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How The Residents Are Affected from Construction Operations Conducted in Residential Areas

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Abstract

The construction projects have adverse impacts on the residents who live at a neighborhood of a construction project. In the literature, these adverse impacts are identified and the social cost of these adverse impacts are formalized. However, in all these studies, all adverse impacts are assumed to create nuisance at the same level, whereas the residents are more sensitive to some of these nuisances, on the other hand some of the nuisances which are considered in the social cost studies can be overlooked by the residents, and therefore this can cause misleading calculations of social cost. In order to overcome shortcoming of social cost studies, a study, which aims to identify the level of effects of each nuisance on the residents, is conducted by performing a questionnaire survey. 266 respondents are obtained at the end of the study, and the data obtained by questionnaire survey is analyzed by using descriptive analysis. According to this analysis, loss of peace and quietude of the neighborhood, cleanliness of the house, and degradation of ambient conditions are identified as the most disturbing nuisances. In addition, the country conditions and culture of the region is considered as important factors that play an important role in the intensity of adverse impacts.

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Keywords: Adverse Impacts, Stakeholder Management, Criticality Index

1. Introduction

The construction industry plays an important role to satisfy human needs, therefore the construction activities cannot be evaded [1]. In addition, most of these activities should be performed in the urban areas, so these activities

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are impossible to be expelled from city centers. However, the construction projects are acknowledged as one of the important sources of nuisances emerged in the urban areas. In other words, the ecological, sociological and economical systems placed at the surrounding of the construction projects can be impacted adversely by construction activities [2, 3]. However, one of misleading behaviors of project teams is the propensity of ignorance of adverse impacts of construction projects on external stakeholders during the management process [4], since the external stakeholders who experience these adverse can develop resistance against the construction projects. In addition, the tendency for external groups to influence the construction projects can be observed due to NIMBY (not in my backyard) syndrome [5, 6]. For instance, they can protest, take legal actions against the project and repress governmental agencies, which in turn lead to delay in projects, budget extensions and charges. Therefore, the nuisances emerged due to adverse impacts of construction projects should be managed by the project management teams in order to avoid conflicts between the environment and project team. However, most of the project teams can inadvertently escalate these conflicts instead of eliminate and mitigate them due to the lack of guiding theoretical frameworks [4]. [1] state that `construction impact assessment' can be used for protecting the natural and built environment and identify the first step of this model as identification of relevant adverse impacts. In their study, they identified a number of adverse impacts, in addition a few studies, especially studies related to social costs and environmental impact assessment, are conducted for identification of adverse impacts of construction projects. The deficiency of the studies related to social cost is that all adverse impacts are assumed to cause same level of negative nuisances to the neighboring community and the findings are proposed based on this assumption. Whereas, the effects of each adverse impacts on the neighboring community can be different, therefore allocating resources for elimination of all adverse impacts is not a good management practice. On the other hand, the environmental impact assessment studies develop models to identify major environmental impact factors, however they overlook the perception of the neighboring community who are affected by the construction projects to these adverse impacts. However, the most disturbing adverse impacts should be identified by considering the views of neighboring community, thus the precious resources used for elimination or mitigation of adverse impacts can be allocated effectively. Consequently, in this study a model which consists of adverse impacts of construction projects is developed. Based on this model, a questionnaire is developed and these adverse impacts are ranked by analyzing the data obtained at the end of the questionnaire study by using descriptive analysis and criticality index. According to the findings of these analyses, a roadmap which can be used for managing the neighboring community is developed for the construction projects.

2. Potential Adverse Impacts of Construction Projects

The initial stage of the developed framework is the identification of the potential adverse impacts of construction projects. For that purpose, a literature survey is conducted. According to the literature, two types of studies where the adverse impacts of construction projects are identified are available in the literature, first one is related to the quantification of social costs and the other one is about environment impact assessment. [1] mention about four categories of adverse impacts of construction projects in urban environments. These are traffic, economic activities, pollution and ecological/social/health, and they state nine adverse impacts, namely prolonged closure of road safety, detours, utility cuts, noise, dust, vibration, air/water pollution, surface/subsurface disruption and damage to recreational facilities under these four categories. [7] develop a bid evaluation method by including the social cost of infrastructure projects in urban areas. According to them, adverse impacts of the construction projects should be considered under four categories, namely "natural environment", "public property", "local economy" and "human society". [8] use the similar categorization of adverse impacts with [7] in their study which is about quantification of social cost of construction projects performed in cosmopolitan centers. They identify a total of twelve subcategories. [9] classify the adverse impacts of the construction projects in four main categories for residential building constructions, namely impact on the community, impact on the economy, impact on the environment and public property. [10] develop an environmental impact assessment model for construction processes and categorize adverse impacts of construction projects into three categories, namely resource depletion, health damage and ecosystem damage. [11] use four main categories, namely physical/chemical, biological/ecological, sociological/cultural and economic/operational, and 26 subcategories in their environmental assessment model. By considering all these studies, 4 adverse impact categories are identified for construction projects, namely damage to nature and built environment, pollution, traffic and human society. When compared to the models proposed in other studies and this study, the main

difference between this model and other models is “economic activities” category. In other words, in all other studies, “economic activities” is considered as an important adverse impact category, however in this study it is eliminated. The reason of this is the target population. In this study, the target population is selected as the residents, therefore the economic category cannot be evaluated by the respondents of the questionnaire precisely, and this can lead to misleading conclusions. Therefore, a model, where adverse impacts related to economy are eliminated, is developed. The table 1 shows the subcategories of the model identified according to the conducted literature survey.

3. Research Methodology

The purpose of this research is to identify and rank the critical adverse impacts emerged throughout a construction project. A questionnaire survey based on 18 factors is conducted in three cities placed in north Cyprus, namely Famagusta, Kyrenia and Nicosia. The target population is determined as the residents live within a 150 m radius to an on-going construction project, therefore the uniformity about degree of explosion to the nuisances emerged due to construction project is satisfied. The number of obtained questionnaire is 266 at the end of the study. These questionnaires are analyzed by using descriptive analysis and criticality index. The criticality index is used in this research, since it has been widely used in research projects for ranking the variables due to its reliability and effectiveness [12]. For instance, [12] used criticality index to rank the major challenges to the application of programme management successfully in the construction industry. In addition, criticality index is used in researches related to stakeholder management. For instance, [13] used relative importance for prioritizing the common issues and concerns of stakeholders in the current construction industry.

The following formula is used in calculation of criticality index of nuisances. In this formula, C is the criticality index, *i* shows the responses category index = 1, 2, 3, 4, 5, 6, 7, 8, 9 and 10. W_i is the weight assigned to i^{th} response. W_i is calculated by considering the number of intervals in the Likert scale used in this study. Since, there are 9 intervals, weight of each response category is calculated by multiplying the responses category index with 0.11 [12]. X_i is the frequency of the i^{th} response given as percentage of the total responses.

$$C = \frac{\sum_{i=10}^{10} W_i X_i}{\sum_{i=10}^{10} X_i} \quad (1)$$

The criticality indexes of the variables are shown in Table 2. The values of criticality indexes are between 0 and 1, and the higher values show that these variables are more critical, in other words the variables whose criticality index is equal to one are the most critical variables.

The other analysis used repeatedly and widely used in the literature for ranking the importance of the variables is mean indexing. This analysis can provide support to the criticality index calculated in this research. A descriptive analysis was conducted by using SPSS version 22.0 for determining the average and standard deviation of the nuisances. The results of the analyses were shown in Table 2.

4. Results and Discussions

According to the findings of descriptive analysis, average of disturbing level of most of adverse impacts of construction projects are calculated higher than 5. Therefore, it can be concluded that most of these impacts are considered as disturbing by the respondents, in other words, the respondents think that they affect their life adversely. Especially, noise is identified as the most disturbing adverse impact according to the average disturbing level of subcategories. However, serious noise pollution caused by construction is identified as insignificant risk in the literature [14, 15], the reason of this conclusion is the ignorance of the concerns of neighboring community in their research. In other words, the target population for these researches is selected as the internal stakeholders, namely consultants, owners and contractors. Whereas, this research shows that the neighboring community is affected by the noise extensively, therefore this shows that the studies which are limited with the internal stakeholders is not sufficient.

The second most disturbing nuisance is identified as the dust. Consequently, it can be said that the pollution is seen as the most disturbing nuisance. Among subcategories of pollution, the loss of peace and quietude of the neighborhood whose average disturbing level is 7.82 is considered as the most disturbing adverse impact. In other words, the project teams should arrange their time table for the construction tasks by considering the peace and quietude of the neighborhood, and they make noise reduction arrangements on site [16].

Table 1: Descriptive analysis of the adverse impacts.

Adverse impacts	Criticality index	Mean	Standard deviation
Damage to nature and built environment			
Loss in serviceability of playfield and parks	0.33	5.29	4.25
Loss of habitats and parks	0.55	7.13	3.82
Loss of landscape	0.54	6.85	3.36
Pollution			
Dust			
Cleanliness of the cars	0.55	7.60	3.54
Cleanliness of the house	0.62	7.71	3.26
Cleanliness of the neighbourhood	0.56	7.23	4.01
Cleanliness of the backyard	0.44	6.37	3.67
Noise			
Loss of peace and quietude of the neighbourhood	0.56	7.82	3.37
Degradation of ambient conditions	0.60	7.41	3.08
Prevention of usage of the outdoor areas of the house	0.41	6.54	4.04
Traffic			
Prolonged closure of road spaces	0.54	6.88	3.68
Detours	0.41	5.96	4.09
Utility cuts	0.22	4.32	4.20
Human society			
Road safety problems	0.46	6.40	3.92
Human health hazards	0.18	3.42	4.00
Living quality decline	0.50	6.13	3.49
Safety hazards in the area	0.52	6.84	3.36
Loss of car parking space	0.26	4.95	4.403

The mean of three nuisances' disturbing level is calculated lower than 5, namely utility cuts, loss of car parking space and human health hazards. Among these adverse impacts, the least important nuisance is identified as human health hazards emerged due to the construction activities. The reason can be explained that the adverse impacts of construction projects on human health can be observed in the long term, therefore they are not aware of these impacts at the time of construction. However, the construction companies cannot ignore this adverse impact due to social responsibility. One of the interesting findings of this study is that the respondents consider that loss of car parking space is not disturbing. Whereas, most of the studies about social cost evaluate loss of car parking space as an important cost indicator. The country conditions can lead to this conclusion, namely parking space is not a problem in North Cyprus because of low population density. Even, the number of paid parking lots is very limited. On the other hand, in some of the countries or cities, parking lots are very expensive. Consequently, the construction companies should consider the country conditions when they are managing the neighboring community.

The other interesting finding is that the standard deviation of all adverse impacts is high. The variety of the target population may lead to this opinion discrepancy. Therefore, the project teams should be aware that different parties are sensitive to different adverse impacts, in other words the project teams should understand the demands of their neighboring community. For that purpose, they can arrange meetings with the neighboring community and take their comments and opinions before initiating the project. They should keep communication with these parties throughout the project.

5. Conclusions

In this study, the adverse impacts of construction projects are evaluated based on the views of the neighboring community. A questionnaire survey, which consists of the adverse impacts determined by performing a literature survey, is conducted in three cities of North Cyprus. A total of 266 questionnaires is analyzed by using criticality index

and descriptive analysis. The analyses show that the pollution is perceived as the most disturbing adverse impact by the neighboring community. The construction is known as one of the major contributors of environmental problems [17]. In other words, it is obvious that every construction project will create pollution and this pollution will disturb the neighboring community. Therefore, the construction companies should develop sustainable projects, and inform the neighboring community how they deal with the pollution emerged during the construction phase. Among pollution subcategories, the neighboring community especially complains about the noise pollution, therefore the construction companies should carefully arrange the time table of the activities which create noise pollution by taking the opinions of the neighboring community.

This study also reveals that the country conditions are very important in determination of effective adverse impacts. In other words, each adverse impacts stated in the literature can affect the different communities differently. Therefore, the environment assessment models should be developed by considering the effects of country conditions. In addition, public should be participated in environment impact assessment in order to capture the opinions of the neighboring community, therefore the country conditions can be taken into consideration [18].

Although the model developed in this study can be used in different countries, the findings of this study should be considered as country specific. In order to identify the effects of adverse impacts in different countries, a comparative study should be conducted. Furthermore, the parameters identified in this study can be used as a benchmark to conduct similar studies in other project based industries.

References

[1] A. Gilchrist and E.N. Allouche, Quantification of social costs associated with construction projects: state-of-the-art review, Tunnelling and Underground Space Technology. 20(2005) 89-104.
[2] L.-y. Shen, et al., Project feasibility study: the key to successful implementation of sustainable and socially responsible construction management practice, Journal of Cleaner Production. 18(2010) 254-259.
[3] M.M. Teo and M. Loosemore, Community‐based protest against construction projects: a case study of movement continuity, Construction Management and Economics. 29(2011) 131-144.
[4] M.M.M. Teo, An investigation of community. Based protest movement continuity against construction projects. Built Environment. PhD. University of New South Wales, Sydney, 2009.
[5] K. Burningham, Using the Language of NIMBY: A topic for research, not an activity for researchers, Local Environment. 5(2000) 55-67.
[6] S. Olander and A. Landin, A comparative study of factors affecting the external stakeholder management process, Construction Management and Economics. 26(2008) 553-561.
[7] W. Xueqing, et al. Practical bid evaluation method considering social costs in urban infrastructure projects. in Management of Innovation and Technology, 2008. ICMIT 2008. 4th IEEE International Conference on. 2008. IEEE.
[8] B. Liu, et al., The decision model of the intuitionistic fuzzy group bid evaluation for urban infrastructure projects considering social costs, Canadian Journal of Civil Engineering. 40(2013) 263-273.
[9] Q.-M. Yuan, D.-J. Cui, and W. Jiang, Study on evaluation methods of the social cost of green building projects, in Wang Jun, et al., (Eds.), Advances in Industrial Engineering, Information and Water Resources, WIT press: Southampton, 2013, pp. 11.
[10] X. Li, Y. Zhu, and Z. Zhang, An LCA-based environmental impact assessment model for construction processes, Building and Environment. 45(2010) 766-775.
[11] Y.-M. Wang, J.-B. Yang, and D.-L. Xu, Environmental impact assessment using the evidential reasoning approach, European Journal of Operational Research. 174(2006) 1885-1913.
[12] Z. Shehu and A. Akintoye, Major challenges to the successful implementation and practice of programme management in the construction environment: A critical analysis, International Journal of Project Management. 28(2010) 26-39.
[13] J. Ye, et al., Stakeholders' requirements analysis for a demand-driven construction industry, Journal of Information Technology in Construction (IT-con). 14(2009) 629-641.
[14] P.X. Zou, G. Zhang, and J.-Y. Wang. Identifying key risks in construction projects: life cycle and stakeholder perspectives. in Pacific Rim Real Estate Society Conference. 2006.
[15] A. Enshassi, S. Mohamed, and S. Abushaban, Factors affecting the performance of construction projects in the Gaza strip, Journal of Civil Engineering and Management. 15(2009) 269-280.
[16] P.X.W. Zou, G. Zhang, and J. Wang, Understanding the key risks in construction projects in China, International Journal of Project Management. 25(2007) 601-614.
[17] F. Bianchini and K. Hewage, Probabilistic social cost-benefit analysis for green roofs: A lifecycle approach, Building and Environment. 58(2012) 152-162.
[18] C. O'Faircheallaigh, Public participation and environmental impact assessment: Purposes, implications, and lessons for public policy making, Environmental Impact Assessment Review. 30(2010) 19-27.