Analysis of the impact of the presence of mobile phone towers on houses' prices in the city of Erbil 2021

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Abstract:

This paper aims to explore the economic effects of cell phone towers being placed on the top of houses. Erbil has been chosen as the case study area to reveal the effects of these towers on houses' prices as well as the consciousness of individuals in regards to this issue. Primary data type was used in this paper by creating and distributing a questionnaire form over one hundred twenty real estate agencies in Erbil to obtain and collect the data needed for drawing the conclusion. For analyzing the data that gathered from the real estate agencies a software package called (SPSS) has been used to illustrate whether cell phone towers have statistically significant effects on houses' prices or not.

Overall, it was found that cell phone towers have positive and significant effects on houses' prices. Furthermore, the study provides policy for the reduction of side effects of communication towers.

Keywords: Communication Towers, Real Estate Agencies, Residential Houses Prices, Peoples' awareness, Erbil.

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تحليل مدى تأثير وجود أبراج الهاتف النقال على أسعار البيوت في مدينة أربيل ٢٠٢١

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المستخلص:

تهدف هذه الورقة إلى استكشاف الأثار الاقتصادية لأبراج الاتصالات التي توضع فوق البيوت،تم اختيار اربيل كمنطقة دراسة حالة لكشف تأثير هذه الأبراج على أسعار البيوت وكذلك وعي الافراد فيما يتعلق بهذه القضية، تم استخدام نوع البيانات الأولية في هذه الورقة من خلال انشاء و توزيع استمارة استبيان على مائة وعشرين ومكاتب عقارية في اربيل للحصول على البيانات اللازمة لاستخلاص والاستنتاج وجمعها، تم استخدام حزمة البرامج تسمى (SPSS)

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لتحليل البيانات التي تم جمعها من المكاتب العقارية، لتوضيح ما إذا كانت ابراج الاتصالات لها تأثيرات إيجابية وهامة على اسعار البيوت، علاوة على ذلك، توفر الدراسة سياسة للحد من الاثار الجانبية لأبراج الاتصالات.

الكلمات المفتاحية: أبراج الاتصالات، الوكالات العقارية، أسعار المساكن، توعية الشعوب، أربيل.

CHAPTER ONE: INTRODUCTION

1.1 Introduction: Usually a home is a one of the biggest investments that people would like to make and have in their lifetime (Lustig, 2016). Therefore, cell phone towers installation on the houses' roofs has been a growing concern for the public due to several reasons, for instance, property devaluation as cell phone towers supposed to affect the prices of their home and another major concern is health problems as its radiation causes some sort of disease (Filippova & Rehm, 2011).

It is supposed that with increasing awareness of the public for the mentioned reasons people are less interested in buying or renting those houses, apartments and buildings being under or located near the cell phone towers (Bond & Squires, 2007). This study has chosen (Erbil) in the Kurdistan region of Iraq where there is lack of scientific papers conducted to explore the influences of the communication towers being installed on the top of the houses or being placed in neighborhoods on the value of those properties being under those towers, but this study examines the economic effects of them rather than their health effects as signaled by health organizations.

1.2 Problem of the Research: Ambiguity of the effects of telecommunication towers being placed on residential houses in terms of pricing, renting and transactions' speedy due to lack of academic studies and papers on it.

1.3 Purpose of the Research: The purpose of this research is to explore the relationship between property values and telecommunication towers in the city of Erbil. It also attempts to illustrate, if there is a relationship and an effect, to what extent the telecommunications towers affect the prices of those properties being under those towers.

1.4 Objectives of the Research: The objective of the study is to explore and illustrate the economic effects of those telecommunication towers that have been installed on residential houses on their prices and rents and transactions' speedy and provide awareness to relevant parties including (the public, Health ministry officials, and Telecommunications companies).

1.5 Importance of the Research: The importance of the study is that it attempts to reveal the economic costs of telecommunication towers on

individual property values as well as the side effects of them and the level of awareness of the public on the risks of those towers they bear. Furthermore, this might be the first academic and scientific study on the telecommunication towers on property values in Erbil city which studies those houses under the cell phone towers. Finally, it adds to the academic literature on the economic costs and effects of those towers on property values for further research and awareness.

1.6 Research Question:

❖ What is the nature of the relationship between Telecommunication Towers and Housing values in Erbil?

❖ Do Telecommunications Towers affect the housing prices in Erbil in the Kurdistan region of Iraq?

❖ What services do Telecommunication Towers offer to the landlords to convince them to place their towers on the roof of their houses and properties?

1.7 The Scope of the Research: This study was conducted on the effects of telecommunication towers placed on the roof of houses on houses' (Property) values in Erbil city.

The study examined the relationship between the telecommunication towers and houses' prices as well as the effects they have on their values in Erbil. Thus, the relationship between telecommunication companies and landlords was revealed based on the services offered by these companies. Furthermore, the study was conducted within a period of ten months that is from the month of January 2021 to the October of 2021. As the researchers contended, this period of time was sufficient enough to gather all the necessary data and information in order to carry out the research.

1.8 Sample of the Research: Institution: Telecommunications Companies and Real Estates agencies

Location: Erbil Time Frame: 2021

1.9 Variables:

Dependent variable: Houses Prices

Independent variable: Telecommunications Towers

$$Houses\ Prices = B_0 + B_1(Communication\ Towers) + e_i$$

1.10 level and Unit of Analysis:

- **Level of Analysis:** Micro
- **Unit of Analysis:** Telecommunications Towers in Erbil

Hypothesis of the Research:

The study assumes that these telecommunication towers have a negative and significant effect on the prices and rents of those houses being under cell phone towers or attached to them.

- $H_0 : B_2 = 0$, there is not a statistically significant relationship between communication towers and housing prices which implies that communication towers do not affect the prices of those houses under telecommunications towers.
- $H_1 : B_2 \neq 0$, there is a statistically significant relationship between communication towers and houses prices which means that communication towers affect the value (prices) of those houses under telecommunications towers.

CHAPTER TWO: LITERATURE AND THEORETICAL REVIEW

2.1 Literature Review:

There are numerous researches conducted on telecommunication towers and their effects on health and property devaluation worldwide. Indeed, due to globalization and the rapid development of technologies people are in greater need of better telecommunication coverage and servicea (Organization for Economic Co-operation & Development, 1998). (NISLAPP, 2014) claimed that house buyers and renters are less interested in those accommodations located close to cell towers as well as in properties where a cell tower is placed on the top of a building. (Bond, 2006), house buyers would pay from 10%-19% less to over 20% less for a property if it were located near a cell phone base station.

(Filippova and Rehm, 2011), found no relationship between proximity to cell phone towers and residential property values based on a study they conducted on the effects of these towers on houses prices. While Bond and Hopkins (2000) discovered that a property which is close to a cellular station is negatively affected by 20%.

2.2 THEORETICAL REVIEW:

2.2.1 TOWER DEFINITION: There are different definitions for the term of tower especially when it comes to American and British English, for instance, in British English it is called mast instead of tower, while in American English people use tower. In engineering terms tower is defined as a self-supporting structure, while a mast is supported by guys. (www.itrainonline.org/itrainonline/mmtk/).

2.2.2. Types of Communication Towers: There are different types of communication towers which are classified based on their structural action, cross section, type of sections used and on the placement of tower.

2.2.2.1 Based on the Cross Section of Tower: Towers can be classified, into square, rectangular, triangular, delta, hexagonal and polygonal towers. Lattice towers claimed to make the most efficient use of material and enable the construction of extremely light-weight and stiff structures by offering less exposed area to wind loads so that most of the power transmission, telecommunication and broadcasting towers are lattice towers (Tah et al., 2017 and Smaqayee, 2016).

2.2.2.2 Based on the Structural Action:

Towers can be classified, based on the structural action, into three major groups (Al-jassani, & Al-Suraifi, 2018).

❖ Self-supporting towers. The towers that are supported on the ground or on buildings are called as self-supporting towers.

❖ Monopole. It is single self-supporting pole, and is generally placed over roofs of high raised buildings.

❖ Guyed towers. Guyed towers provide height at a much lower material cost than self-supporting towers due to the efficient use of high-strength steel in the guys.

2.2.2.3 Based on the placement: Towers are classified based on their placement into green field and roof top towers. Green field towers: These towers are placed in rural areas from 30-200m is their height and said to be les economy.

Roof building towers: These towers are installed on existing buildings with their height from 9 to 30m which are located in the urban areas.

2.3 Effects of Cell Phone Towers:

2.3.1 Effects of Cell Phone Towers on health: Cell phone radiation causes various biological effects, including: cancer, specifically brain tumor and leukemia; altered brain activity; sleep disturbance ; significant changes in internal temperature, and in physiologic parameters of the cardiovascular system; memory loss, fatigue, and headaches, raised blood pressure (Mann & Roschkle, 1996, Krause et al., 2000).

2.3.2 Effects of cell phone towers on property value: Bond and Hopkins (2000) stated that the effect of setting a tower close to a residential property is statistically significant and has a negative effect of 20% at 10-15 meters

from the tower and decreases to 5% at 50 meters and it reveals that the longer the distance the lesser the effect will be. (Christchurch, 2001) found no effect of cell phone base station on property values prices.

2.4 Characteristics of electromagnetic pollution: The increase in the use of electrical energy has led to electromagnetic pollution and has negative effects on the environment. In fact, its side effects are invisible to human beings as they may not occur immediately. All the electrical devices produce electromagnetic fields depending on the amount of voltage and current they use. Indeed, the use of electrical devices particularly wireless communication devices (Mobile, Smart phone, and Wi-Fi) has made people expose more to electromagnetic radiation which can harm and cause to many health problems (Krause et al., 2000).

2.4.1 Electromagnetic Field and Its Effects on Human Health: Electromagnetic field may affect human health in both ways positive and negative.

2.4.1.1 Electromagnetic Field Positive Effects: Electromagnetic fields have three variables: frequency, the direction of spin and the power of spin. Human body supports its own energy when these variables adapt to human body. Magnetic field deficiency in human body causes some health problems such as fatigue and headache.

Such disorders can be treated by providing magnetic fields to the body electromagnetic waves (Batool et al. 2019).

2.4.1.2 Electromagnetic Field Negative Effects: Electromagnetic fields have negative effects on living beings. It can cause changes in the electric currents of some organs and temperature increase in the body. Thus, electromagnetic radiation damages the chemical structure of his oblasts and can cause various types of cancers, neurological disorders such as {ALS, Alzheimer disease (Serra Zerrin Korkmaz el al., 2010 and Ahlbom, 2008)}.

2.5 The effects of cell phone towers on economic development: Technology has proved itself to play an important role in the economy of nations all over the world. Indeed, Economic development has been in rapid acceleration with the advent of technology particularly in industrial and developed nations (Kefela, 2011). (Lum, 2011) found that cell phones have a significant impact on economic growth. Thus, Increases in the cell phone subscriptions rate lead to increases in real per capita GDP.

2.6 The relationship between housing prices and cell phone towers: The role of cell phones in the personal and professional life of everybody has been dramatically increased since the beginning of the 21st century (Kefela, 2011). Thus, more demand for better coverage has led mobile companies to increase installation of towers in residential neighborhoods for providing better services and competition among cell phone companies plays its own role too (Lee & Gardner, 2011). There is a widespread belief that there is a negative correlation between cell phone towers and housing prices based on the studies have been conducted on this phenomena, but this study found a positive relationship between the two and that might be, on one hand, due to the services that the cellphone companies offer to both houses' owners and tenants such as, a monthly payment, free electricity and free mobile and internet recharging. On the other hand, lack of awareness of people about the risks of cell phone towers. The relationship is also illustrated by the diagram below.
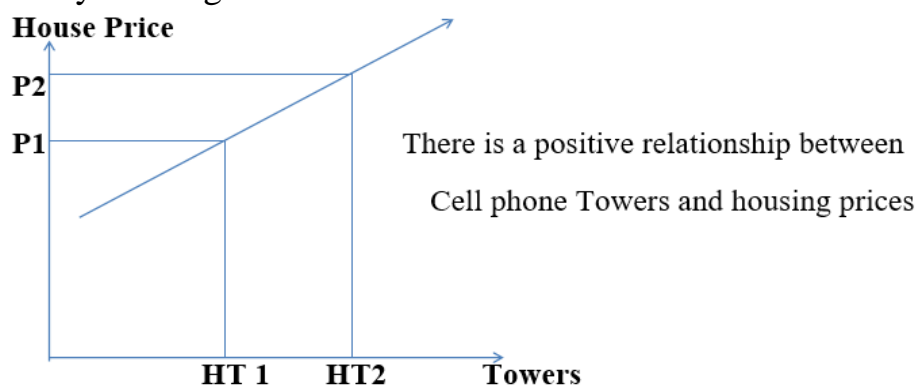
(Prepared by researchers).

While in previous studies conducted on the effects of telecommunications towers on property values in developed countries is illustrated by the diagram below;
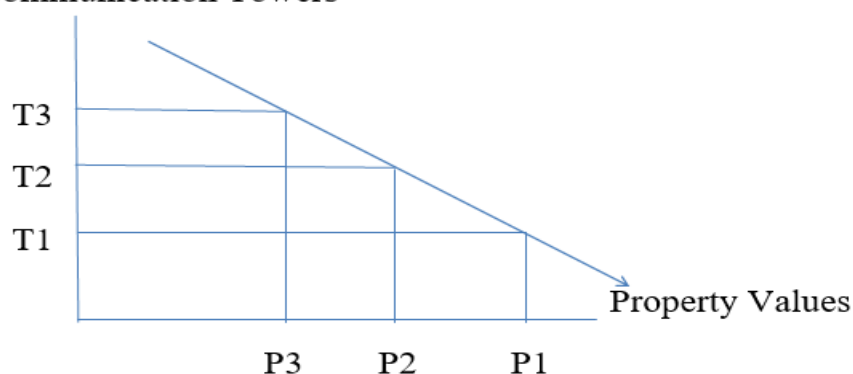
(Prepared by Researcher based on previous studies).

CHAPTER THREE: DATA AND METHODOLOGY

3.1 Data Collection:

Due to lack of data availability this study relied on the primary type data. Therefore, a questionnaire form was designed as an appropriate data collection technique. For the case study area Erbil was chosen. Thus, (120) questionnaire forms were distributed over (120) real estate agencies based in Erbil. Indeed, (100) form was returned in total with answers by the real estate agencies that taken as the sample of the study.

3.2 Methodology:

Several statistical methods and tests have been applied in this study in order to test the validity of the data and analyze them. The tests applied including.

Descriptive Statistics, Factor Analysis, Evaluating Communalities, Correlation Matrix, Kaiser-Meyer-Olkin (KMO) and Bartlett's test. In addition, simple linear regression used to identify the effect of Communication Towers on Houses' prices.

CHAPTER FOUR: RESULTS AND DISCUSSION

4.1. Descriptive Statistics:

Table 1: Shows the Descriptive Statistics for Qualitative Variables

		F	%
X1 installing a cell phone tower on a house leads to an increase in its price	strongly disagree	17	17.0%
	Disagree	18	18.0%
	Neutral	4	4.0%
	Agree	29	29.0%
	strongly agree	32	32.0%
X2 installing a cell phone tower on a house leads to an increase in its renting price	strongly disagree	8	8.0%
	Disagree	16	16.0%
	Neutral	6	6.0%
	Agree	30	30.0%
	strongly agree	40	40.0%
X3 land lords do not live in houses where cell phone towers being placed on	strongly disagree	14	14.0%
	Disagree	27	27.0%
	neutral	11	11.0%
	agree	14	14.0%
	strongly agree	34	34.0%

		F	**%**
X4 cell phone towers lead to a decrease in basic renting prices as accommodation	strongly disagree	11	11.0%
	disagree	22	22.0%
	neutral	16	16.0%
	agree	25	25.0%
	strongly agree	26	26.0%
X5 towers lead to deceleration in housing transaction	strongly disagree	17	17.0%
	disagree	29	29.0%
	neutral	13	13.0%
	agree	19	19.0%
	strongly agree	22	22.0%
X6 cell phone towers lead to an increase in real estate tax	strongly disagree	8	8.0%
	disagree	17	17.0%
	neutral	14	14.0%
	agree	21	21.0%
	strongly agree	40	40.0%
X7 most of the houses with towers being placed on them are located in the middle of neighborhoods	strongly disagree	14	14.0%
	disagree	23	23.0%
	neutral	9	9.0%
	agree	21	21.0%
	strongly agree	33	33.0%

The above table shows 32% of respondents strongly agree with (X1) which stating that installing a cell phone tower leads to an increase in its price and 17% does not agree with. And 40% of the respondents strongly agree and 30% agree that placing a cell phone tower on a house leads to an increase in its renting price while only 24% does not agree with it and that continues to the following questions (3,4,5,6 and 7), in the fourth question which is denoted (X4) the rates are closely distributed.

4.2. Factor Analysis:

Table 2: Represents the Communalities of Variables

	Initial	Extraction
x1	1.000	.749
x2	1.000	.669
x3	1.000	.725
x4	1.000	.644
x7	1.000	.647
x6	1.000	.776
x5	1.000	.702

The initial communalities are for correlation analyses, the proportion of variance accounted for in each variable by the rest of the variables. Extraction communalities are estimates of the variance in each variable accounted for by the factors in the factor solution. The extraction values above indicate the variables picked for the study fit well with the factor solution that are all greater than 0.05. Well, the extraction communalities are acceptable for this solution.

Table 3: Represents Correlation Matrix of the (ECTHP)

	x2	x3	x4	x5	x6	x7
x1	-.120	.588	-.037	.191	.010	.446
x2		-.155	.184	.163	.088	.111
x3			-.112	.154	-.080	.406
x4				-.036	.367	.065
x5					-.393	.298
x6						-.122

The Readings in yellow are greater than 0.30

In these values, there are 4 correlations in the matrix bigger than 0.30, which is fulfilling their needs (blbas et al., 2017) (Table 3).

Table 4: KMO and Bartlett's Test

| Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.601
Bartlett's Test of Sphericity	Approx. Chi-Square	125.241
	Df	21
	Sig.	0.001

This table shows two tests which indicate the suitability of our data for structure detection. The first test is Kaiser-Meyer-Olkin (KMO) which

is a measure of sampling adequacy. In the above table, the value is 0.601 which is greater than 0.5 that means the factor analysis seems useful with our data. The second test is Bartlett's test of Sphericity tests the hypothesis that correlation matrix is an identity matrix, which would indicate that the variables are unrelated and therefore unsuitable for structure detection. In the above result, the p-value is less than 0.05 which indicates that the factor analysis may be useful with our data (blbas et al., 2017).

Table 5: Total Variance Explained

Component	Initial Eigenvalues			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.161	30.874	30.874	2.031	29.016	29.016
2	1.447	20.667	51.541	1.554	22.204	51.220
3	1.303	18.613	70.154	1.325	18.934	70.154

That table shows the variance explained by the extracted factors before rotation. The cumulative variability explained by these three factors in the extracted solution is about 70.154% which is smaller than the initial solution. That small percentage is lost due to latent factors unique to the original variables and variability that simply can't be explained by the factor model. After rotation, the rotated factor model makes some small adjustments to factor 1 and 2, but factor 3 is unchanged.
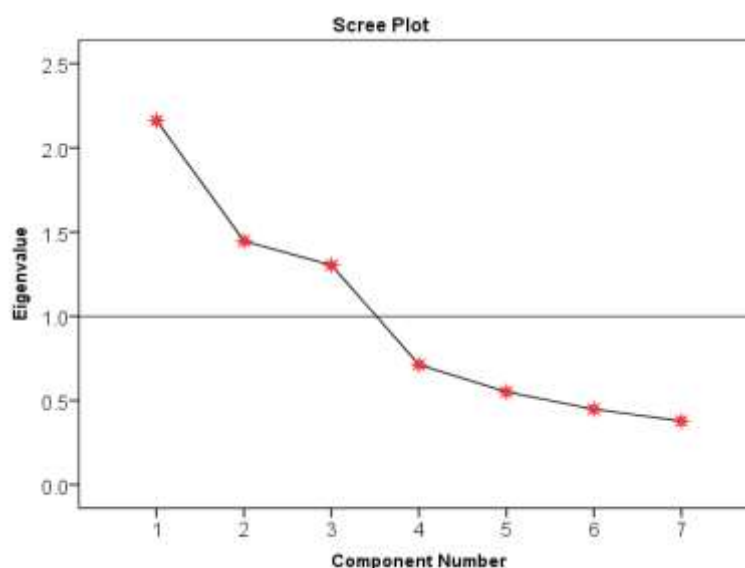
The Scree plot confirms the choice of three components.

Table 6: Shows the Rotated Component Matrixa for a Principal Component Analysis of the ECTHP.

	Component		
	1	2	3
x1	0.86		
x3	0.825		
x7	0.717		
x6		0.881	
x4		0.625	
x5		0.605	
x2			0.806
Extraction Method: Principal Component Analysis.			
Rotation Method: Varimax with Kaiser Normalization.			

In the above table, the first factor is most highly correlated with x1, x3, and x7. The second factor is correlated with x4, x5 and x6, but the third factor is just correlated with x2. After rotated component, the third factor is largely unaffected by the rotation, but the first two factors are easier to interpret.

4.3. Correlation and Regression:

Correlation analysis was used to know the relationship between independent variables and dependent variable. Regression analysis is a statistical method which is used for undertaking and modeling the functional relationship between a response variable and a set of explanatory or predictor variables (Blbas, 2014).

Next, simple linear regression analysis was used to identify an explanatory variable of communication towers that predict on response variable of price of houses (Aroian et. al., 2017 and Blbas, 2014).

Table 7: Simple Regression Analysis between independent variable (Communication Towers) and dependent variable (Houses' prices)

	Coefficients			Model Summary		ANOVA	
	B	t	P-Value	Corr.	R Square	F	P-Value
(Constant)	1.352	3.434	0.001	0.55	0.27	39.988	0.001
Communication Towers	0.674	5.822	0.001				

Table 7 showed the weak positive correlation between independent variable (Communication Towers) and dependent variable (Houses' prices). After finding a weak positive relationship between (Communication Towers) and (Houses' prices) (0.55) from the Pearson's correlation analysis, it is important to know the prediction and influence rate of Communication Towers on Houses' prices. Also, the same table shows the ANOVA table for checking the goodness of fit for the explanatory variable (Communication Towers) on the response variable (Houses' prices), so the model is appropriate based on (F=39.988 and P-Value =0.001).

The table above contains the result of constant, Slope, t-value, and coefficient of determination (R Square). Regression Coefficient (B) for Communication Towers is 0.674, which means, increasing one unit for Communication Towers will increase Houses' prices by 0.674. The coefficient of determination (R Square) explains how much variation in the dependent variable is explained by the independent variable. Determination of Coefficient (R2) reflects that 27% of the variation of Houses' prices is determined by Communication Towers and the remaining variation is turning to other factors that effect on Houses' prices.

CHAPTER FIVE: CONCLUSION AND RECOMMENDATION

5.1 Conclusion:

This research can conclude that against our hypothesis came true as it assumed that there would be a negative relationship between housing prices and cell phone towers. The results obtained in the study showed that cell phone towers being placed on the roof (top) of houses and buildings lead to increase in their selling price and renting price. The results of this phenomena In Erbil where the study has been conducted is different from other studies carried out elsewhere and that might be due to several reasons for instance, first, lack of awareness of the people against the health risks that telecommunication towers can cause, second, some benefits that communication towers companies provide to residents who live in those houses with communication towers placed on them and the ones close to them, and the benefits they provide are free electricity, a free recharging (Fast link 4G Card) for their internet access and a free (Balance Card) for recharging their cell phone. Another benefit which is considered the most important is the monthly payment that the owner of the property receives from the communication towers companies.

5.2 Recommendation:

To reduce the side effects of communication towers the followings are recommended.

1. Raising awareness of people about the risks communication towers have on our health by NGOs, Mass Media, educational institutions, and mosques.
2. Imposing special taxes on those companies install communication towers on residential houses as well as the owners of the houses.
3. Passing a law by the parliament to move those towers out of the residential areas.
4. More researches should be conducted by academic institutes on the side effects of communication towers.
5. Lowering corporate taxes and providing some facilities by the government to those companies move and place their towers out of the residential neighborhoods as an incentive.

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Appendix

Ministry of Higher Education & Scientific Research
Salahaddin University/Erbil
College of Administration and Economics
Finance & Banking Department

Questionnaire Form

This questionnaire form is designed for the purpose of conducting an academic study entitled:

(**Analyzing the Effects of Communication Towers on Houses' prices**)

Erbil has chosen as an example so that we ask you to answer the following questions precisely. Finally, we would very much thank you for your cooperation.

With Best Regards

Researchers:
Assist. Prof. Dr. Ayoub Anwar Smaqayee
Assist. Lecturer: Muhammad Muhsin Anwar

Q1) Installing communication towers on houses lead to an increase in their selling prices.

Agree ☐ Strongly agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree ☐

Q2) Placing towers on houses lead to an increase in their renting prices

Agree ☐ Strongly agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree ☐

Q3) the owners of the houses do not live in their houses being under communication towers.

Agree ☐ Strongly agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree ☐

Q4) Placing tower on a house leads to a decrease in the basic renting of the residential house.

Agree ☐ Strongly agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree ☐

Q5) Placing cell phone towers lead to reaccelerating transaction of the houses.

Agree ☐ Strongly agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree ☐

Q6) placing towers lead to an increase in real estate tax.

Agree ☐ Strongly agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree ☐

Q7) Most of the houses being placed towers on them are located in the middle of the residential neighborhoods.

Agree ☐ Strongly agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree ☐