

The project is resilient to moderate changes in costs and revenues, although risks, such as construction delays, market fluctuations, and regulatory challenges, remain critical considerations. The analysis indicates that the project is both economically viable and resilient, with strong profitability margins. The CBR of 1.78 reflects a significant return on investment, and the NPR of PKR 137.85 billion underscores its financial attractiveness. Nevertheless, while the project remains viable under cost and revenue fluctuations, proactive strategies to mitigate risks like regulatory delays, market uncertainties, and construction challenges are essential to maintain profitability and ensure successful implementation.

Railway Land Site

The Railways site redevelopment project encompasses a total area of 2,550,691 sq ft, with 522,120 sq ft allocated to internal roads, and is located just 34 meters from the city centre, making it highly accessible. The land price is PKR 66,116 per sq ft. The proposed land-use distribution includes one parcel for educational purposes, 34 parcels for commercial development, 45 parcels for mixed-use projects, 20 parcels for green spaces, and 1 parcel for parks, ensuring a diverse and functional layout. Construction areas are divided into 52,304 sq ft for educational buildings, 418,654 sq ft for commercial spaces, 494,466 sq ft for mixed-use structures, 180,061 sq ft for green spaces, and 111,720 sq ft for parks. Building types include one medium-rise educational building with 20 floors, 34 high-rise commercial buildings with 30 floors each, 20 high-rise mixed-use buildings with 30 floors each, 15 medium-rise mixed-use buildings with 20 floors each, and 21 parcels dedicated to green spaces and parks, emphasising a blend of utility and open areas.



Table 23: The Railway Site Overview

Category	Attribute	Value
Site overview	Total area of the site	2,550,691 sq ft
	Total area for internal roads	522,120 sq ft
	Distance of the site from the city centre	34 metres
	Land price per sq ft	PKR 66,116
Land-use distribution	Educational	1 parcel
	Commercial	34 parcels
	Mixed-use	45 parcels
	Green space	20 parcels
	Parks	1 parcel
Construction areas	Educational	52,304 sq ft
	Commercial	418,654 sq ft
	Mixed-use	494,466 sq ft
	Green space	180,061 sq ft
	Parks	111,720 sq ft
Building type	Educational: medium rise (1)	20 floors
	Commercial: high rise (34)	30 floors
	Mixed-Use: high rise (20)	30 floors
	Mixed-Use: medium rise (15)	20 floors
	Green space and park (21)	...

Source: Authors' calculations.

Financial Feasibility

The total project cost for buildings, roads, green spaces, and parks is estimated at PKR 224.17 billion, while the total projected revenue from constructed spaces amounts to PKR 485.26 billion, reflecting a highly favourable CBR of 2.16. Road construction, with a cost of PKR 8,000 per sq ft, accounts for PKR 4.18 billion. Building construction costs include PKR 5.23 billion for mid-rise educational spaces at PKR 5,000 per sq ft, PKR 97.85 billion for high-rise commercial spaces at PKR 10,000 per sq ft, and PKR 96.36 billion for mixed-use developments, combining high-rise at PKR 10,000 per sq ft and mid-rise at PKR 5000 per sq ft structures. Green spaces and parks contribute an additional PKR 20.55 billion at PKR 500 per sq ft.

The revenue breakdown includes PKR 168.22 billion from administrative spaces, PKR 111.09 billion from commercial spaces, and PKR 119.45 billion from mixed-use developments. Financially, the project has a positive NPV of PKR 51.57 billion. Sensitivity analysis reveals the project's resilience, with an NPV of PKR 29.15 billion and a CBR of 1.97 with a 10% cost increase, and an

NPV of PKR 23.99 billion and a CBR of 1.95 with a 10% revenue reduction. Key risks include inflation at 8.6% annual average, market demand fluctuations, potential project delays, and regulatory challenges, which could impact cost and revenue projections. The analysis highlights the robustness of the proposed redevelopment project, showcasing strong profitability and resilience against cost and revenue variations. With a positive Net Present Value, a high Cost-Benefit Ratio, and projected revenues more than doubling the total costs, the project is economically viable. However, careful risk management is essential to address potential challenges, including inflation, regulatory hurdles, and market uncertainties, ensuring the project's financial success.

Table 24: Financial Feasibility of the Railway Land Site

Category	Attribute	Value (PKR Billion)
Total project cost	Buildings, roads, green spaces, and parks	224.17
Total project revenue	Constructed spaces	485.26
Road construction cost	Cost per sq ft = PKR 8,000	4.18
Building construction cost	Educational: Mid Rise (per sq ft = PKR 5,000)	5.23
	Commercial: High rise (per sq ft = PKR 10,000)	97.85
	Mixed-Use: High rise (per sq feet = PKR 10,000) Mid rise (per sq ft = PKR 5,000)	96.36
Green spaces and parks cost	Cost per sq ft = PKR 500	20.55
Revenues	Administrative	168.22
	Commercial	111.09
	Mixed-use	119.45
Key financial metrics	NPV (Discount rate=12%, time=5 years and annual inflation rate = 8.6%)	51.57
	CBR	2.16

Source: Authors' calculations.



PCBL Site

The PCBL site encompasses a total area of 84,263 sq ft and is strategically situated 788 meters from the city centre, enhancing its accessibility and attractiveness for urban redevelopment. Within the site, 20,880 sq ft are dedicated to internal roads, ensuring efficient transportation and connectivity. The land is valued at PKR 62,443 per sq ft, reflecting its high investment potential. The proposed land-use plan includes four primary categories, namely, commercial, mixed-use, green spaces, and parks. The commercial sector occupies 32,407 sq ft across two parcels, each featuring high-rise buildings with 30 floors, ideal for business and office spaces. Mixed-use is allocated 11,537 sq ft in a single parcel, also designated for a high-rise building with 30 floors, integrating both residential and commercial functionalities. Green space covers 16,232 sq ft distributed over six parcels, and the park occupies 3,207 sq ft, providing essential recreational and environmental benefits for the community. This balanced layout ensures a harmonious blend of commercial development and ample green and recreational spaces, fostering a vibrant, sustainable, and functional urban environment.

Table 25: The PCBL Site Overview

Category	Attribute	Value
Site overview	Total area of the site	84,263 sq ft
	Total area for internal roads	20,880 sq ft
	Distance of the site from the city centre	788 metres
	Land price per sq ft	PKR 62,443
Land-use distribution	Commercial	2 parcels
	Mixed-use	1 parcel
	Green space	6 parcels
	Parks	1 parcel
Construction areas	Commercial	32,407 sq ft
	Mixed-use	11,537 sq ft
	Green space	16,232 sq ft
	Park	3,207 sq ft
Building type	Commercial: High rise (2)	30 floors
	Mixed-Use: High rise (1)	30 floors
	Green space and park (7)	

Source: Authors' calculations.

Financial Feasibility

The financial feasibility analysis of the PCBL land parcel redevelopment project highlights strong viability and profitability. The total project cost, including roads and building construction, is estimated at PKR 13.36 billion, with major contributors being the commercial high-rise buildings (PKR 9.72 billion), mixed-use high-rise buildings (PKR 3.46 billion), and internal roads (PKR 167 million). Projected revenue from the sale of commercial and mixed-use spaces is PKR 31.92 billion, with the commercial component contributing PKR 24.31 billion and the mixed-use component PKR 7.61 billion. Key financial metrics indicate an NPV of PKR 4.78 billion (at a 12% discount rate over five years) and a CBR of 2.39, suggesting significant returns on investment. Sensitivity analysis reveals that the project remains viable under moderate increases in construction costs or decreases in revenue, with both NPV and CBR remaining positive. Risks, such as inflation (8.6% average annual rate), market demand fluctuations, and project delays, could impact outcomes, but these can be mitigated with effective strategies. Overall, the redevelopment project is financially feasible, offering robust returns and resilience to potential economic variations, provided that risks are carefully managed.

Table 26: Financial Feasibility of PCBL Site

Category	Attribute	Value (PKR Billions)
Total project cost	Buildings, roads, green spaces, and parks	13.36
Total project revenue	Constructed spaces	31.92
Road construction cost	Cost per sq ft = PKR 8,000	0.167
Building construction costs		
	Commercial: High rise (per sq ft = PKR 10,000)	9.72
	Mixed-Use: High rise (per sq ft = PKR 10,000)	3.46
Green space and parks cost	Cost per sq ft = PKR 500	0.013
Revenues	Commercial	24.31
	Mixed-use	7.61
Key financial metrics	NPV (Discount rate = 12%, time = 5 years, and annual inflation rate = 8.6%)	4.78
	CBR	2.39

Source: Authors' calculations.



11. PROPOSED PUBLIC-PRIVATE PARTNERSHIP FRAMEWORK

For the redevelopment of the Railways land, the GOR site, and other government-owned land parcels in Faisalabad, a PPP approach is recommended, leveraging a hybrid model combining JV for planning and governance with DBFO for construction and long-term management. This model aligns with the preferences of local builders and developers as well as key governmental departments, ensuring balanced public-private involvement, risk-sharing, and efficient project execution. The focus will be on creating mixed-use developments with commercial, residential, and green spaces, alongside affordable housing and public amenities such as parks and schools. The proposal prioritises environmental sustainability, walkability, and public transport connectivity, addressing the challenges of inter-agency coordination, funding, and legal complexities identified by the FDA and MC. The PPP model will facilitate private sector investment, ensure economic growth through high-value land use, and promote long-term urban sustainability, benefiting both the economy and the local community.

12. CONCLUSION

This study provides a comprehensive analysis of government-owned land parcels in Faisalabad, focusing on key attributes such as ownership status, land use, land cover, economic status, area, distance from the city centre, and commercial value. The findings reveal that the provincial government holds the majority of these parcels, with diverse land uses and economic potential. Underutilised land parcels, especially those near the city centre and with mid-range commercial values, are identified as prime candidates for urban regeneration. The priority scoring model effectively highlights the most promising parcels for development, emphasising the significance of proximity to the city centre. The moderate negative correlation between distance from the city centre and property price per marla underscores the critical role of location in land value.

This research not only identifies key areas for potential urban regeneration but also provides a framework for future land use planning and development strategies. The detailed analysis of land ownership and use patterns offers valuable insights for policymakers and urban planners aiming to optimise land resources. By focusing on parcels with high development potential, the

study supports the efficient allocation of resources, promoting sustainable urban growth. The highlighted parcels, with their strategic locations and significant economic potential, present opportunities for transformative projects that can drive economic development, enhance urban infrastructure, and improve the quality of life for residents.

Stakeholder insights on the redevelopment of three government-owned land parcels indicate strong public support, with a focus on sustainability, mixed-use development, high-rise buildings, and cultural preservation. The public is optimistic about economic growth, investment opportunities, and desires active community engagement in the planning process, emphasising the importance of public space improvements, transportation, and cultural heritage. Local builders and developers are keen to participate, favouring mixed-use projects as the most profitable.

However, challenges such as land acquisition, regulatory hurdles, and market demand uncertainty are anticipated, with many expecting a project timeline of more than five years. There is widespread support for high-rise buildings, with aesthetic appeal, connectivity, and environmental sustainability prioritised in design considerations. The strong demand for mixed-use development reflects confidence in the market's potential. Environmental sustainability is a key concern, with suggestions for green certifications and renewable energy. Developers highlighted the importance of community benefits, particularly in job creation, infrastructure improvements, and housing options. PPP models, such as BOO and JV, were well received, with incentives like tax breaks and long-term land leasing seen as attractive, though legal and regulatory risks remain significant concerns. Government officials support the redevelopment, recognising its potential for economic growth, infrastructure development, and environmental sustainability, but acknowledge the need to address political instability, funding limitations, and bureaucratic inefficiencies. Transparency and regulatory reforms are crucial for PPP success, and a focus on green spaces, walkability, and improved public transportation can significantly enhance the urban landscape.

Both the proposed redevelopment layout plans exemplify thoughtful urban development, prioritising sustainability, inclusivity, and economic growth. By strategically integrating commercial, mixed-use, and green spaces, these plans foster vibrant, walkable communities that enhance environmental quality, support local businesses, and improve quality of life. Together, they serve as models for sustainable urban transformation, addressing current needs while laying the foundation for long-term resilience and prosperity. All three sites show positive NPVs, indicating financial feasibility. However, the Railways



land site appears to be the most promising in terms of absolute profitability with a strong revenue-to-cost ratio, followed by the GOR Site, which also offers a solid return on investment. The PCBL land site, while smaller in scale, still shows a favourable CBR and can be considered a viable investment, especially if there are capital constraints or if a smaller-scale project is preferable. Key risks across all sites include inflation, market fluctuations, and potential delays, which should be carefully managed to ensure the success of these redevelopment projects.

The recommended approach for redeveloping the selected sites in the study area is a PPP model combining JV for planning and governance with DBFO for construction and long-term management. This model aligns with the preferences of local builders and government departments, ensuring balanced risk-sharing and efficient execution. The focus will be on mixed-use developments with commercial, residential, and green spaces, while addressing challenges like inter-agency coordination and funding. The model aims to promote economic growth, urban sustainability, and public amenities, benefiting both the economy and the local community.

13. POLICY IMPLICATIONS

The concerned authorities of Faisalabad City may harness the full potential of its government-owned land, drive sustainable urban growth, and improve the overall quality of life for its residents by focusing on the following recommendations:

- **Revitalising Underutilised Land Parcels:** Prioritise the redevelopment of underutilised land, especially those near the city centre, as these parcels offer higher commercial potential. Their revitalisation can drive economic growth and urban development.
- **Targeting Provincial and Local Lands:** Parcels owned by provincial and local entities should be prioritised for regeneration efforts, while those owned by national organisations should be addressed through strategic collaboration to facilitate their contribution to the city's development.
- **Enhancing Infrastructure and Amenities:** Improve infrastructure and public amenities in areas near the city centre to increase land value and attract more investment. Better facilities will encourage private sector participation in redevelopment projects.



- **Streamlining Regulatory Processes:** Simplify and expedite approval processes for redevelopment projects by creating a more transparent and efficient system. Streamlining land acquisition and construction permits will reduce delays and uncertainties, fostering a more investment-friendly environment.
- **Strengthening Public-Private Partnership (PPP) Models:** Strengthen policies that support PPP models, especially BOO. Clear guidelines on shared decision-making, risk allocation, and legal protections will attract greater private sector participation in redevelopment projects.
- **Supporting Mixed-Use Development:** Encourage policies that promote mixed-use projects, which reflect developer interest and meet market demand. Offering zoning flexibility to integrate residential, commercial, and office spaces will stimulate diverse and dynamic urban development.
- **Improving Legal Frameworks:** Develop clearer legal frameworks to minimise the risks developers face. This could include predefined arbitration mechanisms, enhanced land tenure security, and a commitment to stable government policies, all of which will boost investor confidence.
- **Extending Long-Term Land Leasing:** Extend long-term land leasing policies to provide security for private developers, allowing them ample time to recoup their investments. This will enhance the appeal of PPPs and promote sustained private investment.
- **Enhancing Public Spaces and Connectivity:** Mandate improvements in public spaces, walkability, and transportation connectivity within redevelopment areas. The enhancement of public transportation and pedestrian-friendly infrastructure will improve the urban environment and attract further investment.
- **Offering Incentives for Sustainable Practices:** Introduce tax breaks and financial incentives for developers who implement green building certifications, renewable energy, and other sustainable practices. This will align development efforts with both public preferences and developer goals for environmental sustainability.



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PART II

SLUDGE AND DEVELOPMENT

Policy Briefs



DIGITALIZATION AND AUTOMATION OF ADMINISTRATIVE PROCEDURES: BUILDING SOLUTIONS FOR ADDRESSING SLUDGE IN SETTING-UP RESTAURANT BUSINESSES

Yasir Zada Khan

INTRODUCTION

Lahore's restaurant industry faces serious regulatory barriers that slow its growth and discourage new entrepreneurs. Excessive paperwork, corruption, and inefficiencies in registration, licensing, and approvals increase both time and costs for business owners. Inspired by PIDE's Sludge Audit Series, this study examines these challenges and proposes a digital, integrated system to simplify processes, cut costs, and promote growth in the sector. It supports e-governance and the "Digital Pakistan" vision by reducing bureaucratic hurdles, improving compliance, encouraging entrepreneurship, and raising service standards. Findings show that restaurant owners face high

costs, frequent demands for bribes, and long approval delays; spending on average about PKR 641,562 on registrations, licenses, and approvals, with sludge accounting for roughly 9.46% of total setup costs. This burden hits small and medium enterprises the hardest, limiting their ability to expand. The sludge cost as a share of Punjab's hotel and restaurant sector's GNP was estimated at 3.77% in 2020, 4.39% in 2021, and declined to 0.50% (following the revised criteria for restaurant classification) in 2022, showing both the scale of the problem and the potential for reform.

METHODOLOGY

The study is divided into three components, explained below.



Component 1:

Situational Analysis;
Registering and Licensing Restaurants in Lahore

Objective:

Investigate regulatory challenges in registering and licensing restaurants in Lahore.

Approach:

Conducted a survey of 242 restaurants categorized into single-branch, multi-branch, and multinational setups.

Goals:

- (i) Identify obstacles faced by restaurant owners during registration across various departments.
- (ii) Analyze the current registration processes and owner perceptions to pinpoint improvement areas.
- (iii) Estimate the total costs incurred by owners for licenses and approvals

Component 2:

Calculating the Costs of Sludge in Restaurant Businesses

Objective:

Quantify the regulatory burden ("sludge cost") as a percentage of:

- (i) Total restaurant setup costs.
- (ii) Sectoral Gross National Product (GNP) of hotels and restaurants in Punjab.

Goals:

- (i) Measure regulatory costs in relation to setup expenses.
- (ii) Evaluate the sludge cost's contribution to the GNP of the hotel and restaurant sector in Punjab.

Component 3:

Development of Digitized & Automated Software Architecture System

Objective:

Build a user-friendly, blockchain-enabled digital registration system for restaurant businesses in Lahore.

Goals:

- (i) Simplify processes through one-time applications and integrated inspections.
- (ii) Minimize waiting periods and eliminate physical visits.
- (iii) Introduce online grievance redressal for anonymous complaints.
- (iv) Establish feedback loops for continuous system improvement.

Key Features:

Centralized platform integrating functions of DTS, PFA, LDA, MCL, etc.

Digitized application process with real-time status tracking, online payments, and single-window approvals.

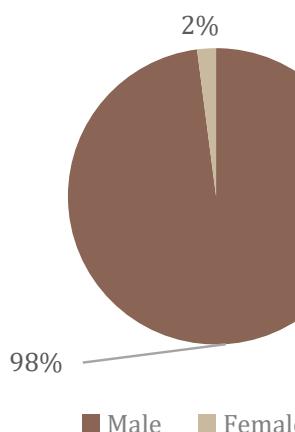
Blockchain/IPFS for secure, tamper-proof records.

FINDINGS AND DISCUSSIONS

The survey of restaurants across Lahore revealed pervasive corruption, inconsistent licensing costs, and systemic inefficiencies within the regulatory framework. Restaurant owners expressed apprehension about discussing costs due to fear of departmental repercussions, highlighting bribery and undue fines by authorities. Licensing expenses varied based on location, timing, seating capacity, and cuisine type, with many owners

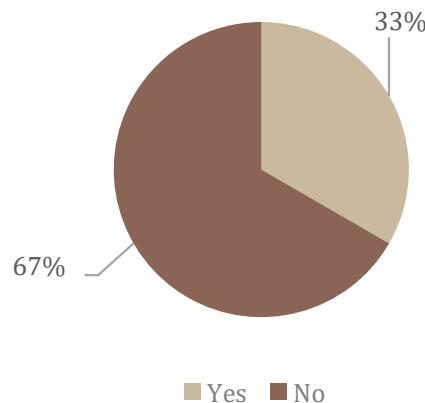
resorting to bribes or influential contacts to expedite processes. Complaints of blackmail and extortion were common, with police demanding bribes, free meals, or cash to permit operations beyond legal hours. Additionally, the involvement of numerous regulatory bodies caused confusion and delays, disproportionately affecting smaller or desi restaurants. These findings underscore a hostile environment for new and small businesses, stifling growth and impeding the ease of doing business.

Figure 1: Gender of Owners



Source: Authors' calculations.

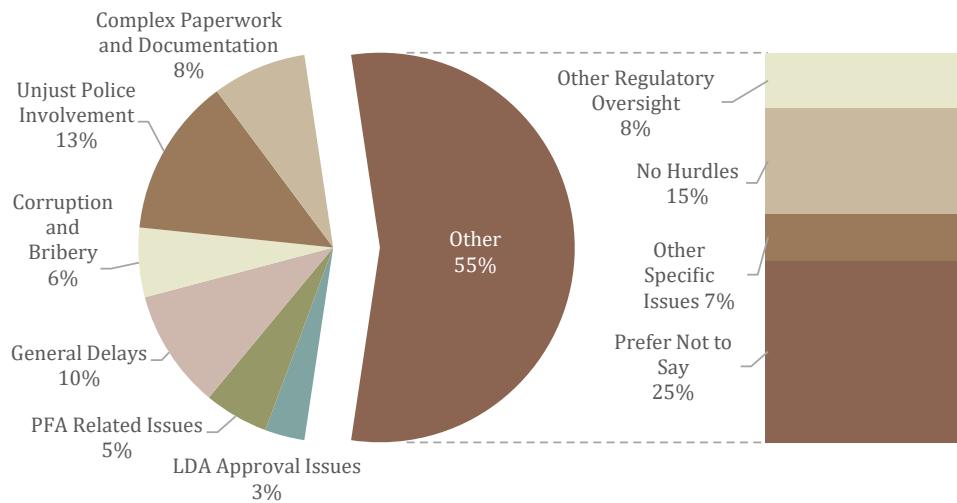
Figure 2: Previous Business Experience



Source: Authors' calculations.

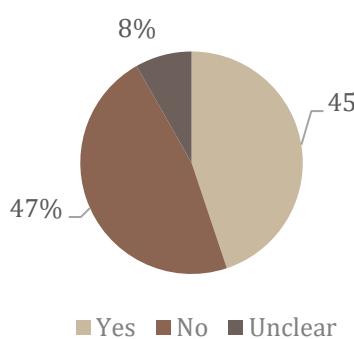


Figure 3: Major Challenges Faced By Owners



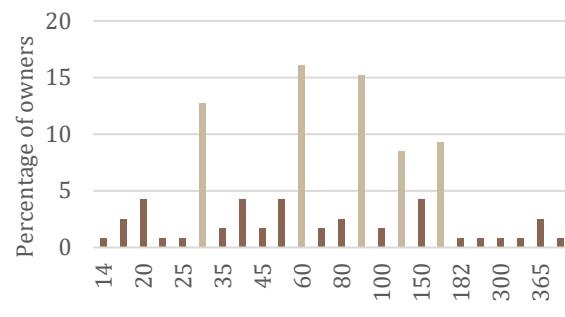
Source: Authors' calculations.

Figure 4: Delays in Approvals



Source: Authors' calculations.

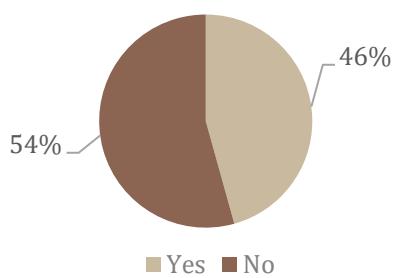
Figure 5: Duration of Delays



Number of days in experiencing overall delays

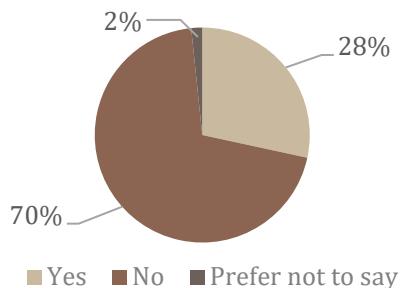
Source: Authors' calculations.

Figure 6: Percentage of Owners Who Hired a Legal Advisor Or Consultant



Source: Authors' calculations.

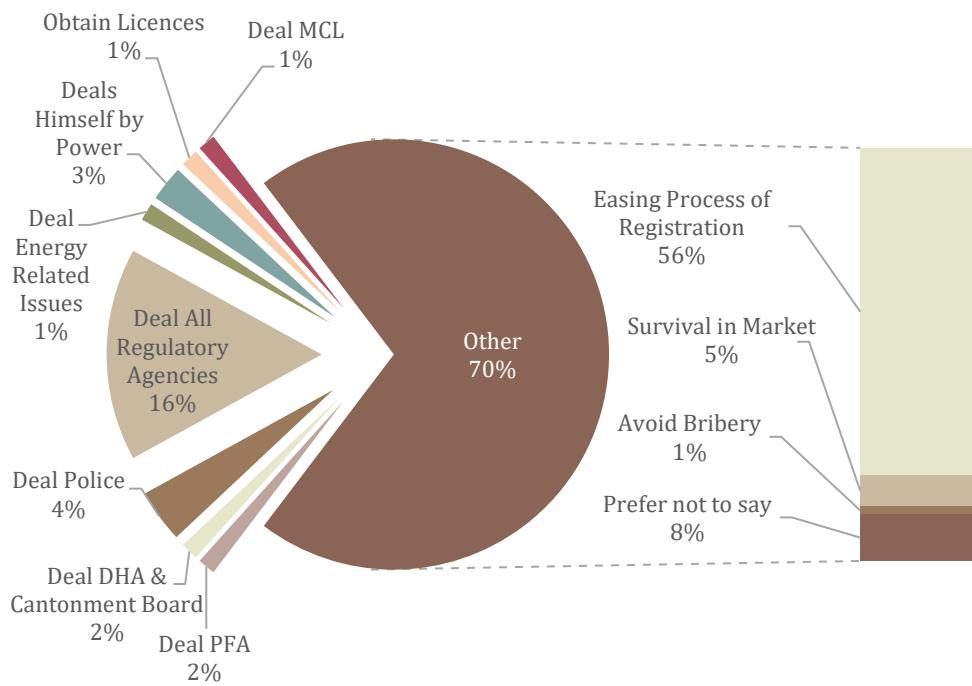
Figure 7: Percentage of Owners Who Ever Approached an Influential Individual



Source: Authors' calculations.

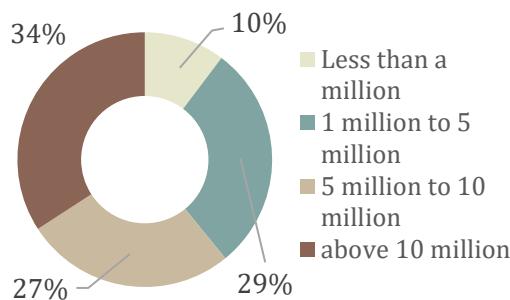


Figure 8: Reasons for Approaching Influential Individuals



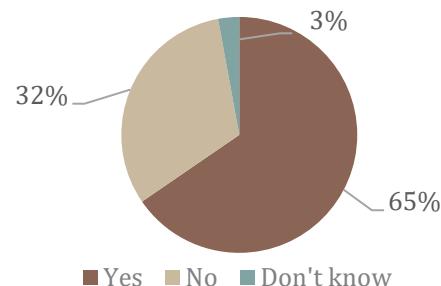
Source: Authors' calculations.

Figure 9: Startup Costs Distribution



Source: Authors' calculations.

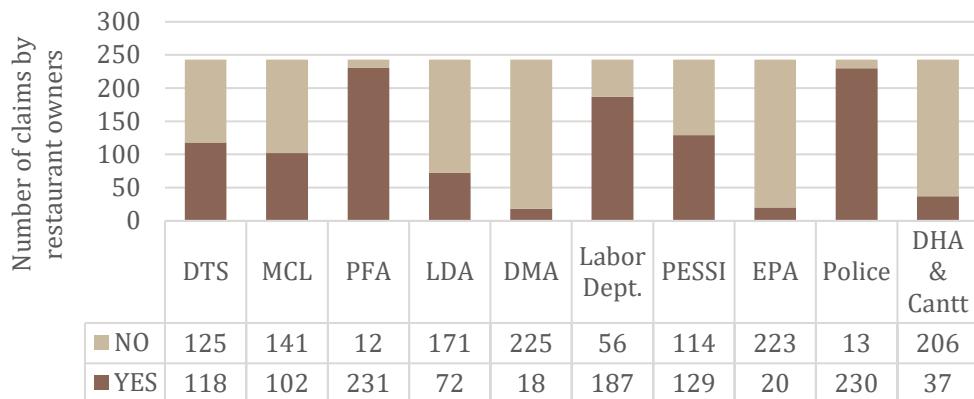
Figure 10: Recurring License Costs



Source: Authors' calculations.

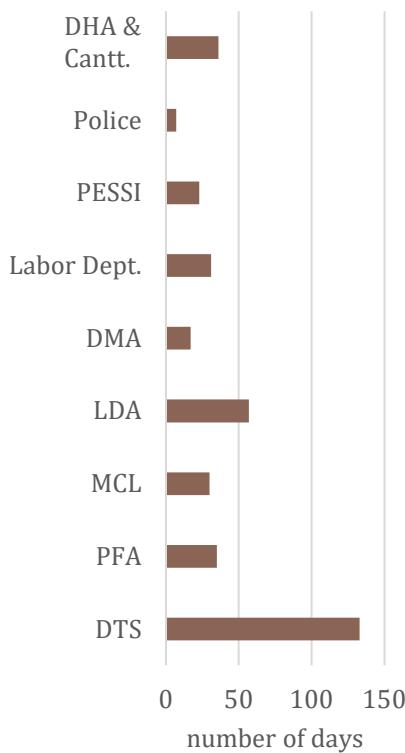


Figure 11: Owners Claiming Involvement of Selected Departments in Business



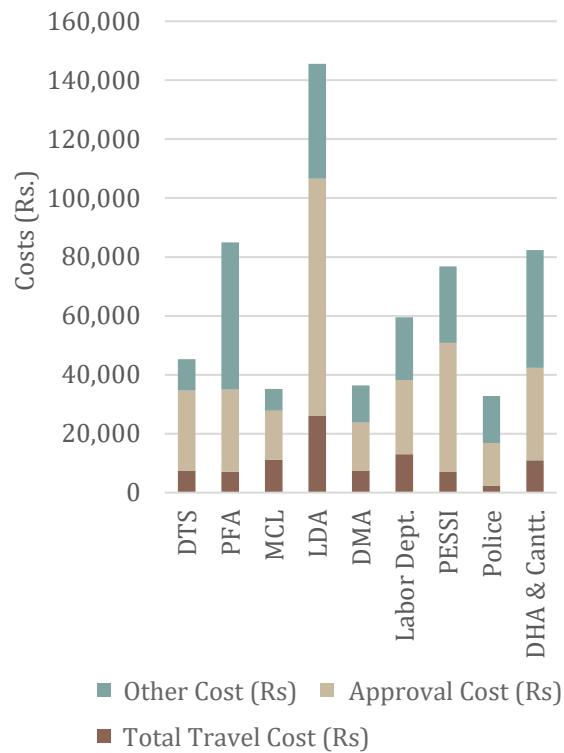
Source: Authors' calculations.

Figure 12: Time Taken for Approvals



Source: Authors' calculations.

Figure 13: Registration/License/Approval Costs by Department



Source: Authors' calculations.



Figure 14: Estimated Total Costs of Registration/License/Approval



Source: Authors' calculations.

By surveying restaurant owners, the study estimated the average setup cost at PKR 6.78 million using linear interpolation across predefined expense categories. The sludge cost, derived from the average regulatory burden, was calculated at PKR

641,562 per restaurant, representing approximately 9.46% of the total setup cost. Moreover, the cost of sludge as a percentage of the National and Punjab GNP is summarised below.

Table 1: Total Cost of Sludge as a Percentage of National and Punjab GNPs

Year	National GNP (Hotels & Restaurants, PKR Million)	Punjab GNP (Hotels & Restaurants, PKR Million)	Total Hotels & Restaurants in Punjab	Total Sludge Cost in Punjab (PKR Million)	Sludge % of Punjab GNP	Sludge % of National GNP
2020-21	726,385	~ 393,676	23,156	~ 14,856	~ 3.77%	~ 2.04%
2021-22	822,966	~ 445,060	30,459	~ 19,541	~ 4.39%	~ 2.37%
2022-23	1,180,653	~ 639,993	4,987	~ 3,199	~ 0.50%	~ 0.27%

Source: Authors' calculations.

POLICY RECOMMENDATIONS

The study highlights the urgent need to modernise the Pakistan Hotel and Restaurants Act, 1976, and its associated Rules of 1977, as they rely

on outdated, manual processes that hinder digitisation and automation. Key reforms recommended include amending the Act to delegate authority to provincial governments, replacing references to the "Federal Government" with "Provincial



Government" to align with constitutional mandates. It is also suggested that provinces be empowered to appoint controllers, formulate rules, and enforce regulations, including granting sealing powers to provincial authorities. These changes aim to decentralise governance, streamline processes, and ensure effective implementation of restaurant

registration and compliance procedures at the provincial level.

Additionally, integrating the functions of various departments and authorities is essential. The following table summarises their integration and performance based on the regulatory review conducted in the study.

Table 2: Integration of Key Players in the Web-Application Portal and Proposed Functioning

Player(s)	Current Functioning	Proposed Functioning & Integration in Web-Application Portal
Federal Government	Appoints Controllers for hotel and restaurant registration.	Delegates the appointment of Controllers for hotel and restaurant registration to Provincial Governments while setting overarching guidelines adaptable through the portal.
Provincial Government	Limited delegated powers for regulation.	Gains full authority to appoint Controllers, Deputy Controllers, and other authorities; monitors and reports activities via the web application.
Controller (DTS)	Inspects premises and processes physical applications for registration and licensing.	Conducts virtual inspections, processes online applications, and approves them via the web portal.
Deputy Controller (DTS) Operations	Handles appeals and additional inspections.	Manages appeals and inspections digitally, tracking them via the portal to ensure transparency and timely resolutions.
Punjab Food Authority (PFA)	Regulates food safety, conducts physical inspections, and processes manual applications for CPR.	Implements online applications, digital CPR issuance, virtual inspections, and integrates food safety compliance checks into the web application for automated feedback and synchronised reviews.



Player(s)	Current Functioning	Proposed Functioning & Integration in Web-Application Portal
Food Safety Officers	Conducts physical inspections and enforces food safety standards.	Conduct virtual inspections, log compliance digitally, and issue improvement notices via the web application while accessing up-to-date compliance records for enforcement.
Public Analysts	Analyses food samples and provides manual reports to the PFA.	Conduct digital analyses, upload reports directly to the web application, and ensure timely actions based on the results.
Metropolitan / Municipal Authorities	Manages local compliance, physical inspections, and fee collection for various permits and licenses.	Use the web application for fee collection, virtual inspections, compliance tracking, and coordination with other authorities for streamlined processes.
Environmental Protection Authority (EPA)	Processes physical applications for Initial Environmental Examination (IEE) and issues NOCs for environmental compliance.	Handles IEE applications, inspections, and NOC approvals digitally, ensuring tracking and notifications through the portal.
Traffic Engineering and Planning Agency (TEPA)	Reviews applications for parking agreements and traffic impact, ensuring compliance with zoning and parking requirements.	Manages parking agreements and traffic compliance digitally, with approvals and assessments processed via the portal.
Labour and Human Resource Department	Conducts physical inspections and ensures compliance with labour laws, including employee registration, wage enforcement, and workplace safety.	Digitises employee registrations, wage compliance checks, and workplace safety audits while allowing restaurant owners to track inspections and resolve disputes through the portal.
Labour Inspectors	Conduct physical inspections to ensure compliance with labour laws, including minimum wage and safety standards.	Log inspection reports and findings digitally, enabling automated follow-ups and recommendations visible on the portal.
Building Control Authority (DHA/LDA)	Reviews physical applications for building plans, commercialisation approvals, and completion certificates.	Enables digital submission and tracking of building plans, zoning compliance, and structural approvals via the web application.



Player(s)	Current Functioning	Proposed Functioning & Integration in Web-Application Portal
District Public Safety Commission (DPC)	Handles complaints against police misconduct and ensures law enforcement support aligns with legal boundaries.	Digitises complaint submissions, follow-ups, and resolutions, allowing restaurants to raise complaints or seek police support through the portal.
Water and Sanitation Agency (WASA)	Reviews physical applications and conducts inspections for water connections, sewerage setups, and compliance with sanitation standards.	Manages online applications for water/sewerage connections, monitors sanitation compliance digitally, and enables restaurant owners to track compliance directly through the portal.
Punjab Employees Social Security Institution (PESSI)	Processes manual registrations and compliance checks related to social security coverage for employees.	Digitises employee registrations for social security and monitors compliance through automated updates, allowing restaurant owners to track employee statuses on the portal.
Civil Defence Department	Conducts physical inspections to ensure fire safety and emergency preparedness in commercial establishments.	Digitises fire safety certifications and compliance checks, integrating inspection results into a centralised system accessible on the portal.
Police Department	Conducts background checks and physical verification of premises.	Provides digital police clearance certificates, conducts online verifications, and uploads results directly into the portal, minimising delays.
Food Business Operators (FBOs)	Submits physical applications, follows up manually, and visits multiple offices for licenses.	Submit online applications, track progress, and receive digital licenses and approvals via the web application, eliminating the need for multiple office visits.
Joint Secretary, Tourism Division, Islamabad	Handles appeals and revisions for hotel and restaurant registrations.	Manages appeals and revisions for hotel and restaurant registrations digitally, ensuring transparency and timely resolution via the web application.
Hotels and Restaurants Committee	Advises on classification, fair rates, and other regulatory matters.	Provides digital advice and recommendations on classification, fair rates, and other regulatory matters, with decisions logged and accessible through the portal for centralised transparency.

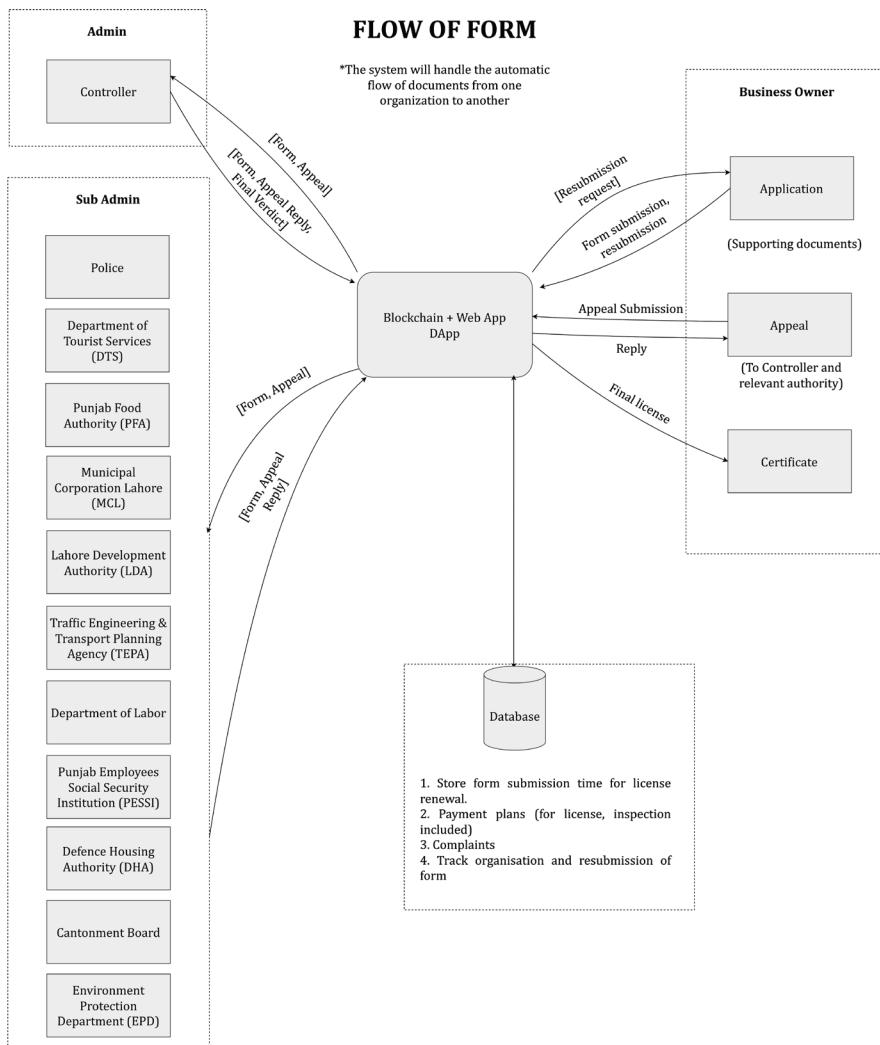
Source: Author's analysis based on regulatory review.



As a solution, the study proposes a web application for restaurant business registration that prioritises user-friendliness, transparency, and security through a blockchain-based architecture. Developed using the MERN stack, the system features a streamlined interface, decentralised data storage via Ethereum blockchain/IPFS, and MongoDB for efficient retrieval. It automates

application submission, tracking, and approvals, replacing paper-based processes with secure digital workflows. Role-based access ensures tailored functionalities for users and administrators, while scalability allows future enhancements, including machine learning integration and expanded functionalities.

Figure 15: Mapping of General Process Flows in the Web Application



Source: Authors' illustration.



The web application streamlines restaurant registration by automating processes from user registration and document submission to inspections, approvals, and license issuance, eliminating manual delays. Key features include dynamic admin management, an intuitive dashboard, online fee payments, license renewal, and a feedback mechanism. Using a decentralised blockchain-based system, applications flow seamlessly between authorities, with transparent appeal and review processes. The platform also tracks submissions, manages payments, handles complaints, and stores records centrally for accountability and efficiency. Below is a diagram representing the general process flow.

The proposed policies digitise key regulatory processes for restaurant businesses, introducing a centralised digital inspection system for randomised checks, shared access to reports, and improved transparency. A one-time submission of employee medical fitness certificates via a web portal simplifies compliance and reduces administrative burdens. Additionally, integrating commercialisation completion certificates into the portal streamlines LDA approvals, enhances transparency, and ensures compliance with zoning regulations, fostering a business-friendly environment.



A DYNAMIC CGE-SLUDGE FRAMEWORK FOR PAKISTAN

Muhammad Zeshan

INTRODUCTION

The concept of a sludge economy has garnered increasing attention in recent years as a framework for understanding the drag on economic productivity and individual welfare created by excessive administrative burdens. Sludge refers to the frictions and inefficiencies that make it unnecessarily difficult for individuals and businesses to complete basic tasks, comply with regulations, or access public services. Reducing sludge has become a priority for policymakers seeking to streamline bureaucracy, improve service delivery, and promote economic dynamism.

Computable general equilibrium (CGE) models have become a cornerstone of economic policy analysis over the past few decades. These models provide a powerful framework for assessing economy-wide impacts of policies, shocks, and structural changes across various sectors and regions. Though originally developed to

analyse trade policies, CGE models have expanded to study various distortions and frictions that create welfare losses and deadweight costs. For example, recent applications have quantified the economic impacts of informality, financial market imperfections, and governance quality. The unifying theme is using CGE models to measure direct and indirect effects of market imperfections and institutional failures.

Our CGE-Sludge framework extends the usage of the dynamic Global Trade Analysis Project (GTAP) model by incorporating sludge features through the productivity channel. Our simulation results focus on the economic impact of sludge on investment, real GDP, domestic rate of return (DROR) on capital, and welfare levels. Certain sectoral production and household demand results are also summarised. The results are presented on an annual basis for 2025 through 2030, which represent short- and medium-term, rather than long-term, outcomes.

RESEARCH

METHODOLOGY: DYNAMIC CGE-SLUDGE FRAMEWORK

Simulation Design

Our dynamic CGE-Sludge framework was first calibrated to a SAM that reflects Pakistan's current economy, including the existing sludge. Baseline equilibrium inherently incorporates productivity losses and distortions caused by sludge across different sectors. To simulate sludge removal, our model adjusted sector-specific total factor productivity parameters based on empirical estimates in the PIDE Sludge Audit Series. These adjustments represent productivity gains from removing administrative burdens. For example, the audit data suggests that sludge in construction due to "Obtaining permission for a high-rise building from the CDA" causes cumulative productivity loss in the construction sector equal to 17.5% of annual GDP over four years. Our dynamic CGE-Sludge model increased (matched) the TFP parameter for construction by corresponding to each year to reflect this effect in each of the four years.

Other causes of sludge affecting construction were similarly modelled to obtain our initial sludge

removal change in TFP for this sector. Similar adjustments were made for other sectors based on their specific sludge burdens estimated in PIDE audits. After implementing these changes, the CGE model was solved for a new general equilibrium, allowing all markets to adjust. Economic impacts of sludge removal were then quantified by comparing key indicators between the no-sludge simulation counterfactual equilibrium and the sludge-inclusive baseline.

Social Accounting Matrix (SAM)

GTAP provides a comprehensive framework for analysing global economic issues, offering a wide range of CGEs models along with an extensive database, enabling researchers to assess the economic implications of various policies and shocks. The construction of the GTAP Data Base version 11 aims to harmonise global-scale data sources for analytical purposes, offering comprehensive time series data on value flows, volumes, and various tax measures. This extensive coverage of economic activities enhances its utility in conducting wide-ranging studies on national and global economic issues.



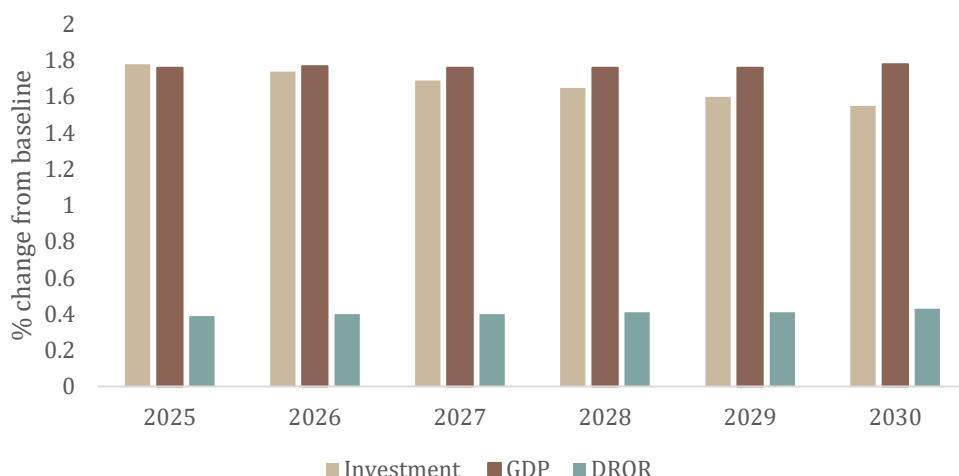
SIMULATION RESULTS

Sludge Removal in the Electricity Sector

According to the PIDE Sludge Audit Vol. 2, the cost of sludge in the electricity sector for year 1 only is around 1.50% of GDP. Compared to the baseline model, a 30.3% TFP productivity gain in the electricity sector would raise total GDP by this amount. The simulation results of removing sludge in the electricity

sector revealed a picture of steady growth and positive trends across multiple sectors. Macroeconomic indicators showed an increase in investment from 1.78% in 2025, declining slightly to 1.54% in 2030. GDP growth demonstrated a consistent upward trajectory from 1.76% to 1.78% compared to the baseline without sludge removal. The DROR showed a steady increase from 0.39% to 0.43%, indicating improved profitability and efficiency in domestic investments.

Figure 1: Macro Indicators: Electricity Sector Sludge Removal Only



Source: Authors' calculations.

Sludge Removal in All the Given Sectors

When sludge was removed from multiple sectors, an initial increase in investment was extraordinarily high at 314.6% compared to the baseline in 2025 (Figure 2). PIDE

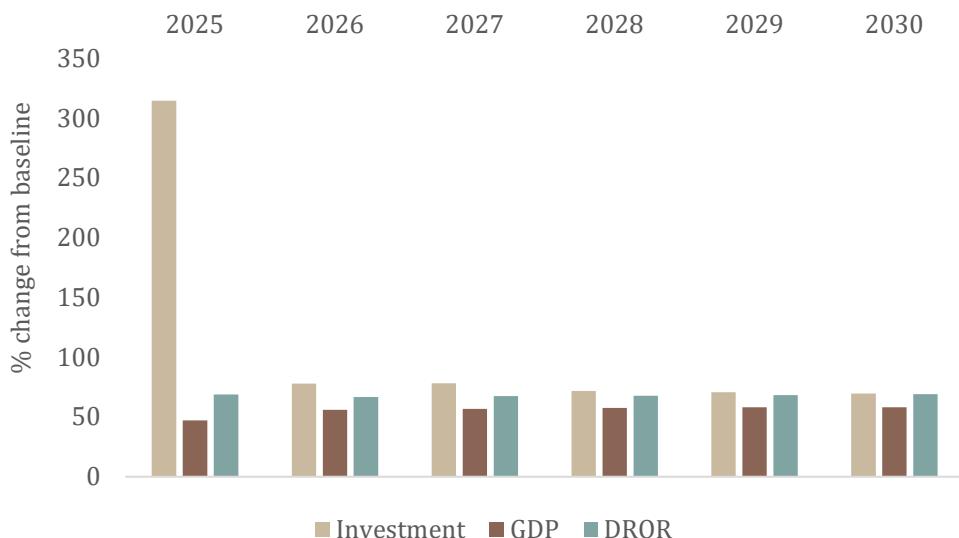
Sludge Audit Vol. 1 explains that obtaining permission for a high-rise building from the CDA costs 10.9% of GDP in year 1, which is the primary cause of such huge investment loss in Pakistan. However, it reduces significantly in subsequent years.



The real GDP growth showed a consistent increase from 47% in 2025 to 57.9% by 2030. Thus, the overall impact of removing sludge in the general equilibrium framework was higher after five years (57.9% of GDP) than the combined effects from the PIDE Sludge Audits Vols. 1-3 (49% of GDP). The increase was due

to intertemporal impacts and backwards and forward linkages between different industries, such that there were both direct and indirect effects of sludge removal. Therefore, these linkages intensified the impact of sludge removal. DROR increased by around 68%.

Figure 2: Macro Indicators: Multi-sector Sludge Removal



Source: Authors' calculations.

Our simulation results also indicated significant welfare gains from removing sludge, with these gains closely tied to increased household consumption. Welfare gains were expected to keep rising, reaching over USD 142 billion by 2030 (41% higher compared to the baseline). A persistent boost in private

household demand for various commodities over time was a key driver of welfare gains. The increased household consumption across various sectors suggested a general improvement in living standards. The shift towards domestic production in key areas further amplifies these effects.



CONCLUSIONS

Our simulation results highlight the profound economy-wide benefits of removing bureaucratic inefficiencies in Pakistan. Key findings include a significant boost to investment, which could transform economic development by accelerating industrialisation, technological adoption, and productivity growth. Welfare gains, driven by increased production activity by domestic firms and more household consumption, particularly in the construction and pharmaceutical sectors, signal broad improvements in living standards and health outcomes.

Sectoral impacts reveal a boom in pharmaceuticals and construction, offset by a contraction in real estate as investments shift to other, more productive sectors. Reduced reliance on imported materials and pharmaceuticals highlights enhanced domestic industry competitiveness and promoted self-reliance. While the transition offers immense opportunities, challenges such as employment disruptions in certain sectors require careful policy management to ensure equitable benefits and minimise short-term impacts.

KEY POLICY RECOMMENDATIONS

Several key recommendations emerge from our CGE analysis:

Prioritise High-Impact Sectors for Reform: Our CGE analysis reveals that certain sectors offer disproportionate economy-wide benefits when freed from sludge. The large potential in the domestic activity of pharmaceuticals and construction sectors suggests prioritising reforms in these sectors. Furthermore, the magnitude of their effects, captured through our general equilibrium framework, is substantially larger than what partial equilibrium analysis alone would suggest due to inter-industry linkages.

Manage Structural Economic Transitions: The CGE results uniquely highlighted the need for careful management of structural economic changes. Our analysis showed that removing sludge could cause a significant contraction in the real estate sector while boosting other sectors. This insight, which emerges from the general equilibrium effects, suggests policymakers need to:



- Develop transition strategies for affected sectors.
- Implement gradual reform timing to avoid market disruptions.

Balance Import Substitution and Export Promotion: The economy-wide analysis revealed complex trade effects that were not visible in sector-specific studies. The projected 400% decrease in construction material imports alongside domestic sector growth suggests opportunities for import substitution. However, policymakers should:

- Target sectors showing strong domestic growth potential.
- Support export capacity development in newly competitive sectors.
- Maintain balanced trade policies during the transition.

Challenges of Sludge Reduction

It is important to acknowledge that achieving substantial sludge reduction in practice is a complex and challenging undertaking. Ingrained bureaucratic processes, vested interests, and resistance to change within institutions can create significant obstacles. Furthermore, the interconnectedness of various forms of sludge means that addressing one specific inefficiency may have unintended consequences in other areas. Successfully navigating these challenges requires strong political will, sustained commitment to reform, and careful consideration of potential implementation hurdles. However, even partial progress in reducing sludge can yield significant economic benefits, making even incremental reforms worthwhile.



EVALUATION OF BALOCHISTAN'S KACHHI CANAL PROJECT

Irfan Ali and Verda Salman

INTRODUCTION

The Kachhi Canal Project (KCP) was envisioned to transform the socioeconomic livelihood of the local populace by developing the Kachhi plain of Balochistan. The KCP originates from Taunsa Barrage, Punjab, enters Dera Bugti in Balochistan and extends to the Jhal Magsi District by irrigating a total of 713,000 acres of culturable command area (CCA). It has a total length of 500 kilometres, with 194 kilometres of the CCA in Balochistan. It aims to provide an annual benefit of PKR 19.66 billion to the national economy by enhancing the cropping intensity from 4.68% to 88.50%. The project has been executed by the Water and Power Development Authority (WAPDA) and funded through the Public Sector Development Programme (PSDP).

The project has been revised twice due to multiple snags, including time and cost overruns. According to the original PC-1, the initial total allocated budget for the project was PKR 31.204 billion and was expected to be completed by 2007. However,

the project delays and revisions raised the cost from PKR 31.204 billion to PKR. 80.352 billion, with the revised completion date by the end of 2018 for Phase 1 only. Per the second revision, the project has been divided into three distinct phases. The KCP Phase 1 has been further divided into two parts. Phase 1 (Part A) was inaugurated by the Prime Minister of Pakistan, Shahid Khaqan Abbasi, while development work is in progress on Phase 2 of the project.

The KCP is a major undertaking from PSDP on which substantial resources have been expended over the past two decades. As per the envisioned plan, Phase 1 (Part A) of the project, operational since 2018, was planned to irrigate 72,000 acres of the CCA, providing an annual benefit of PKR 3 billion to the national economy and improving the socioeconomic landscape of the region. Despite its initial promise, the project has failed to live up to its true potential due to delays and a lack of planning. Our study aimed to study the impact on socio-economic indicators of the local populace and its utility in enhancing the agricultural output.



After its delayed completion, Phase 1 of the project did improve upon the socioeconomic indicators of the local population. However, the flooding in 2022 substantially damaged the canal infrastructure at multiple places, rendering it non-operational. At present, a massive restoration effort is required to reinvigorate the project.

METHODOLOGY

The primary objective of the study was to carry out an impact assessment of Phase 1 (Part A) and evaluate the impact on the socioeconomic profile of the region. The perspective of the WAPDA was incorporated into initial field surveys that were conducted to get an idea about the situation of the Kachhi Canal. The perspectives of farmers and landowners were incorporated through focus group discussions (FGDs). The FGDs included those farm owners/farmers who have access to the canal and benefited from the irrigation water from KCP in the Sui region of Dera Bugti, Balochistan. A total of 6 FGDs were conducted with farmers and landowners in different mauzas. A quantitative analysis was conducted using data obtained from the Agriculture Extension Department of Balochistan. Economic and financial analyses were conducted to ascertain the viability of the project using benefit-cost ratios, net present value, and internal rate of return. To

derive the findings from FGDs, a reflexive thematic framework was used.

FINDINGS

The themes devised based on the FGDs fell into three main categories, i.e., Pre-KCP Time (T-I), KCP Phase I Operational (T-II), and KCP Post-Flood 2022 (T-III).

Pre-KCP Time (T-I)

In the pre-KCP time, the local population was dependent on rainfed agriculture. Most of the land was barren and desert-like. Water scarcity was one of the major impediments that led to low crop production, productivity, and yields. Traditional farming methods were employed. Cropping intensity and land utilisation were significantly lower due to water scarcity. The socioeconomic conditions were marked by minimal economic activities, limited employment, sparse population, and frequent occurrence of social & armed conflicts.

KCP Phase I Operational (T-II)

The operational phase of the KCP was characterised by growth and widespread prosperity in the region, and barren and sandy lands were brought under cultivation. The cropping intensity increased significantly, crop varieties were



historically greater, and agricultural output and yield significantly increased. The FGD participants revealed that the socioeconomic landscape of the region had changed altogether, and there was a reduction in social and armed conflicts. As a result, income levels increased significantly in the region.

KCP Post-Flood 2022 (T-III)

The severe rains in the DG Khan and Rajanpur districts damaged the Kachhi Canal, damaging at least six structures partially or completely with 129 major breaches. The lack of restoration of the canal turned a prosperous region into a desert, which profoundly deteriorated the socioeconomic conditions in the area. The conditions have become even worse compared to the rainfed agriculture system due to the levelling of land water, which rendered the rainfed system impractical as it disrupted the natural ability of the land to store and use water. The participants of the FGDs unanimously endorsed the presence of severe water scarcity even for drinking and other purposes, migrations from the region to other areas/provinces, and worsening of agricultural output. Another important finding was that the land has become infertile, sandy, and barren. The social and armed conflict increased in the region.

Findings of Focus Group Discussions

There is an urgent need to restore the canal. Most of the participants indicated that urgent rehabilitation of the canal plunged the local populace into despair, as the majority of the population is dependent on agriculture. The current state of socio-economic conditions is very bad due to extreme water scarcity, even though drinking water is not available to the residents.

Findings of Economic and Financial Analysis

The viability of KCP Phase-1 (Part A) was conducted employing net present value, benefit-cost ratio, and internal rates of return. Different scenarios were assumed to check the financial viability of the project. These scenario estimates were compared with estimates made at the time of project appraisal and the estimates made by the Agriculture Extension Department of Balochistan. The sensitivity analysis of these scenarios was also carried out. The findings indicate that the project is financially viable if restoration of the canal starts in 2024-25 and is completed within three years. Other scenarios provide mixed results.



POLICY IMPLICATIONS

Canals have historically been a substantial contributor to improving socio-economic indicators. The KCP project was conceived with the right intent to transform the socio-economic landscape of the population of Balochistan. However, cost overruns and project delays have substantially enhanced the cost-effectiveness and delayed the promised returns. Even after its completion, the project has suffered a major setback due to flash flooding, making the project non-operational. Being an agriculture-based economy, Pakistan is likely to undertake numerous such initiatives in the future as well. Cholistan Canal is also in the offing as part of the Green Pakistan Initiative. Therefore, it is imperative to take the right policy decisions in the future before the commencement of such major undertakings. The gist of a few policy implications from our study is as follows:

1. In order to keep the KCP financially feasible, the restoration work needs to be completed on a priority basis. There should be special emphasis to make it climate resilient to subsequent flash flooding by devising flood control and resilience strategies, for instance, the construction of protective structures, embankments, and floodwater diversion systems.
2. Before initiating any future project, the expected impact of climate change should be studied in detail, and suitable safeguards should be put in place to make the project climate resilient.
3. The KCP is a classic case of project mismanagement, as the project costs were increased considerably, and timelines for completion have been delayed by almost two decades. Although the reasons for these delays were not deliberated upon as they were out of the scope of study objectives, there is a need to identify the root cause of these delays for future reference.
4. The *raison d'être* for KCP was to reduce the backwardness of the area by improving upon socio-economic indicators, which has yet to be materialised. The GoB should start socioeconomic support programmes in the region, for example, financial aid, subsidised inputs, and interest-free loans to encourage farmers and landowners to invest in tubewells and rehabilitate their lands.



5. Offer skill development programmes, training, and alternative livelihood options to attract farmers and reduce the outflow of farmers and mitigate economic distress.
6. Upon completion of the project, land disputes between tribes are likely to emerge as a major challenge in the future, which may result in conflicts. Therefore, there is a need to address the issue of social and armed conflicts by promoting dialogue among stakeholders and involving law enforcement agencies and tribal leaders.



REDEFINING URBAN SPACES: HARNESSING THE POTENTIAL OF PUBLIC-PRIVATE PARTNERSHIP FOR SUSTAINABLE CITY REGENERATION

Shoaib Khalid, Fariha Zameer, and Muhammad Irfan Gill

INTRODUCTION

Cities are critical drivers of economic growth, contributing over 80% of global GDP. Sustainable economic development is closely tied to the dynamism of urban areas, which can be fostered through efficient land use and the regeneration of underutilised urban spaces. Regenerating neglected areas through adaptive reuse and mixed-use developments can revitalise cities, making them more productive, vibrant, and resilient. Urban redevelopment, particularly in developing countries, often requires public-private partnerships (PPPs) due to the complexity and high costs involved in such projects. By leveraging the leasing of government-owned land and private investment, urban landscapes can be transformed more effectively. Vertical urban development is also essential for both economic and environmental sustainability, especially in densely populated regions. Although costly, tall

buildings reduce automobile dependence, conserve energy, and preserve valuable agricultural land.

Despite the ongoing trend of urbanisation, Pakistani cities, including Faisalabad, have vast tracts of valuable but underutilised land, most of which is government-owned. This land represents a source of untapped capital that hinders urban economic growth. Faisalabad, the third-largest city in Pakistan, has witnessed rapid population growth and urban expansion driven by its industrial success. Over the past three decades, the city's urban footprint has expanded nearly threefold, with urban sprawl, particularly in the northeast, encroaching upon fertile agricultural land. The lack of government-led construction and housing initiatives has further fueled private sector developments, often ignoring city master plans. Consequently, large government-owned land parcels remain vacant and underutilised, presenting a



significant opportunity for planned urban development and construction. Urban redevelopment is therefore crucial for revitalising these neglected areas and enhancing economic vitality.

A strategic, multi-dimensional approach is required to identify and redevelop underused sites, maximising their commercial potential. The PPPs and sustainable development practices can drive economic growth, promote efficient land use, and create inclusive, vibrant urban spaces. In this policy brief, the contours of a strategy for revitalising the urban core of Faisalabad through the strategic redevelopment of dormant public properties are outlined. The proposed approach emphasises the utilisation of PPPs to transform underperforming assets into economically productive and socially inclusive spaces. The approach aims to provide policymakers, urban planners, and investors with a practical roadmap for sustainable urban regeneration in the city.

METHODOLOGY

A mixed-method approach was used to comprehensively analyse the underutilised state-owned land parcels within Faisalabad and develop a strategic framework for their redevelopment. First, the data on 10,171 state-owned land parcels located within the Faisalabad

metropolitan area was collated. These data were obtained from various government entities, including the Revenue Department, Faisalabad Development Authority (FDA), and the Punjab Land Record Authority. Each parcel was analysed based on its distance from the city centre, current land use, and economic potential. Commercial property prices at 93 locations were also obtained. Using the inverse distance weighted (IDW) interpolation method, the prices were mapped to see their spread across the area. Each parcel was then rated on factors like ownership, land use, size, and commercial value to identify the best opportunities for redevelopment. Layout plans for three key sites were developed with input from stakeholders.

The proposed plan for the GOR site includes mixed-use blocks for residential, commercial, and office spaces, along with central parks and administrative zones. The plan for the Pakistan Railways land features high-rise commercial buildings along major roads, mid-rise buildings near residential areas, parks to enhance community interaction, and space reserved for an educational complex. For the PCBL Land, commercial spaces are planned near the railway station, pedestrian-friendly zones with strong public transport connectivity, and green spaces to foster community engagement. This



approach provided a comprehensive evaluation of redevelopment potential, balancing economic, environmental, and social factors.

KEY FINDINGS

Underutilised Government Land

Faisalabad has a large number of government-owned land parcels, including those occupied by informal public housing or left vacant, that represent untapped economic potential. The provincial government holds 71.8% of these land parcels, while the FDA and Tehsil Municipal Administration (TMA) account for 14.9% and 2.4%, respectively. Over a significant portion of the parcels are occupied without formal allotment, while 8.3% remain entirely vacant, presenting valuable opportunities for redevelopment and regeneration. Unlocking these resources is essential for driving economic growth and addressing Faisalabad's urban challenges.

Strategic Sites for Redevelopment

Three key sites were identified for redevelopment based on their strategic location and potential impact:

- **Government Officers Residences (GOR):** This high-value site encompasses

54 acres of land and is located at a prime location near the city centre. It has low-density single-storey buildings, currently occupied by government officers, including the commissioner's residence (8 acres), the Circuit House (7 acres), and police officers' houses on several acres. Since the existing structures on this land are outdated, the opportunity cost of its redevelopment is low, as the government only receives rental income from these properties. Redeveloping this prime site could introduce a mixed-use zone with residential, commercial, and administrative spaces, and parks, optimising land use and boosting urban functionality.

- **Pakistan Railways Land:** Although this prime site is located near the city centre, it is underutilised. The site offers significant potential for high-rise commercial development and green public spaces. The land is presently occupied by abandoned grain storage facilities and a railway workshop. It has an area of 63 acres, and redeveloping this site could pave the way for high-rise commercial developments, along with expansive green public spaces.



Economic Insights

A negative correlation of -0.715 of price with the distance from the city centre indicates that parcels closer to the centre are significantly more valuable. Most parcels are priced in the range of PKR 6-8 million per marla, making them attractive for both public and private investment. Redevelopment of centrally located parcels is essential for maximising economic returns and optimising resource allocation.

Stakeholder and Community Perspectives

Community Support and Preferences

Faisalabad's residents showed strong support for urban redevelopment, particularly projects emphasising environmental sustainability and vertical expansion through high-rise developments. Approximately 67% of respondents highlighted sustainability as a priority, while 91% anticipated improved economic activity and living standards as a result of redevelopment. Public sentiment also leaned heavily toward integrating green building practices and multi-modal transit solutions.

Challenges Identified by Stakeholders

Stakeholders, including local officials and developers, identified several hurdles in implementing redevelopment projects. These

include delays in regulatory approvals, challenges in land acquisition, and the need for financing solutions. Stakeholders also stressed the importance of transparent governance to mitigate risks such as favouritism and inefficiency.

Public Perception of Proposed Land Use Plans

The public overwhelmingly endorsed the proposed land-use plans, particularly the emphasis on mixed-use development and green spaces. Key features, such as pedestrian-friendly zones, public parks, and integrated residential-commercial areas, were highlighted as transformative for the city's urban environment. The inclusion of low-income housing options and community facilities was seen as essential for fostering social equity and inclusivity.

CONCLUSION

Faisalabad stands at a crossroads in its urban development journey, with underutilised government lands offering a unique opportunity to address urban sprawl, housing shortages, and economic stagnation. This study demonstrates the transformative potential of targeted urban redevelopment, particularly by prioritising high-value sites like the GOR, Pakistan Railways land, and PCBL parcels. These sites,



strategically located and inherently valuable, can act as catalysts for broader economic and social revitalisation. By adopting mixed-use development models, the proposed plans ensure an optimised balance between residential, commercial, and recreational needs. The integration of parks, green spaces, and pedestrian-friendly infrastructure not only enhances environmental quality but also improves community well-being. Incorporating sustainable building practices aligns Faisalabad's urban growth with global trends in eco-conscious development, attracting both investors and environmentally conscious residents. The economic insights gathered through this study highlight the financial viability of these projects, with high land values near the city centre underscoring the importance of proximity in regeneration planning.

Stakeholder and community perspectives further reinforce the necessity of inclusive and transparent redevelopment processes. Strong public support for initiatives focusing on sustainability and vertical expansion through high-rise developments reflects the community's readiness to embrace change. However, overcoming challenges such as regulatory hurdles, land acquisition issues, and financing gaps will require robust policy frameworks and transparent

governance mechanisms. The PPPs emerge as a pivotal mechanism to achieve these objectives, offering a pathway to mobilise resources while ensuring accountability. By leveraging innovative financing models and fostering collaborative engagement among government bodies, private investors, and local communities, Faisalabad can create a sustainable and equitable urban environment.

POLICY RECOMMENDATIONS

Based on key findings, the following are public policy recommendations. These aim to transform the urban landscape of Faisalabad City into a model of sustainable and inclusive development. The recommendations focus on harnessing the economic and geographic potential, addressing key urban challenges, and ensuring long-term growth and resilience in the city.

Strategic Framework

A comprehensive redevelopment policy is essential to streamline approvals, ensure coordinated efforts among government departments, and provide a clear roadmap for urban transformation. The PPPs should be leveraged through models such as build-operate-transfer (BOT) and build-own-operate (BOO), enabling



private investment while maintaining public oversight. These frameworks will help mobilise resources and share risks effectively.

Land Use Optimisation

Focusing on high-potential sites like the GOR, Pakistan Railways land, and PCBL parcels ensures impactful and efficient urban regeneration. Encouraging high-density, mixed-use development integrates residential, commercial, and recreational spaces, reducing urban sprawl and promoting walkability. These strategies create vibrant, functional urban centres that meet diverse community needs while optimising land use.

Sustainability and Infrastructure

Sustainability should be at the core of redevelopment initiatives. This includes mandating energy-efficient designs, integrating renewable energy, and using sustainable construction materials. Enhancing transportation infrastructure, particularly through multi-modal transit systems and improved pedestrian pathways, is crucial for accessibility and reducing carbon emissions.

Community Engagement

Active community engagement is essential for fostering inclusivity and

ensuring shared ownership of urban redevelopment projects. This can be achieved through consultations, surveys, and workshops. Ensuring affordable housing options within redevelopment plans addresses the needs of low-income residents and promotes social equity. Community-driven initiatives will strengthen public trust and participation.

Economic Incentives

To generate revenue for urban development, underutilised parcels should be monetised through long-term leasing and phased development. Attracting private sector participation through tax breaks, streamlined regulatory processes, and subsidised financing will further drive investment and ensure project viability. These incentives balance financial feasibility with urban goals.

Monitoring and Governance

Transparent governance mechanisms are critical in the redevelopment projects. Establishing clear performance metrics will ensure that projects remain on schedule and meet their intended outcomes. Regular audits and public reporting will enhance accountability and build stakeholder confidence in the redevelopment process, ensuring that projects are completed effectively and ethically.

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