

## A game theory approach to land acquisition conflicts in Pakistan

Ahsan Shafi<sup>a,\*</sup>, Zhanqi Wang<sup>a,\*</sup>, Muhsan Ehsan<sup>b</sup>, Faizan Ahmed Riaz<sup>c</sup>,  
Muhammad Rashid Ali<sup>d</sup>, Feng Xu<sup>a</sup>

<sup>a</sup> Department of Land Resource Management, China University of Geosciences, Wuhan, China

<sup>b</sup> Department of Earth and Environmental Sciences, Bahria University Islamabad, Pakistan

<sup>c</sup> Services and General Administration Department Punjab, Pakistan

<sup>d</sup> Management Studies Department, Government College University Lahore, Pakistan

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### ABSTRACT

Rapid urbanization in Pakistan requires new public infrastructures, which necessitates land acquisitions. However, Land Acquisition Act, 1894 (LAA, 1894) is primitive, recessive, complex, and prone to land conflicts, requiring systematic research exploring the logic of the legal conduct. This paper converts LAA, 1894 into an extensive-form game to explain the logic of land acquisition conflicts in Pakistan, as incumbents interact strategically. The Nash equilibrium (NE) of the extensive-form game suggests Land Acquisition Collector has an absolute advantage over settlers, reasoned by flawed compensation assessment. Thus, a bad win-win situation induces illegitimate behavior, extending the paper to Artificial Price Hike and Corruption-based game models. The mixed-strategy NE of both models suggests that illegitimate behaviors remain unchecked because of the high litigation costs, lack of transparency, the informality of land, and insufficient cadastral information. Finally, the models are calibrated with current land acquisition conflicts and legal precedents in the study area. This paper provides generalized interactive game models applicable to study the logic of land conflicts amid legal and policy implementation and suggests policies to improve the land administration and legal system to manage conflicts.

### 1. Introduction

Urban growth, unprecedented in Asia and Africa, is significant for demographic changes caused by the ever-growing population. It is projected that 5.6 billion people will be urbanized by 2050 (Montgomery, 2008), increasing demand for public infrastructure projects driven by socio-economic growth. Such development projects require land acquisitions (LA) from indigenous settlers, resulting in involuntary resettlement and economic displacement. The process causes urban-urban and rural-urban resettlement, rural-urban migration, homelessness, unemployment, food insecurity, and psychological losses (Chen et al., 2019; Patil et al., 2020; Qian, 2015). In the last two decades, displacement and resettlement of around 200–300 million people have been caused worldwide (Kaida and Miah, 2015). However, in developing countries, lack of institutionalism coupled with political instability, non-professional behavior, and contradictory constitutional provisions root socio-economic, political, and ethical problems and reasoning conflicts (Perera, 2014).

Pakistan, one of the most populated countries globally, has a high

urbanization rate (UNDP, 2019); inherited the centuries-old colonial land administrative system and laws (Raza et al., 2005). Article 23 of the constitution of Pakistan provides citizens with the right to acquire, hold, and dispose of the property. However, Articles 24(2) and 24(3) empower the state to acquire the property for a public purpose for fair compensation, called Eminent Domain (ED) (GoP, 1973). Land Acquisition Act 1894 (LAA, 1894) and Capital Development Authority Ordinance 1960 promulgate essential provisions of the conduct, modified and amended over time, rationalize “necessity,” thus dispossession for fair compensation (Jana et al., 2020; Levien, 2011). Though LAA, 1894 stipulates monetary compensation only, it neither entails the participation of the affected nor rehabilitation, resettlement, and restoration (Ramesh and Khan, 2015; Water and Board, 2019). Such phenomena cause and augment conflicts between Land Acquisition Collector (LAC) and Settlers (S), ensued by the gap between compensation expected and compensation offered (Asif, 1999; Banerjee and Iyer, 2005; Patil et al., 2020). As land provides psychological, physical, and financial security (Rao, 2019), foreseeable post-displacement uncertainties in developing countries spike controversy and disceptation.

\* Corresponding authors.

E-mail addresses: [ahsanshafi145@gmail.com](mailto:ahsanshafi145@gmail.com) (A. Shafi), [zhqwang@cug.edu.cn](mailto:zhqwang@cug.edu.cn) (Z. Wang).

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The institutional flaws infringe on settlers' property rights, aggravating land administrative problems in Pakistan (Z. Ali et al., 2013). There are numerous minors and megaprojects, with agreed-upon and decided compensations are matters of great controversy, for example, Mangla Dam, Diamir Bhasha Dam, Neelum Jhelum Hydro-Electric Project, Ghazi Barotha Hydro project, Tarbela Dam, Rawalpindi Ring Road, Ravi Riverfront Urban Development Program, Karachi Circular Railway, and Orange Line Train, etc. (Batool and Abbas, 2017; Hasnain, 2020; Sabir et al., 2017). One significant reason is the informality of land, empowering officials with a monopoly over the determination of compensation. Moreover, the compensation assessment procedure is maligned with ineptness, corruption, and land grabbing tactics, aiming at personal profiteering in public-private partnership projects through rent-seeking (Abdullah et al., 2020; Hull, 2008). Thus, the inevitability of ED pretermits the profitability and compels settlers to accept award compensation, commonly known as DC-Rate of the land. The complexity exacerbates when most settlers refuse and hold the land for better payoffs (O'Flaherty, 1994). So, an unstable and volatile compensation structure with a non-existent rehabilitation program becomes the primary cause of conflicts (Sarkar, 2007). The persistence of conflicts extends to the mediation process by a civil court, which prolongs for decades. The procedure compels the incumbents, institutions, and settlers, to exploit the loopholes of the system to render abnormal profits (Hull, 2008).

This paper aims to explain the logical grounds of LA conflicts during the legal conduct and policy of Pakistan through a qualitative study. After a concise review of the definition and causes of land conflicts, the paper extends to the reasons and consequences of LA conflicts in Pakistan. As the nature of conflict demands strategic interaction, the study will analyze the strategic behavior opted by the stakeholders during the process as shown in Fig. 1. In this context, the paper extracts the game-relevant variables to create an interactive game-theoretical model of the LAA, 1894, which elaborates on unfair compensation as the point of conflict. The paper extensively discusses and deliberates interactive actions, and logically reasons, and explores the tactics to exploit and manipulate the system following the game models presented by Hui and Bao (2013). The dynamic game-theoretic models would help understand the responses and the stimuli, i.e., loopholes and glitches of

the legal system. It may suggest some policy directions to improve the administrative and legal mechanisms for LA.

## 2. Literature review

### 2.1. Land conflicts; definition and reasons

The definition of the land conflict originates from the Brazilian human rights group Comissão Pastoral da Terra (Pastoral Land Commission, CPT). Conflicts can be a verbal altercation to the extreme of assassination (Araujo et al., 2009; Hui and Bao, 2013). Land conflicts initiate when two or more parties have different interests over property rights; ownership, revenue, dispossession, transfer, or compensation for the land (Dadashpoor and Ahani, 2019; Kalabamu, 2019; Wehrmann, 2008). These issues are the most controversial in developing countries, with primitive land tenure becoming the primary source (Platteau, 1996), causing land conflicts by threatening land expropriation (Alston et al., 2000). However, in agrarian economies, land conflicts are primarily based upon unequal agrarian rights, the violation of tenure rights, and displacement (Foweraker, 2002; Locher et al., 2012; Upreti, 2004). The gap between the legal framework and institutional ineptness creates immense functional deficits. The slightest understanding of property rights, coupled with complex legal and litigation systems, results in severe consequences amid the conflict. Since there is no generalized mechanism to monitor the land markets (Wehrmann, 2008), many profit-seeking actors opt for land grabbing, dispossession, or excluding the disadvantaged party from exercising its land rights (Hui and Bao, 2013; Patil et al., 2020). Here, the most crucial actor is government, utilizing the prerogative of ED for public use, prevalent in countries with private land ownership (Chan, 2003; Menezes and Pitchford, 2004).

### 2.2. Land acquisition conflicts in Pakistan; reasons and consequences

The LAA, 1894, had the sole purpose of setting up cantonments. The land compensation assessment criteria were agricultural-use based, changed to market value in 1969 ("KES vs Khalida Latif," 1997). Because the demand for compensation differs on stakeholder's attitudes,

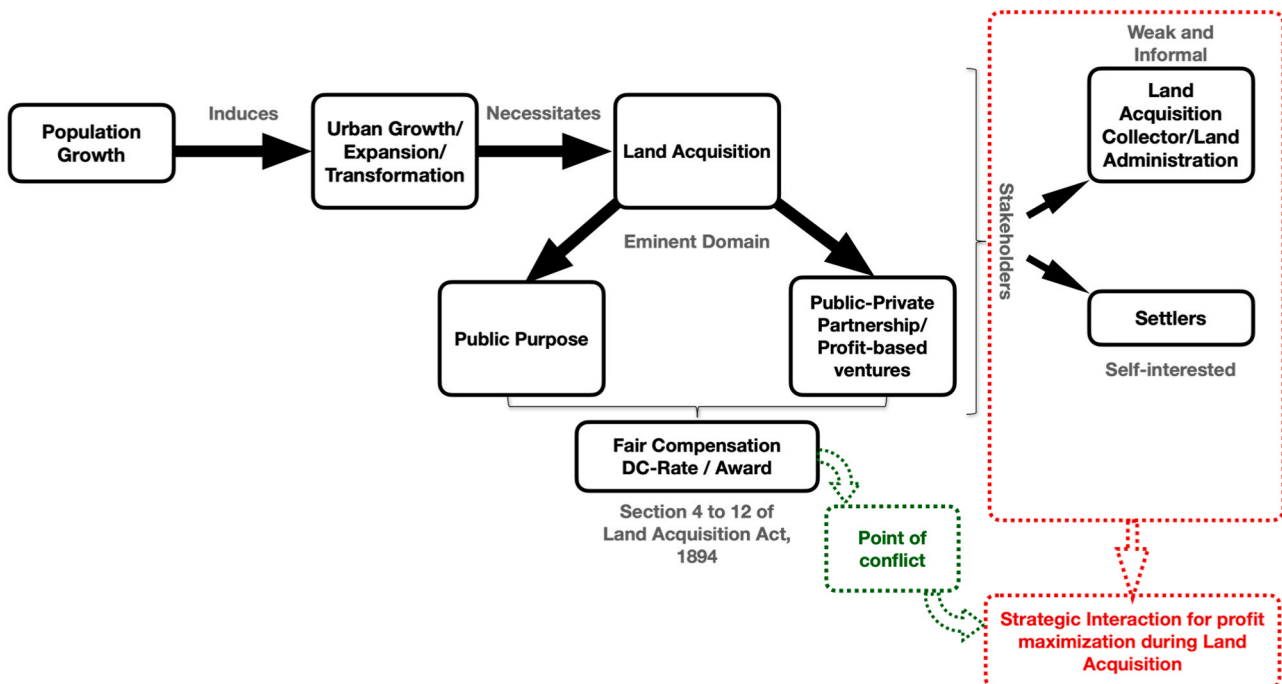


Fig. 1. Systematic workflow of the study.

expectations, and behavior (Awasthi, 2014; Li et al., 2015), the inclusion of all stakeholders is of paramount significance (Patil et al., 2020). In this context, Sabir et al. (2017) elaborate on the issues of low compensations, funding disputes, delay in compensation, inequitable committees of stakeholders, the maligned process of land measurement, categorization, and compensation with no accurate information, and public participation during Diamir-Bhasha Dam LA process. The World Bank declared such compensation projects as partly successful, suggesting a strong need to reform and establish an appropriate policy framework because 12000 cases of unpaid compensation for Tarbela Dam and Ghazi Barotha dam are still pending (Mankone and Mohamed-Katerere, 2006). Currently, certain hydro development projects remain halted; the primary reason is LA conflicts (Batool and Abbas, 2017). Which exhibits the complicated behavior within the system creating outstanding opportunities for malpractices and corruption (Abdullah et al., 2020). The compensation awarded for most projects has been inadequate and insufficient, causing social instability and poverty (“Noman Ahmed and 14 others vs. CDA, etc.,” 2021), thus conflicts leading to mediation.

The expropriation of land is ED, settlers can only ask for fair compensation, and if there is a dispute between LAC and settlers, it is referred to civil courts. The dispute resolution mechanism by the courts in Pakistan stratifies compensation assessment into five principles; market value, one-year average sale, differentials in prices, other lands in the locality, and potential value (Desai, 2011; “HDA vs Abdul Majeed,” 2002; “Khalil Muhammad vs WAPDA,” 2015; “Muhammad Saeed vs LAC,” 2002; Tariq Saeed vs LAC (EHV), 2002; “WAPDA vs Haji Muhammad Riaz-Ul-Hassan,” 2014). The court’s behavior is pro-settler; it forms a commission of experts to assess the land by proscribed principles. The commission reports documentary evidence to support the court during dispute resolution. However, the report can be discarded if deficient in the abovementioned principles (“Khalil Muhammad vs WAPDA,” 2015).

The specificity of public infrastructure development demands LA. However, for public projects, LAC also acquires land for private

developers. As LAC renders monopoly, individual interests are achieved through rent-seeking and Public-Private Partnerships. However, settlers’ interests are only linked with increased compensations if no malafide intention is found.

2.2.1. Artificial price hike for compensation

The principles set by the court precedent for fair compensation determination are pro-settler. Here, the informality of land creates complexities for the officials to access the cadastral information and owner’s rights. Z. Ali et al. (2012) argue that the contemporary cadastral data and information system of Pakistan is inefficient and inaccurate., Thus, creating opportunities for free-riders to enter the LA process, carrying information about the entire project, and aiming to maximize profits through artificial price hikes (Jana et al., 2020) While compelling settlers to forge documents and create an artificial price-hiked bubble in the land market to maximize the profitability during LA process.

2.2.2. Corruption and malpractices

Pakistan lags in reforming land-use policies compared to neighboring countries of China and India, which have paid significant attention to improve efficiency through rationalizing land allocation and enhancing the land management systems (Ding, 2003; Jana et al., 2020). Z. Ali and Nasir (2010) explored that the complexity of the land administrative system of Pakistan stipulates room for corruption and malpractices. However, the officials’ monopolistic powers for the decision of monetary compensation usually cause a collaboration between the officials and settlers for profit maximization (Hull, 2008).

2.3. Theoretical framework of the study

Based on the literature provided, Fig. 2 presents the theoretical framework of the study. The study will explore the logic of the interaction between the LAC and Settlers and reason the absolute advantage of the LAC provisioned by ED. It will keep the Award Compensation as the point of conflict, where LAA, 1894, and principles set by the court of

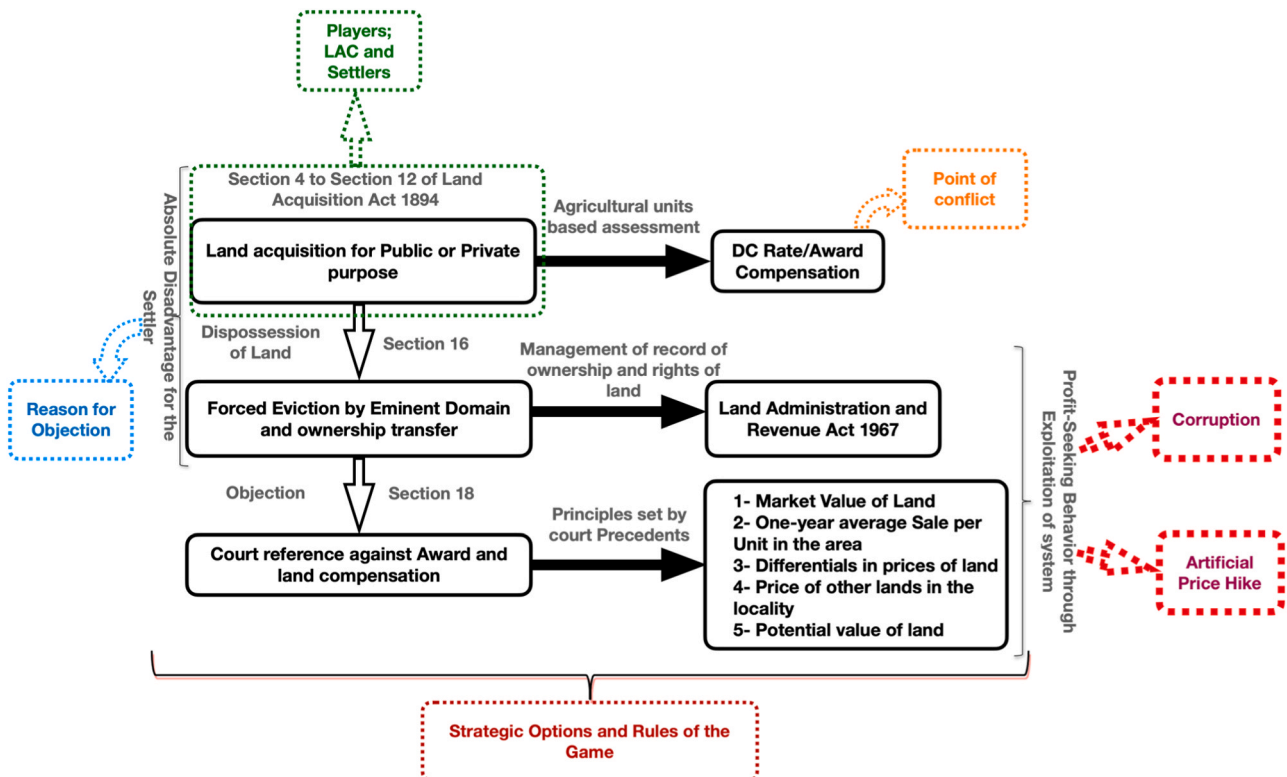


Fig. 2. Theoretical framework of the study.

law will serve as the rules of interaction. The study will pinpoint the inconsistencies of the pertaining laws and systems to the indulgence of profit-seeking exploitative behavior. This study will utilize the dynamic game-theoretic model for conflict introduced by Hui and Bao (2013), which will be discussed in the next section.

### 3. Research method

#### 3.1. The development of game theory literature for the analysis of the land acquisition conflicts

Game Theory (GT) derives logic from its assumptions, where self-interested incumbents interact in simulation-based models. The decision-maker's actions are interdependent with the perfect knowledge of payoffs and decisions. Madani (2010) describes GT as tool of analysis where quantitative data is not available; actions and payoffs are qualified in an ordinal arrangement to assess and calculate the gravity of the strategic interaction. The ordinal arrangement usually analyzes the behavioral aspect of the player; the preferences given to different outcomes (Hui and Bao, 2013). The validation of GT requires calibration of the results with realistic situations and scenarios in a social system. Thus, the application of GT extends to various academic disciplines ranging from pure sciences to applied sciences and humanities (Burns et al., 2001).

#### 3.2. Game theory and land acquisition conflicts

LA, a one-way social interaction between institutions and individuals or groups of individuals, targets profit maximization. Mostly, this interaction concludes in conflicts, asserting the incumbents to optimal strategies for the optimum outcome. Because of the complicated nature of the decision-making process for land (Alexander, 1964; E. Alexander, 2014; Byrne, 2003; De Roo, 2004), various researchers utilized GT to elaborate the impact of rational choices of one player on decisions of another (Camerer, 2011; Hui and Bao, 2013; Jana et al., 2020; Samsura et al., 2010; Smith, 1982). There are other approaches and methods to sort strategic conflicts, for example drama theory and the graph model for conflict resolution (Hipel et al., 2020), metagame analysis (Howard, 1971), hyper game analysis (Wang et al., 1988), theory of moves and conflict analysis (Jeong, 2008; Kilgour, 1995) explains that all above-mentioned approaches have game-theoretic roots primarily focusing on perfect cooperation over a single composite objective. However, decision-making process during land conflicts are multi-criteria and interdependent (Hui and Bao, 2013).

GT has not been appropriately incorporated in Pakistan to assess and mitigate land conflicts. Hui and Bao (2013) established innovative extensive and dynamic GT models to elaborate the logic of land acquisition conflicts in China. However, the complexity of the procedure of land transactions and the multitude of payoffs of different stakeholders create difficulties in conceptualizing the structure of the game (Samsura et al., 2010). Recently the methodology has been applied to land use policy to optimize the cost and regularize land use in China (Liu et al., 2015; Tan et al., 2015; Wu et al., 2005). Jana et al. (2020) developed a multi-stakeholder utility model to create an understanding of the informal markets of the Global South, where multi-staged Nash equilibrium signifies the utilities of stakeholders in the process of LA in India.

#### 3.3. The game model for land acquisition conflicts

GT has four essential components or variables, rules of the game, players/stakeholders, strategies/set of actions, and payoffs of the game. In this study, the data relating to these components are extracted from LAA, 1894, court precedents, real-life examples, and available literature.

##### 3.3.1. Rules of the interactive game of land acquisition

The assumptions and rules of the GT are converted forms of the

abstraction of rules of the real world. The interactive model of GT derives its logic from LAA, 1894, and the principle set by the court of law and assumes that the players are self-interested entities. The LA process is analyzed under two scenarios, a) LA for pure-public projects, b) LA for public-private partnerships, or LA for companies. First, however, the behavioral preferences, variables, i.e., players, strategies, and payoffs, are adopted and calibrated with the court precedents, recent LA conflicts in Pakistan, and literature available.

##### 3.3.2. Players

The extensive game illustrates the strategic interaction between Acquisition Collector (LAC) and Settler (S), thus defining the two-player interactive game model. The term Settler (S) is utilized because of the informality of the land administration system and the ambiguity of the land titles (Abdullah et al., 2020). It is assumed that players are well-aware of the LA process, strategies, payoffs, and game outcomes and thus will try to maximize the payoffs under the given system.

##### 3.3.3. Strategic choices

The strategic choices are the set of actions of one player in response to the plan of actions within the system. During the LA process, the pertaining law, LAA1894 provisions the set of actions for both the players. As S can object to LA procedure, the government can opt for better compensation criteria; thus, the choices for the government will be, Acquire, Award, and Forced eviction.

##### 3.3.4. Payoffs and outcomes

In this study, payoffs are assumed to be the sum of ordinal qualitative measures of the variables involved in the LA process. The payoff variables are assumed separately during each sub-game and game depending upon the rules and regulations and precedents available from real life as mentioned in the literature review. However, the outcome is the overall tangible social situation produced by the LA process and induced by the behavior of the player.

##### 3.3.5. Nash equilibrium as solution concept of the game

GT has certain solution concepts, but Nash equilibrium (NE) is the intended solution concept of this study. NE provides with win-win situations for the players under prescribed conditions, rules and circumstances; the best response of players towards each other. It must be noted that all the players cannot be better off until NE is achieved, and every strategic interaction has at least one NE (Samsura et al., 2010). For extensive form game, subgame Perfect equilibrium (SPE) is another solution concept, defined as NE at a specific stage of a game in the tree but not a solution. In essence SPE is NE, not vice versa. Since the game concepts have been explained, it is essential to discuss analytical framework to access and resolve land acquisition conflicts.

Fig. 3 explains the analytical framework of the study, where the results obtained from GT will be calibrated with real-life examples and will be discussed extensively from the perspective of policy implications for sustainable social development. However, Table 1, provides detail of the data to be utilized in the analytical part of the study.

#### 3.4. The extensive game of LAA, 1894, and strategic interaction

The enacted process is sequential. So, assumptions must be made; settlers' land  $L$ , to be expropriated for standard compensation  $C$ . The compensation Award  $C_a$ ; where  $C_a > C$  The rights of land development  $D$  and revenues  $P$  are to be acquired. If settlers object, the objection cost is  $A_s$ ; thus, LAC land reassessment cost is  $A_g$ , and the cost of forced eviction for LAC is  $A_f$ . If settlers object, LAC negotiates and offers increased compensation  $C_n$ ;  $n$  is the subgame level.

The process starts with acquisition notification to settlers for  $L$ , and LAC offers an assessment-based  $C$ . As per law, settlers accept or Object. Thus, the acceptance leads to an agreement, no conflict with payoffs  $(D+P-C)$  and  $(C-L)$  for LAC and settlers, respectively. In case of

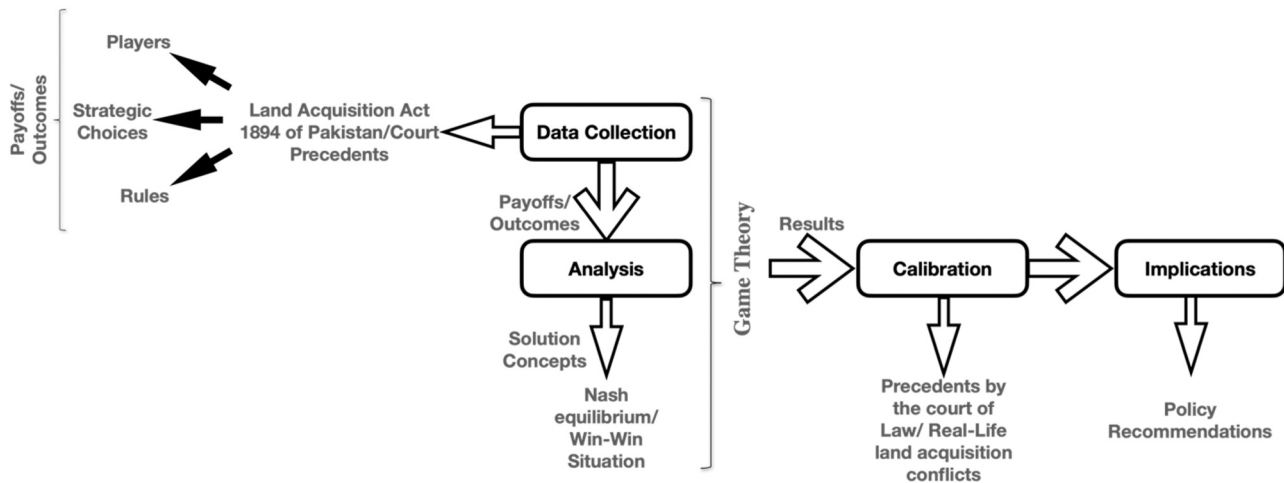


Fig. 3. Analytical framework of the study.

**Table 1**  
The derivation of variables and factors affecting the decision-making process.

| Variables Acquired from LAA,1894 and Principles set by the Court of Law |  | Factors affecting the decisions of the players, derived from Hui and Bao (2013) and modified by LAA,1894 |  |
|---|--|--|--|
| <b>Players</b>  | <b>Strategic Options</b>   | <b>Payoffs</b>   |  |
| LAC   | 1. Acquire/Not Acquire<br>2. Award/Negotiate<br>3. Forced Eviction/Negotiate | Acquires Land employing Eminent Domain   | Land (L)<br>Compensation (C)<br>Award Compensation ( $C_a$ )<br>Cost of Objection ( $A_o$ )<br>Cost of Using Force ( $A_f$ )<br>Land Assessment Cost ( $A_g$ )<br>Land Development (D)<br>Land Revenue (P) |
| Settler   | 1. Accept<br>2. Object   | Receives Monetary Compensation in any Scenario   |  |

persistence, LAC has two strategies: reassess the land and decree an Award or negotiate with settlers. During negotiations, both parties can settle the issue through increased compensation. So, the payoffs for LAC and settlers are  $(D+P-C-C_1)$  and  $(C+C_1-L-A_s)$ , respectively.  $C_a$  is conclusive on behalf of LAC; if settlers accept, the respective payoffs are  $(D+P-C_a-A_g)$  and  $(C_a-L-A_s)$ . Alternatively, continuous objections will oblige LAC to refer the dispute to Civil Court. Thus, payoffs for second-level negotiation are  $(D+P-C-C_2-A_g)$  and  $(C+C_2-L-2A_s)$ . The reference is considered the final step as the dealings between the incumbents are concluded. At this level, settlers can be evicted by force by practicing ED. If settlers evict, payoffs are  $(D+P-C-A_g-A_f)$  and  $(C-L-2A_s)$  for LAC and settlers. Since settlers can refer to the Civil Court, this mediation leaves the final payoffs at  $(D+P-C-C_3-A_g-A_f)$  and  $(C+C_3-L-3A_s)$  for LAC and settlers, respectively. The resistance to forced eviction is natural, and persistence impacts LAC performance negatively (Desai, 2011). So, mediation is mandatory as required by the law.

3.4.1. The logic of the interaction for the public purpose

The game utilizes the backward induction process to find Nash equilibrium (NE). Here, the last subgame is the first step to reasoning. The strategies of the game depend upon the comparison between  $A_s$ ,  $A_g$ , and  $C_n$  at certain levels of the game. The public purpose demands LAC to use hard and soft methods to acquire the land, i.e., ED.

The last subgame is encircled in Fig. 4. To find NE, settlers' payoffs  $(C_a-L-2A_s)$  and  $(C+C_3-L-3A_s)$  are compared. Here the primary comparison is between  $C_3$  and  $A_s$ . Since the LA process is for a public purpose

and the constitution deems it superior among the individual right,  $A_s$  is higher in terms of time and resources. The mediation process is to augment agreement with a nominal increase in compensation. As,  $A_s > C_n$  forces settlers to accept the last subgame because the objection cost increases over time, so the payoffs would be  $(D+P-C-A_g-A_f)$  and  $(C_a-L-2A_s)$  for LAC and settlers, respectively.

Moving upward, LAC compares its payoffs at the upper stage  $(D+P-C-A_g-A_f)$  with  $(D+P-C-C_2-A_g)$  for the public purpose  $A_f < C_2$ , though it impacts negatively LAC adopts forced eviction. Here payoffs for LAC and settlers would be  $(D+P-C-A_g-A_f)$  and  $(C-L-2A_s)$ , respectively. Settlers, with perfect information, try to minimize  $A_s$ ; thus, moving upward, they are prone to accept Award, with payoff  $(C_a-L-A_s) > (C_a-L-2A_s)$ . LAC also moves upward and concludes the dealings with Award as an amicable strategy instead of forced eviction. Thus, the respective payoffs are  $(D+P-C_a-A_g)$  and  $(C_a-L-A_s)$  for LAC and settlers, which also represent the Subgame Perfect Equilibrium (SPE), solved by the backward induction method.

3.4.2. The logic of the interaction for profit-based projects

The backward induction is the criteria for finding NE; the last subgame defines the compensation at  $C_3$  for settlers, where  $C_3 > A_s$ . Settlers are prone to object and resist the forced eviction in this subgame. Thus, the payoffs for both LAC and settlers would be  $(D+P-C-C_3-A_g-A_f)$  and  $(C+C_3-L-3A_s)$ , respectively. Moving upward, LAC bargains and negotiates with settlers but faces resistance amid lower payoffs in the absence of a mediating party. However, reference to the civil court serves as a waste of time and resources; for example, Orange Line Metro Project, Lahore, Punjab, remained halted for 22 months (Hasnain, 2020). Thus, the payoffs for the upper-level game with the strategy of negotiation would be  $(D+P-C-C_2-A_g)$  and  $(C+C_2-L-2A_s)$ . Here, the general perception builds up that LAC would negotiate instead of forced eviction, and as  $C_a$  is a flawed compensation assessment system, settlers persist and object. Thereby, it forces LAC to get a payoff  $(D+P-C-C_1)$ , while settlers get  $(C+C_1-L-A_s)$ . As backward induction suggests that settlers object to each move of LAC, the parties achieve the SPE through negotiation, where LAC and settlers would have the payoffs of  $(D+P-C-C_1)$  and  $(D+P-C-C_1)$ , respectively.

3.4.3. The logic and strategy of artificial price hikes

One outcome of LA conflicts characterizes the profit-maximizing of settlers during the process. The LAA 1894 allows civil court mediation when referred by LAC. The civil court asks for the market rate for the land, which is an average of the sales and purchases during one calendar year (Desai, 2011; "KES vs Khalida Latif", 1997). Settlers being well-informed of LA, utilize the informality of land and lack of cadastral

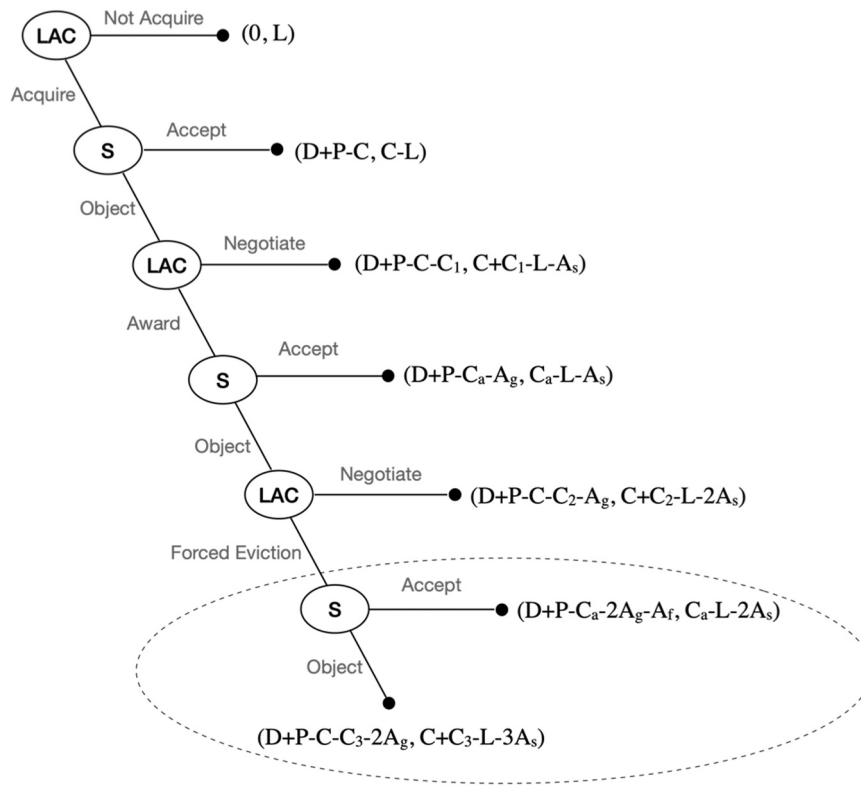


Fig. 4. Land acquisition process between LAC and settlers (S) with respective payoffs at each game level.

information to provoke the tactics such as documents falsification and land grabbing (Jana et al., 2020) and create a higher bar for the average value of the land per unit (Hull, 2008). This deviant behavior can be qualitatively measured and assessed with GT.

The game assumes, let the piece of land  $L$  is acquired for compensation  $C$ .  $P_i$  is the artificially increased bar of the average market value of  $L$ , and  $I$  is the cost of investigation for the price of land. The game assumes that both the players, officials, and settlers, have perfect information about each other's payoffs and strategies. The set of actions for settlers are; 1) land grabbing, dispossession, and falsification of documents by settlers, denoted by Falsify 2) alternatively, present the original documents, denoted by Original.

According to the game presented in Table 2, the best strategy for settlers is to falsify the documents and artificially increase the average market price bar. However, the local government can investigate the documents and penalize settlers, forcing settlers to withdraw the false claim and accept  $C$  for  $L$ . Because  $I < P_i$ , there is no pure-strategy NE, implying the game does not have a unique solution but mixed-strategy NE.

The probability of investigation is assumed as  $\alpha$ , and  $(1 - \alpha)$  of no investigation, while settlers falsify the documents with probability  $\beta$ , and  $(1 - \beta)$  of presenting original documents.

The probability of investigation is assumed as  $\alpha$ , and  $(1 - \alpha)$  of no investigation, while settlers falsify the documents with probability  $\beta$ , and  $(1 - \beta)$  of presenting original documents.

The game rules define equal chances of gaining payoffs, corresponding to one strategy. So, officials allow settlers to gain equally from

Table 2  
Payoff matrix of the officials and settlers.

| Officials Strategy | Settlers' Strategy |           |
|--------------------|--------------------|-----------|
|                    | Falsify            | Original  |
| Investigate        | $-I + P_i, -P_i$   | $-I, C-L$ |
| Not Investigate    | $-P_i, P_i - L_s$  | $0, C-L$  |

both strategies, thus forming an equation.

$$\alpha(-P_i) + (1 - \alpha)(P_i - L) = \alpha(C - L) + (1 - \alpha)(C - L) \tag{1}$$

Solving for  $\alpha$ ;

$$\alpha = \frac{P_i - C}{2P_i + L} \tag{2}$$

The best strategy for the officials is to choose a random strategy with probability  $\alpha = P_i - C / 2 P_i + L$ . It also implicates, that if  $\alpha > P_i - C / 2 P_i + L$  and officials investigate, then the optimal strategy for settlers is to falsify the documents. If the investigation is carried out with  $\alpha < P_i - C / 2 P_i + L$ , the optimal response is to present original documents.

In the case of settlers, choosing the strategy formulates the following equation;

$$\beta(P_i - I) + (1 - \beta)(-I) = \beta(-P_i) + 0 \tag{3}$$

The solution for  $\beta$  is;

$$\beta = \frac{I}{2P_i} \tag{4}$$

It implies settlers choose a random strategy with probability  $\beta = I / 2 P_i$ . The equation also signifies that when settlers choose to falsify the documents with probability  $\beta$ , where  $\beta > I / 2 P_i$ , officials' optimal strategy is to investigate. Alternatively, settlers falsify the documents with probability  $\beta$ . If  $\beta < I / 2 P_i$ , the optimal strategy for the officials is not to perform investigations.

Fig. 5 represents the reaction function of the officials and settlers, where point N is the optimal reaction point for both players. It is derived from (2) and (4) with the intersection of both probabilities  $N$  is the mixed-strategy NE of this game.

#### 3.4.4. The logic and strategy for corruption in the compensation process

The LA process mainly focuses on monetary compensation to settlers; however, rehabilitation and resettlement are novel. Moreover, the process promulgates officials with monopolistic powers over land

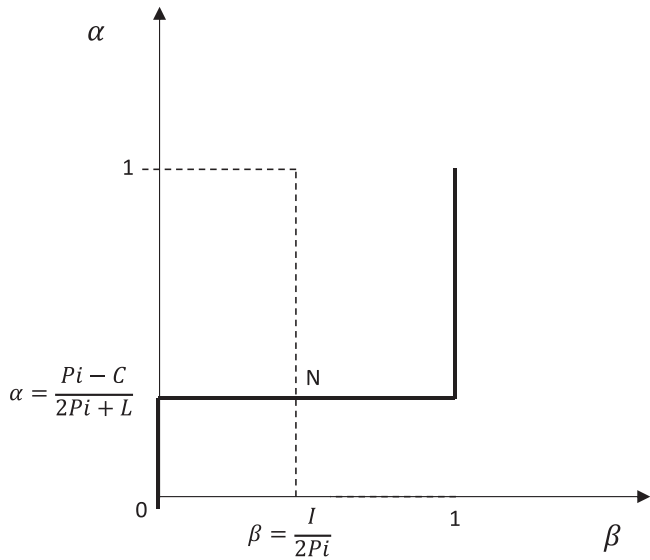


Fig. 5. : Reaction function of the officials and settlers.

evaluation and compensation assessment. Such discretionary powers malign the procedure (Hull, 2008).

The corruption-based game model assumes; that the officials set an abnormally high compensation rate, colluding with settlers for a fair share. The basic assumptions are; let  $L$  parcel of land be acquired for award compensation  $C$ , here abnormal compensation is  $C_a$ , the profits,  $P_r$ , earned through malpractices with the cost of reporting corruption to higher authorities for settlers  $A_s$ . Corruption can be penalized with criminal charges  $-mP_r(m \geq 1)$  as the cost of criminal proceedings against the officials. Here, the game assumes that settlers and officials have perfect information about each other's payoffs.

According to the game presented in Table 3, if  $(C_a - L) > (C - L)$ , then  $C_a > C$ , settlers would accept the deal. This situation becomes optimal for both the player and NE is attained, with payoffs  $P_r$  and  $(C_a - L)$  for the officials and settlers, respectively.

Nevertheless, if  $(C_a - L) \leq (C - L)$ , there is no pure-strategy NE, as the players become indifferent. Therefore, the game has no unique solution, so the mixed-strategy NE is sorted.

Assume that the officials execute corruption with the probability of  $\mu$ ; thus  $1 - \mu$  is the probability of no corruption, and settlers accept the offer with probability  $\rho$  and the probability of objection  $1 - \rho$ . Since settlers are indifferent, the game assumes that settlers gain equally from each payoff, formulating Eq. (5).

$$\mu(C - L - A_s) + (1 - \mu)(C - L - A_s) = \mu(C_a - L) + (1 - \mu)(C - L) \quad (5)$$

Results  $\mu$  as,

$$\mu = \frac{A_s}{C - C_a} \quad (6)$$

Eq. (6) implies that officials randomize strategy with probability  $\mu = A_s / C - C_a$ . When the officials opt for corruption with probability  $\mu > A_s / C - C_a$ , the objection would be the optimal strategy; if  $\mu < A_s / C - C_a$ , settlers' best response would be to accept the LA procedure.

This logic is also applicable for settlers to choose a randomized strategy; according to assumptions following equation is formulated.

Table 3  
Payoff matrix of the officials and settlers for corruption.

| Officials Strategy | Settlers' Strategy   |                |
|--------------------|----------------------|----------------|
|                    | Report/Object        | Accept         |
| Corruption         | $-mP_r, C - L - A_s$ | $P_r, C_a - L$ |
| No Corruption      | $0, C - L - A_s$     | $0, C - L$     |

$$\rho(-mPr) + (1 - \rho)Pr = 0 \quad (7)$$

Keeping  $\rho$  as the subject,

$$\rho = \frac{Pr}{mPr + Pr} \quad (8)$$

Eq. (8) implies settlers randomize strategy with probability  $\rho = P_r / mP_r + P_r$ . When settlers object with probability  $\rho > P_r / mP_r + P_r$ , corruption and acceptance of bribery would be the optimal strategy for officials; if  $\rho < P_r / mP_r + P_r$ , then the official best response is to restrain corruption.

To conclude, from (6) and (8) mixed-strategy NE for players, the officials would opt for corruption with probability  $\mu = A_s / C - C_a$ , and settlers object with probability  $\rho = P_r / mP_r + P_r$ . Fig. 6 represents the reaction function of officials and settlers, where point E is the optimal reaction point for both parties. It is derived from (6) and (8) the intersection of both probabilities; E is the mixed-strategy NE of this game.

#### 4. Results and discussion

##### 4.1. The game for a public purpose

The NE of the extensive game finds that settlers are compelled to accept the awarded compensation since forced eviction is rationalized for a pure-public purpose. It is the only win-win situation created per LAA, 1894. Therefore, LO, well-informed, must agree upon the awarded compensation under Section 12 of LAA, 1894. However, as the compensation Award is insufficient, LO is at an absolute disadvantage despite a win-win situation, and NE results in protests and conflicts. The findings can be calibrated with the conflicts of Diamir Bhasha Dam, which were initiated with unfair compensation and turned into violent protests as stakeholders were not involved in the decision-making process (Magsi et al., 2021).

##### 4.2. The game of profit-based projects

The NE of the extensive game for profit-based ventures suggests that LAC negotiates instead of forced eviction. However, S is prone to object instead of accepting the compensation award because individual interest is invoked when LAC seeks abnormal profits through LA. The local government or authority can rent, lease, sell, exchange, etc., to maximize its revenues (Desai, 2011; Hui and Bao, 2013). Thus, objection

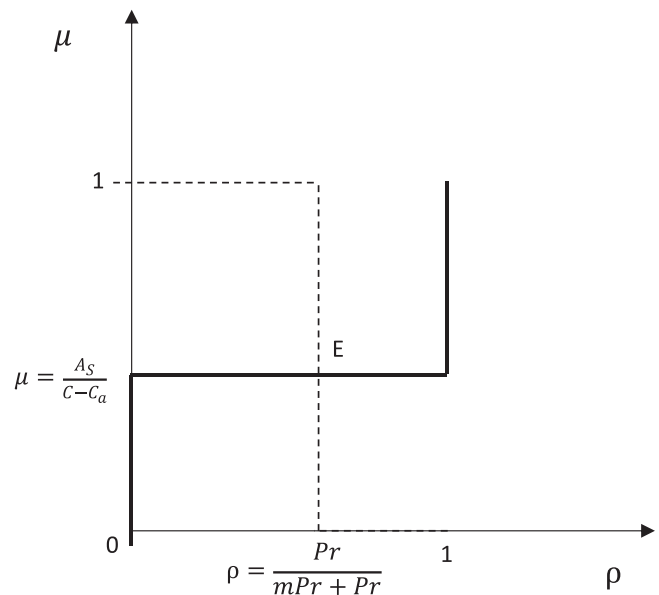


Fig. 6. Reaction function of the officials and settlers for corruption.

remains optimal for S till the win-win situation is achieved. However, the flawed compensation criteria, DC-rate of land, keep LAC at a relative advantage over S. Though Asian Development Bank has guided the South-Asian countries to adopt SPS 2009 Land Acquisition and Resettlement Plans, the conceptual gap with the LAA 1894 causes loopholes in the compensation assessment system (Rosien, 2010), reasons the Supreme Court of Pakistan to intervene to resolve most of the conflicts (Ahmed et al., 2021).

The Ravi Rural Development Authority was established recently and will acquire 40000 ha of land for the Ravi Riverfront Urban Development Projects (GoP, 2020). However, the proposed compensation is approximately PKR 10 million/acre (USD 47,620 Approximately); contrarily market price is approximately PKR 80 million/acre (USD 380, 952 Approximately) (Hasnain, 2020). Thus, the gap between compensation expected and compensation offered cause and augment conflicts between Land Acquisition Collector (LAC) and S (Asif, 1999; Banerjee and Iyer, 2005; Patil et al., 2020). Similarly, the LA for new sectors in Islamabad, F-14, F-15, G-14, and G-15, has been controversial (Dawn, 2021a; Dawn, 2021b). As S has perfect information about the purpose of LA, deterrence, and persistence to acquisition are the natural responses, as the violence abrupted during the acquisition of Bahria Town Karachi (Abbas, 2021; F. Z. N. S. Ali, 2019) since the incumbents know various land assessment criteria principles sanctioned by the court of law. Thus, with a conflict-based scenario, moral and financial corruption rise.

4.3. Th game of artificial price hike game

The NE of the artificial price hikes game finds that the investigation probability is directly proportional to the difference between artificial price hikes and standard compensation; a greater difference creates more chances for a government investigation. However, the probability of document falsification is directly proportional to the investigation cost. Therefore, increased investigation costs motivate settlers to engage in forgery and fraudulent behavior; for example, in the Rawalpindi Ring Road scam, the real estate market forged a bubble to earn abnormal profits (Abbasi, 2021; Sharif, 2021). Contrarily, better compensation negatively impacts the falsification of the documents; a higher average price of the land lessens falsification chances. Therefore, it also implies that a low and insufficient compensation scheme compels S towards

fraudulent behavior. Fig. 7 represents the factors causing a specific fraudulent behavior and sums up the result.

4.4. The game of corruption

The NE of the corruption-based model finds that if the officials opt for corruption while offering a lower dividend to S, objection becomes directly proportional to the bribery and inversely proportional to the penalization cost. It implies that S is more concerned about profits than the system, evident from the price hike model. It also indicates the lack of transparency in the system, where officials and S show a tendency towards corruption, as evident from the Rawalpindi Ring Road scam and sector G-14, Islamabad investigation, where anti-grafting authorities have penalized officials for abnormal compensation and alleged colluding with real estate developers to share profits (Ali, 2019; Dawn, 2021a; Yasin, 2021). Contrarily, the probability of opting for corruption is directly proportional to the objection cost, implying the higher objection/report cost would encourage the officials to malign the process. Practically, the cost of objection is very high in terms of time and resources, i.e., prolonged litigation procedure; it took 38 years to receive awarded compensation ("Mst. Asiya Ashraf Chaudhary vs GoP etc, ", 2019). Since there is no rehabilitation and resettlement concept and transparency in Pakistan, the objection cost remains high, and officials exploit the situation. It further elaborates on the absence of a proper anti-corruption mechanism for land administration and management systems in Pakistan., which further consolidates the monopolistic authority of officials over the land market. Fig. 8 represents the factors causing corrupt behavior by the officials.

4.5. Discussion

The extended game of LAA, 1894, exhibits the interactive strategic model of the incumbents where Nash equilibrium (NE) explains the best strategy of each player. However, LAA, 1894 undermines the incumbents/players' strategic options. Since the incumbents are well-informed about the game of LA, the point of conflict remains the monetary compensation. We keep LAA,1894 as a pivotal point and find out the role of NE during the conflict-based situation. The NE consequently pinpoints the rules of the game, i.e., Eminent Domain. The landowner or

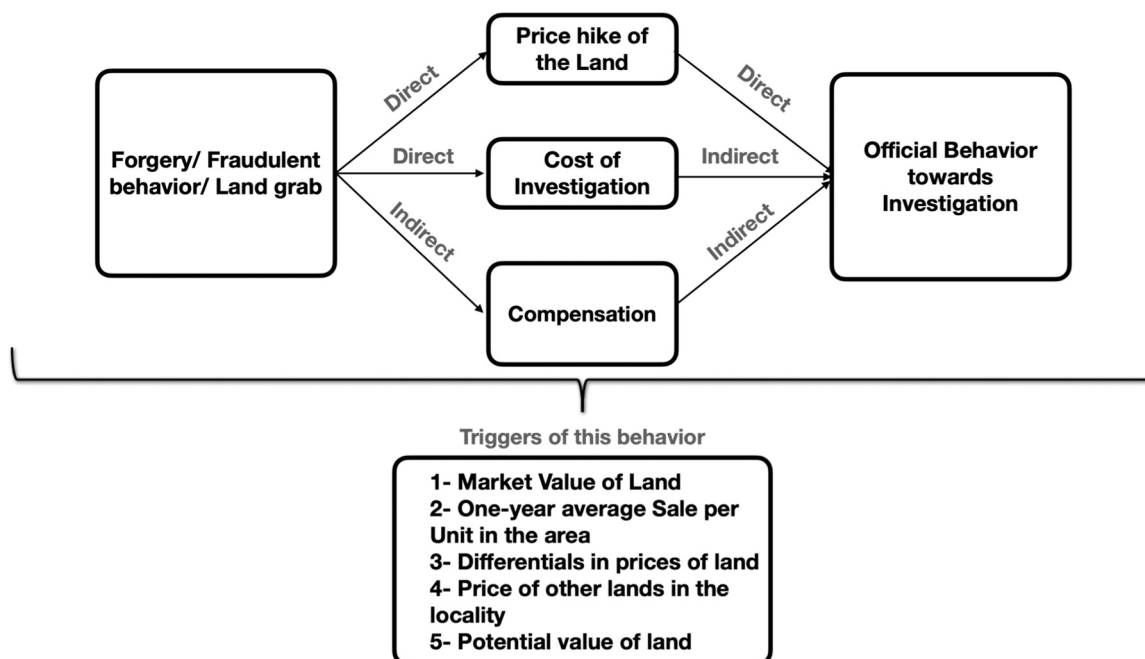


Fig. 7. Factors causing the fraudulent behavior/land grab by the Settler (S).



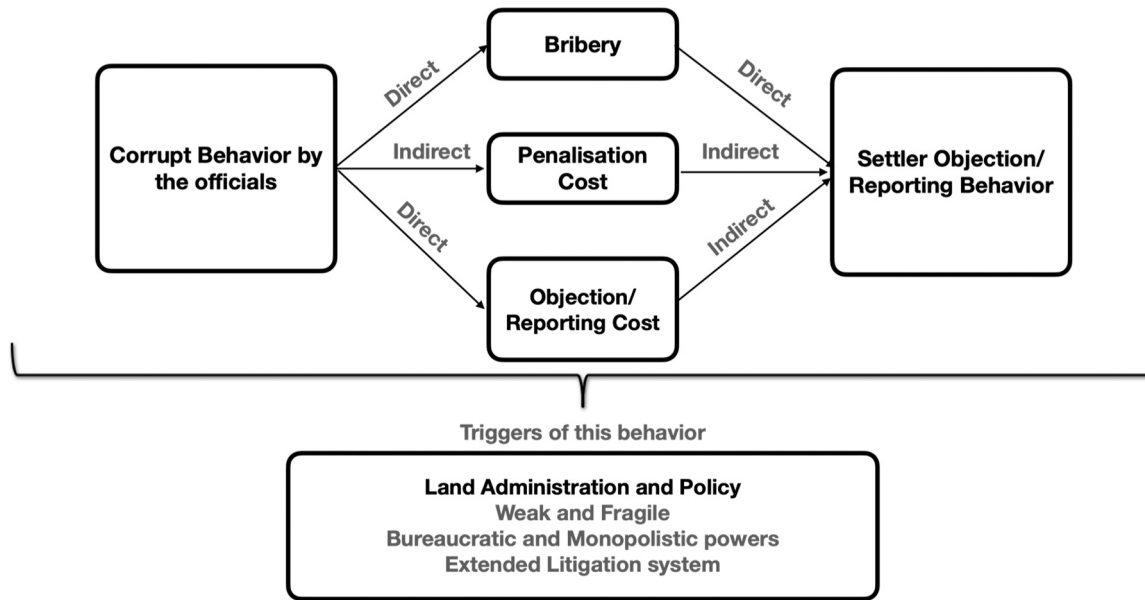


Fig. 8. Factors causing the corrupt behavior by the officials.

possession holder or Settler considers the factor that ED is the government’s prerogative, which rationalizes the use of force for the greater good; the resistance will only exacerbate the conflict. Thus, the circumstances and the rules of the game leave the S with strategic options of either objection under Section 5 or reference to the court of law under Section 18 of LAA, 1894 only, proving that ED makes the law non-inclusive and inequitable and it neither entails the participation of affected nor rehabilitation, resettlement, and restoration (Ramesh and Khan, 2015; Water and Board, 2019). Moreover, the criteria of possession first and compensation later create the enigma of a legal land “grab” (Zoomers et al., 2016; Zoomers and Kaag, 2014), which points to the law’s obsolete nature, necessitating other institutions to augment and rationalize the procedure, the land administration, and the civil courts. The involvement of other institutions creates legal and administrative perplexities (Ahmad and Anjum, 2012), further complicating the acquisition procedure.

The LA conflicts are challenged and interpreted by the court of law. Still, the litigation procedures are recessive and prolonged for decades, as evident from (“Mst. Asiya Ashraf Chaudhary vs GoP, etc. ”, 2019). Though the principles set by the court precedents steer the LA process, the principles are not well admissible, holistic policy. Additionally, the court precedents have declared the law colonial and inconsistent with fundamental human rights (“Noman Ahmed and 14 others vs. CDA, etc. ”, 2021). The other complementary institute, land administration, is informal and primitive with institutional flaws, infringe on S property rights, and provokes non-cooperative and complicated behavior in the system (Abdullah et al., 2020; Ali and Nasir, 2010; Ali et al., 2013) as the contemporary cadastral information system of Pakistan is inefficient and inaccurate also creating opportunities for free-riders to enter the LA process, carrying information about the entire project, and aiming to maximize profits through artificial price hikes (Jana et al., 2020). Thus, multiple institutions managing and implementing LA paradoxically enter new players into the system with illicit intentions, officials, and land grabbers, which compels the landowner, possession holder, and officials to exploit the loopholes and glitches in the system to maximize their profit. Thus, the outcome of the extended game of LAA, 1894, is illegitimate behavior in the form of artificial price hikes and corruption.

The analysis of the extended game elaborates on a bad win-win situation, an unstable compensation structure with a non-existent rehabilitation program that extends the conflict, which in return leads to glitches and loopholes in the system. The illegitimate behavior is mainly

reasoned by low compensation and the high cost of investigation by officials’ reason forgery. It signifies the informality of land with the least documentation and inadequate cadastral information available for verification. Finally, the low penalization costs for officials and high objection costs for LO provoke the officials to malpractice. It indicates a lack of transparency and high litigation cost with the least focus on anti-corruption policies in the land administration and management system of Pakistan.

### 5. Conclusions and policy recommendations

This paper has converted the legal procedure of LAA, 1894, into an extensive game to analyze the strategic interaction of incumbents during LA. NE suggests an absolute advantage of LAC over settlers caused by primitive compensation assessment criteria, which also reasons the induction of illegitimate behavior. Thus, game models of Artificial Price Hike and Corruption are developed as outcomes of the conflict, signifying the profit-maximizing tactics of settlers and officials, respectively. The paper generates generalized game models to access bad win-win situations during legal and policy interactions, leading to conflicts. It discusses various stages of the process, where interactive actions are extensively deliberated, and the logical reasons for exploitation and manipulation of the system are explored.

The NE of the extensive game of the LA model concludes; that in the case of pure public purpose, settlers accept the compensation award by LAC. The enigma of ED rationalizes forced eviction, as evident from the Diamir Bhasha Dam LA conflicts. However, the individual interest-based model is prone to objections as LAC aims to minimize costs, utilizing primitive agricultural units-based compensation assessment criteria. Thus, the official price of the land is lower than the market rate, as evident from the conflicts, F-14, F-15, F-16, G-14, and G-15 sectors of Islamabad and Bahria Town Karachi. The compensation is in monetary terms only without resettlement, rehabilitation, or restoration of settlers. The absolute disadvantage of settlers rationalizes objection and struggle for increased compensation from LAC and provokes illegitimate behaviors of the incumbents.

The NE of the artificial price hike model concludes low compensation and high cost of investigation by officials reason forgery. It signifies the informality of land with the least documentation and inadequate cadastral information available for verification. Finally, the corruption-based model concludes that low penalization costs for officials and high

objection costs for settlers provoke the officials to malpractice. It indicates a lack of transparency and high litigation cost with the least focus on anti-corruption policies in the land administration and management system of Pakistan.

Sustainable Development Goal 11 (SDG 11) aims to *make cities inclusive, safe, resilient, and sustainable*, leading toward sustainable urban growth and development. But, LAA1894 and policy not only compromise SDG 1, Sub-goal 1.4, “*ownership and control over land and other forms of property*,” and also become the root cause of socio-economic instability. The government must create a logical way of assessing the compensation with effective policy measures to make the LA decision-making process transparent and inclusive. There is a strong need for legal, policy, institutional and technological reforms through constitutional amendments rather than court precedents. It is suggested that an institute be established to protect the rights of the incumbents in the process of LA, as established by India through the Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013. However, the civil litigation procedure should also be improved. It can help alleviate the conflict and augment the fabric of the society to harmony and stability.

This study is only focused on qualitative aspects of LAA, 1894 to analyze the behavior of the incumbents during the procedure. Future quantitative studies can calibrate the logic of this study and utilize the assumptions of the model to check its potency and effectiveness.

## Declaration of Competing Interest

There is no conflict of interest to declare.

## Data Availability

No data was used for the research described in the article.

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## References

- Abbas, Z., 2021. Bahria town violence editorial, Dawn, June 9th, 2021 (<https://www.dawn.com/news/1628366>).
- Abbasi, A., 2021. Govt's Ring Road 'scam' is a scandal in itself, News May 13, 2021 (<https://www.thenews.com.pk/print/834686-govt-s-ring-road-scam-is-a-scandal-in-itself>).
- Abdullah, M., De Vries, W., Ali, Z., 2020. Assessing the performance of land administration system in Punjab after land records computerization. Paper presented at the World Bank Conference On Land and Poverty. The World Bank, Washington DC. ([https://www.conftool.com/landandpoverty2020/index.php/07-08-Abdullah-467\\_paper.pdf?page=downloadPaper&filename=07-08-Abdullah-467\\_paper.pdf&form\\_id=467&form\\_version=final](https://www.conftool.com/landandpoverty2020/index.php/07-08-Abdullah-467_paper.pdf?page=downloadPaper&filename=07-08-Abdullah-467_paper.pdf&form_id=467&form_version=final)).
- Ahmad, N., Anjum, G.A., 2012. Legal and institutional perplexities hampering the implementation of urban development plans in Pakistan. *Cities* 29 (4), 271–277. <https://doi.org/10.1016/j.cities.2011.07.006>.
- Ahmed, N., Ahmed, S., Ahmed, S., 2021. Impacts of judicial verdicts on land acquisition practices for real estate in Pakistan. *ICONARP Int. J. Archit. Plan.* 9 (2), 680–702. <https://doi.org/10.15320/ICONARP.2021.176>.
- Alexander, E., 2014. Land-property markets and planning: a special case. *Land Use Policy* 41, 533–540. <https://doi.org/10.1016/j.landusepol.2014.04.009>.
- Alexander, C. (1964). *A city is not a tree*. 1965, 124.
- Ali, F.Z.N.S. (2019, 08 Apr, 2019). How land authorities and Bahria Town (Pvt) Ltd colluded in violating multiple laws to facilitate a massive land grab. *Dawn*. Retrieved from (<https://www.dawn.com/news/1252809>).
- Ali, Z., Nasir, A., 2010. Land administration system in Pakistan—current situation and stakeholders' perception. *Pap. Presente FIG Congr.* ([https://www.fig.net/pub/fig2010/papers/fs03f/fs03f\\_ali\\_nasir\\_3901.pdf](https://www.fig.net/pub/fig2010/papers/fs03f/fs03f_ali_nasir_3901.pdf)).
- Ali, Z., Tuladhar, A., Zevenbergen, J., 2012. An integrated approach for updating cadastral maps in Pakistan using satellite remote sensing data. *Int. J. Appl. Earth Obs. Geoinf.* 18, 386–398. <https://doi.org/10.1016/j.jag.2012.03.008>.
- Ali, Z., Zevenbergen, J., Tuladhar, A., 2013. Quality assessment of the land administration system in Pakistan. *J. Spat. Sci.* 58 (1), 119–146. <https://doi.org/10.1080/14498596.2012.759093>.
- Alston, L.J., Libecap, G.D., Mueller, B., 2000. Land reform policies, the sources of violent conflict, and implications for deforestation in the Brazilian Amazon. *J. Environ. Econ. Manag.* 39 (2), 162–188. <https://doi.org/10.1006/jeem.1999.1103>.
- Araujo, C., Bonjean, C.A., Combes, J.-L., Motel, P.C., Reis, E.J., 2009. Property rights and deforestation in the Brazilian Amazon. *Ecol. Econ.* 68 (8–9), 2461–2468. <https://doi.org/10.1016/j.ecolecon.2008.12.015>.
- Asif, M., 1999. Land acquisition act: need for an alternative paradigm. *Econ. Political Wkly.* 1564–1566.
- Awasthi, M.K., 2014. Socioeconomic determinants of farmland value in India. *Land Use Policy* 39, 78–83. <https://doi.org/10.1016/j.landusepol.2014.04.002>.
- Banerjee, A., Iyer, L., 2005. History, institutions, and economic performance: The legacy of colonial land tenure systems in India. *Am. Econ. Rev.* 95 (4), 1190–1213. <https://doi.org/10.1257/0002828054825574>.
- Batool, A., Abbas, F., 2017. Reasons for delay in selected hydro-power projects in Khyber Pakhtunkhwa (KPK), Pakistan. *Renew. Sustain. Energy Rev.* 73, 196–204. <https://doi.org/10.1016/j.rser.2017.01.040>.
- Burns, T.R., Gomolinska, A., Meeker, L.D., 2001. The theory of socially embedded games: Applications and extensions to open and closed games. *Qual. Quant.* 35 (1), 1–32. <https://doi.org/10.1023/A:1004825116540>.
- Byrne, D., 2003. Complexity theory and planning theory: a necessary encounter. *Plan. Theory* 2 (3), 171–178. <https://doi.org/10.1177/147309520323002>.
- Camerer, C.F., 2011. *Behavioral game theory: experiments in strategic interaction*. Princeton University Press.
- Chan, N., 2003. Land acquisition compensation in China—problems and answers. *Int. Real. Estate Rev.* 6 (1), 136–152.
- Chen, W., Ye, X., Li, J., Fan, X., Liu, Q., Dong, W., 2019. Analyzing requisition—compensation balance of farmland policy in China through telecoupling: a case study in the middle reaches of Yangtze River Urban Agglomerations. *Land Use Policy* 83, 134–146. <https://doi.org/10.1016/j.landusepol.2019.01.031>.
- Dadashpoor, H., Ahani, S., 2019. Land tenure-related conflicts in peri-urban areas: a review. *Land Use Policy* 85, 218–229. <https://doi.org/10.1016/j.landusepol.2019.03.051>.
- Dawn. (2021a, November 1st, 2021). FGEHA asked to provide details of land acquisition in G-14 News. Dawn. Retrieved from <https://www.dawn.com/news/1655167>.
- Dawn. (2021b, November 27th, 2021). FGEHA told to redress grievances of F-14, F-15 landowners Dawn. Retrieved from <https://www.dawn.com/news/1660431>.
- De Roo, G., 2004. Coping with the growing complexity of our physical environment: the search for new planning tools in the Netherlands *Towards Sustainable Cities*, first ed. Routledge, pp. 161–175.
- Desai, M., 2011. Land acquisition law and the proposed changes. *Econ. Political Wkly.* 95–100.
- Ding, C., 2003. Land policy reform in China: assessment and prospects. *Land Use Policy* 20 (2), 109–120. [https://doi.org/10.1016/S0264-8377\(02\)00073-X](https://doi.org/10.1016/S0264-8377(02)00073-X).
- Foweraker, J., 2002. *The struggle for land: a political economy of the pioneer frontier in Brazil from 1930 to the present day*. Cambridge University Press.
- GoP. (1973). *Constitution of Pakistan, 1973*. Islamabad. Land Acquisition Act, 1894, (1973b).
- GoP. (2020). Ravi Riverfront Development Authority. Retrieved from (<https://ruda.gov.pk>).
- Hasnain, K. (2020, November 13, 2020). Ravi Riverfront Urban Development Project: Land acquisition process triggers mass protests Dawn. Retrieved from <https://www.dawn.com/news/1590100>.
- HDA vs Abdul Majeed, 2002 SC 84 (Supreme Court of Pakistan 2002).
- Hipel, K.W., Fang, L., Kilgour, D.M., 2020. The graph model for conflict resolution: reflections on three decades of development. *Group Decis. Negot.* 29 (1), 11–60.
- Howard, N., 1971. *Paradoxes of rationality: Theory of metagames and political behaviour*. MIT press.
- Hui, E.C., Bao, H., 2013. The logic behind conflicts in land acquisitions in contemporary China: a framework based upon game theory. *Land Use Policy* 30 (1), 373–380. <https://doi.org/10.1016/j.landusepol.2012.04.001>.
- Hull, M.S., 2008. Ruled by records: The expropriation of land and the misappropriation of lists in Islamabad. *Am. Ethnol.* 35 (4), 501–518. <https://doi.org/10.1111/j.1548-1425.2008.00095.x>.
- Jana, A., Basu, R., Mukherjee, C., 2020. A game theoretic approach to optimize multi-stakeholder utilities for land acquisition negotiations with informality. *Socio-Econ. Plan. Sci.* 69, 100717 <https://doi.org/10.1016/j.seps.2019.06.002>.
- Jeong, H.-W. (2008). *Understanding conflict and conflict analysis*: Sage.
- Kaida, N., Miah, T.M., 2015. Rural-urban perspectives on impoverishment risks in development-induced involuntary resettlement in Bangladesh. *Habitat Int.* 50, 73–79. <https://doi.org/10.1016/j.habitatint.2015.08.008>.
- Kalabamu, F.T., 2019. Land tenure reforms and persistence of land conflicts in Sub-Saharan Africa—the case of Botswana. *Land Use Policy* 81, 337–345. <https://doi.org/10.1016/j.landusepol.2018.11.002>.
- KES vs Khalida Latif, 1997 848 (Sindh High Court 1997).
- Khalil Muhammad vs WAPDA, 2015 YLR 84 (Peshawar High Court 2015).
- Kilgour, D.M. (1995). Book review: Theory of moves. *Group Decision and Negotiation*, 4 (3), 287–288.
- Lieven, M., 2011. Rationalising dispossession: the land acquisition and resettlement bills. *Econ. Political Wkly.* 66–71.
- Li, Y., Li, Y., Westlund, H., Liu, Y., 2015. Urban—rural transformation in relation to cultivated land conversion in China: implications for optimizing land use and balanced regional development. *Land Use Policy* 47, 218–224. <https://doi.org/10.1016/j.landusepol.2015.04.011>.

- Liu, Y., Tang, W., He, J., Liu, Y., Ai, T., Liu, D., 2015. A land-use spatial optimization model based on genetic optimization and game theory. *Comput., Environ. Urban Syst.* 49, 1–14. <https://doi.org/10.1016/j.compenvurbsys.2014.09.002>.
- Locher, M., Steimann, B., Raj Upreti, B., 2012. Land grabbing, investment principles and plural legal orders of land use. *J. Leg. Plur. Unoff. Law* 44 (65), 31–63. <https://doi.org/10.1080/07329113.2012.10756681>.
- Madani, K., 2010. Game theory and water resources. *J. Hydrol.* 381 (3–4), 225–238. <https://doi.org/10.1016/j.jhydrol.2009.11.045>.
- Magsi, H., Sabir, M., Torre, A., Chandio, A.A., 2021. Management practices to minimize land use conflicts on large infrastructure projects: examples of dams construction in Pakistan. *GeoJournal* 1–11. <https://doi.org/10.1007/s10708-021-10532-0>.
- Mankone, N., Mohamed-Katerere, J., 2006. 4.10 Pakistani land acquisition act and world bank operational directive OD 4.30 on involuntary resettlement: the Ghazi Barotha Dam. *Compens. Policy Issue* (91), 90–99.
- Menezes, F., Pitchford, R., 2004. The land assembly problem revisited. *Reg. Sci. Urban Econ.* 34 (2), 155–162. [https://doi.org/10.1016/S0166-0462\(03\)00041-3](https://doi.org/10.1016/S0166-0462(03)00041-3).
- Montgomery, M.R., 2008. The urban transformation of the developing world. *Science* 319 (5864), 761–764. <https://doi.org/10.1126/science.1153012>.
- Mst. Asiya Ashraf Chaudhary vs GoP etc (Lahore High Court, Punjab 2019).
- Muhammad Saeed vs LAC, 2002 SCMR 07 (Supreme Court of Pakistan 2002).
- Noman Ahmed and 14 others vs. CDA, etc. (Islamabad High Court, Islamabad 2021).
- O’Flaherty, B., 1994. Land assembly and urban renewal. *Reg. Sci. Urban Econ.* 24 (3), 287–300. [https://doi.org/10.1016/0166-0462\(93\)02044-4](https://doi.org/10.1016/0166-0462(93)02044-4).
- Patil, V., Ghosh, R., Kathuria, V., Farrell, K.N., 2020. Money, Land or self-employment? Understanding preference heterogeneity in landowners’ choices for compensation under land acquisition in India. *Land Use Policy* 97, 104802. <https://doi.org/10.1016/j.landusepol.2020.104802>.
- Perera, J. (2014). Lose to gain: is involuntary resettlement a development opportunity?: Asian Development Bank.
- Platteau, J.P., 1996. The evolutionary theory of land rights as applied to sub-Saharan Africa: a critical assessment. *Dev. Change* 27 (1), 29–86. <https://doi.org/10.1111/j.1467-7660.1996.tb00578.x>.
- Qian, Z., 2015. Land acquisition compensation in post-reform China: evolution, structure and challenges in Hangzhou. *Land Use Policy* 46, 250–257. <https://doi.org/10.1016/j.landusepol.2015.02.013>.
- Ramesh, J., Khan, M.A., 2015. *Legislating for Equity: The Making of the 2013 Land Acquisition Law*. Oxford University Press.
- Rao, J., 2019. A ‘capability approach’ to understanding losses arising out of the compulsory acquisition of land in India. *Land Use Policy* 82, 70–84. <https://doi.org/10.1016/j.landusepol.2018.11.042>.
- Raza, F., Almas, M., Ahmed, K., 2005. Land records information management system. Paper presented at the 25th Annual ESRI International User Conference. San Diego, California.
- Rosien, J., 2010. Understanding the Asian Development Bank’s safeguard policy. What protections does the bank’s new safeguard policy provide for communities and the environment. *Oxfam Australia*, 19–26, Victoria.
- Sabir, M., Torre, A., Magsi, H., 2017. Land-use conflict and socio-economic impacts of infrastructure projects: the case of Diamer Bhasha Dam in Pakistan. *Area Dev. Policy* 2 (1), 40–54. <https://doi.org/10.1080/23792949.2016.1271723>.
- Samsura, D.A.A., Van der Krabben, E., Van Deemen, A., 2010. A game theory approach to the analysis of land and property development processes. *Land Use Policy* 27 (2), 564–578. <https://doi.org/10.1016/j.landusepol.2009.07.012>.
- Sarkar, A., 2007. Development and displacement: land acquisition in West Bengal. *Econ. Political Wkly.* 1435–1442.
- Sharif, F. (2021, May 19, 2021). Rawalpindi Ring Road scam: A ‘planned teamwork between govt bigwigs, realtors’. *The Correspondent Pk*. Retrieved from <https://www.thecorrespondent.pk/2021/05/19/rawalpindi-ring-road-scam-a-planned-teamwork-between-govt-bigwigs-realtors/>.
- Smith, J.M., 1982. *Evolution and the Theory of Games*. Cambridge University Press.
- Tan, R., Liu, Y., Zhou, K., Jiao, L., Tang, W., 2015. A game-theory based agent-cellular model for use in urban growth simulation: a case study of the rapidly urbanizing Wuhan area of central China. *Comput., Environ. Urban Syst.* 49, 15–29. <https://doi.org/10.1016/j.compenvurbsys.2014.09.001>.
- Tariq Saeed vs LAC (EHV), WAPDA, 2002 YLR 3180 (Lahore High Court 2002).
- UNDP, U. (2019). *Population Growth: Implications for Human Development*.
- Upreti, B., 2004. Land conflict in Nepal. *Community, Work Fam.* 7 (3), 371–393. <https://doi.org/10.1080/1366880042000295763>.
- Wang, M., Hipel, K.W., Fraser, N.M., 1988. Modeling misperceptions in games. *Behav. Sci.* 33 (3), 207–223.
- WAPDA vs Haji Muhammad Riaz-Ul-Hassan, 2014 MLD 1528 (Peshawar High Court 2014).
- Water, K., & Board, S. (2019). *Social Management Framework*. Retrieved from.
- Wehrmann, B. (2008). *Land conflicts: A practical guide to dealing with land disputes: GTZ Eschborn*.
- Wu, Y., Wu, C., & Shen, L. (2005). Modeling the decision-making using game theory in monitoring land-use practice in China. *系统工程理论与实践 (Systems engineering theory and practice)* (9), 60–70.
- Yasin, A. (2021, May 27, 2021). Two inquiries started into Rawalpindi Ring Road project scam, *News. Dawn*. Retrieved from <https://www.dawn.com/news/1625857>.
- Zoomers, A., Kaag, M., 2014. *The global land grab: Beyond the hype*. Bloomsbury Publishing.
- Zoomers, A., Gekker, A., Schäfer, M.T., 2016. Between two hypes: Will “big data” help unravel blind spots in understanding the “global land rush?”. *Geoforum* 69, 147–159. <https://doi.org/10.1016/j.geoforum.2015.11.017>.