ISSN 1728-7715 (print)
ISSN 2519-5050 (online)

JOURNAL OF RESEARCH IN ARCHITECTURE AND PLANNING

VOLUME TWENTY-NINE
2020 (Second Issue)

ISSN 1728-7715 (print)
ISSN 2519-5050 (online)

JOURNAL OF RESEARCH IN ARCHITECTURE AND PLANNING

VOLUME TWENTY-EIGHT
2020 (First Issue)

Department of Architecture & Planning,
NED University of Engineering & Technology, City Campus
Maulana Din Muhammad Wafai Road, Karachi.

ISSN: 1728-7715 (Print)
ISSN: 2519-5050 (Online)

Online publication available at:
http://www.neduet.edu.pk/arch_planning/NED-JRAP/index.html

Publication Designed at Department of Architecture and Planning
NED University of Engineering & Technology, Karachi

JOURNAL OF RESEARCH IN ARCHITECTURE AND PLANNING

Published by

Department of Architecture and Planning, NED University of Engineering and Technology, Karachi, Pakistan.

Printed by

Khwaja Printers, Karachi.

CONTENTS

Note: All the photographs included in this issue have been taken by the authors unless otherwise mentioned.

EDITORS' NOTE

The five research papers included in this volume cover themes related to resettlement communities, sustainable traveling options, housing quality, healthcare infrastructure, design during Covid-19 and ecotourism.

The first paper assesses displaced villagers' life satisfaction in government-designated resettlement communities after land expropriation. From the theoretical perspective of subjective well-being, the study explores the relations between the overall life satisfaction of displaced villagers and their subjective satisfaction with three dimensions in their post-resettlement life.

The second paper aims to identify the significant relationship between the socio-economic characteristics of travelers and their intentions of carpooling strategy. The data was collected with the help of a questionnaire survey in Lahore city and analyzed using frequency analysis and ordered probit regression analysis.

The third paper uses multiple regression analysis to identify the factors which are making a negative impact on multi-story housing quality in Hyderabad, Pakistan. The study variables were categorized into safety and security environment, life convenience, space utilization and utilities and services. To record the residents' opinion, the variables were inserted in a structured questionnaire.

The fourth paper explores the current context with reference to COVID-19 health burden. Existing infrastructure and facilities were explored through literature review and documented against the set criteria and standards with respect to quarantine and isolation facilities. Development of a basic concept about the nature of COVID-19 was explored with respect to Pakistan and its spread in the country.

The last research paper is categorized under Young's Scholar contribution. This paper explains the current status of tourism development and its impact on the local communities and environment of Chotiari Wetland Complex in the province of Sind, Pakistan. It establishes the architectural ethics in planning and developing tourist's facilities that bridge the gap between ecotourism and its architecture which are beneficial for community and environment.

This volume also includes a book review of "A Pattern Language: Towns, Buildings, Construction" authored by *Christopher Alexander, Sara Ishikawa, Murray Silverstein, Max Jacobson, Ingrid Fiksdahl-King and Shlomo Angel*. The book uses architecture, sociology, psychology, and anthropology to define the architectural settings that are most satisfying. In a nutshell, the philosophy of the book is that people always depend on several languages in developing their environments which, like the languages, they converse, enable them to express and articulate an endless variety of projects within a formal process that gives them cohesion.

Editorial Board

EVALUATING VILLAGERS' LIFE SATISFACTION IN RESETTLEMENT COMMUNITY: A PILOT STUDY OF SUBURBAN NANJING, CHINA

*Zhu Qian**

ABSTRACT

This paper assesses displaced villagers' life satisfaction in government-designated resettlement communities after land expropriation. From the theoretical perspective of subjective well-being, the study explores the relationship between the overall life satisfaction of displaced villagers and their subjective satisfaction with three dimensions in their post-resettlement life – 1) material living conditions, 2) social security and employment support, and 3) attitudinal perceptions, social relations and participation. A pilot survey was conducted in two resettlement communities in suburban Nanjing. The study shows that while compensation and resettlement policy reforms have improved resettled villagers' material living conditions; they still struggle with urban life transformation and adaptation from the social and attitudinal perspectives. An integrated resettlement approach is proposed to facilitate better accessibility to social security programs and non-agricultural employment opportunities, and to address issues in identity adaptation, lifestyle transformation, and social activity participation.

Keywords: Life Satisfaction, Resettlement, Land Expropriation, Displaced Villagers, China

INTRODUCTION

Rapid industrialization and massive urbanization in China's economic reform era has created enormous demand for urban construction land. The pace of urbanization has accelerated since the 1990s, leading to decrease in rural population decrease and loss of agricultural land due to urban development in rural land expropriation. An increasingly large number of rural villagers has been resettled to urbanized communities and lost all or part of their rural land during the process. Resettled villagers then have to face numerous challenges in their new urban life and often find themselves in a disadvantaged position in urban society. As passive participants in the process, resettled villagers typically have no alternative but to obey decisions from local authorities. Consequently, some resettled villagers may develop a resistant attitude towards resettlement policies and processes (Tang et al., 2016). Meanwhile, urban residents' perception of resettled villagers and the sense among villagers of being inferior to urban citizens formed by the long existing urban rural dualism might reinforce their limitations competing in the labour market and discourage their active participation in urban social activities (Zhang and Qian, 2020). Once deprived of their rural property rights and land collective ownership, resettled villagers encounter financial challenges in their daily life as well as face marginalization in the labour market and urban social security programs such as pension plans, health care, low-income subsidies, and unemployment insurance(Liang and Zhu, 2015; Ma and Hu. 2014). All these influence resettled villagers' attitudes toward compensation and resettlement policies and their overall life satisfaction with urban life.Over the past decade, multiple compensation and resettlement approaches have been devised to address these issues but with mixed consequences.

Existing empirical studies on resettled villager's well-being have not sufficiently addressed whether resettled villagers consider policy reforms effective and how they evaluate their life quality and well-being after land expropriation and resettlement. Research on resettled villagers' life satisfaction in urban society from their own opinions will contribute to local government's understanding and planning of resettlement programs in their policy revisions. It will also provide an opinion platform to resettled villagers and facilitate a bottom-up mechanism in assessing resettlement and compensation systems to give more considerations to the rights and interests that resettled villagers care about. It is imperative to investigate how resettled villager's life has been impacted by resettlement and compensation programs and how (un)satisfied these former villagers feel about the resettlement and compensation institution in bettering their life experience in urban setting.

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China's compensation principles are focused mainly on direct economic loss, leaving insufficient considerations to indirect losses association with rural land conversion to urban uses such as agricultural and environmental amenity changes, new urban life assistance, tradition and culture transformation, and lifestyle changes (Ma and Hu, 2014). Yet, resettled villagers' life quality after land expropriation can experience tremendous changes resulted from material living conditions, social security coverage, re-employment, social network reconstruction and urban lifestyle adaptation.Studies have examined various aspects of resettled villagers' satisfaction with their life quality (Chen et al., 2013; Duan and Chen, 2009; Hu et al., 2014;Luo and Fan, 2008) but few have employed the perspective of subjective well-being and incorporated multiple dimensions to assess resettled villagers' satisfaction level with new urban life from their own opinions. The subjective well-being discourse emphasizes on individual's own evaluation that can be cognitive, experiential, and attitudinal (Diener, 2000). This research examines the practicability and sustainability of resettlement and compensation programs by investigating resettled villagers' self-assessment of life quality and well-being in their resettlement communities designated by local government. Life quality satisfaction assessment serves to provide more empirical evidence of how resettled villagers evaluate their life quality, and clarify what life aspects they are satisfied or unsatisfied with, and understand what they really expect and highly value in current resettlement and compensation institutions.

CONCEPTUAL DISCOURSE ON SUBJECTIVE WELL-BEING AND RESETTLEMENT

Subjective well-being theory is central to life quality research. Life quality refers to the overall well-being of individuals and is typically defined by multiple value-based indicators such as equal distribution of resources, living standards, access to employment opportunities, and social security systems (Bellani and Ambrosio, 2011; Bohnke, 2005). It entails material conditions, social relationships and participation, subjective satisfaction perception, and psychological experience (Bohnke, 2005; Diener, 2000). Allardt (1993) summarizes life quality in a three-pillar concept of 'having, loving and being' in which 'having' refers to material living conditions, 'loving' refers to social relationship networks, and 'being' refers to a sense of belonging and recognition as well as integration into the new society. Besides material conditions, subjective well-being also considers social interactions and psychological factors such as attitudes and perceptions.

Subjective well-being theory concerns about individual's self-reported satisfaction with multiple dimensions of life quality (Bohnke, 2005; Diener et al., 2003). From the subjective well-being perspective, life satisfaction can be assessed in three dimensions: 1) material living conditions, 2) social security and employment support, and 3) attitudinal perceptions, social relationships and participation. Each of the three dimensions may exert influence on other dimension(s). Factors in material living conditions include living environment, income, expenditure, consumption capability, and disposal of monetary compensation from land expropriation; factors in social security and employment support include social security types, coverage, professional skill training, employment information availability and accessibility; factors in social relationships, participation, and attitudinal perceptions include participation in community activities, knowledge of compensation policies obtained by social interactions, attitudes toward urban life, and use of social networks.

Subjective well-being has been strongly influenced by material living conditions (Bohnke, 2005), Material living conditions relate to financial burden, consumption capability, and living environment (Bellani and Ambrosio, 2011). Substantial relationships exist between a variety of influencing factors of material living conditions and people's self-reported satisfaction (Bayram et al., 2012; Bohnke, 2005; Liu, He and Wu, 2008; Shui et al., 2014). Typically, those with limited access to the labour market are more vulnerable to unemployment risks and insufficient social security system (Silver, 1994). Long-term unemployment means not only depletion of income and material sources, but also loss of social status, self-identity, and social network (Bohnke, 2005). For social relationships and attitudinal perceptions, research has found that active participation in social interactions, either formal or informal, is positively related to life well-being and happiness (Helliwell, 2001; Putnam, 2001). Displaced villagers usually are faced with challenges in self-identity recognition and adaptation to urban life (Zhang and Tong, 2006), because of factors such as institutional inequality and attitudinal perception of rural being inferior than urban (Wu and Qin, 2008). Some displaced villagers still consider themselves as traditional rural villagers in psychological, cultural and social aspects, despite of their urban household registration status (Liang and Zhu, 2015).

RESEARCH METHODOLOGY

Since the 2000s, Nanjing has witnessed two major resettlement and compensation policy reforms, aiming to improve displaced villagers' life quality and experience in

urban society. The 2004 policy reform tremendously increased compensation rates and diversified approaches, in order to provide resettled villagers with better living standard (Zhou et al., 2014). For instance, monthly monetary compensation replaced the lump-sum compensation payment. About 70% of the compensation and resettlement fund went directly to displaced villagers' personal accounts instead of their rural collective's. However, the 2004 policy reform did not grant resettled villagers the same social security package that was enjoyed by urban residents. The 2011 policy reform introduced a social security fund and a wide range of social insurances for resettled villagers' long-term social welfare. It also ushered in a comprehensive compensation mechanism that is based on a zoning compensation system, an advanced social security arrangement (such as endowment insurance, health care, and unemployment insurance), and a resettlement fund. The compensation standard takes location and differential land rent into consideration, in which rural land is classified into three acquisition zones with differentiated acquisition and compensation prices. Compensation rateswere also raised from the 2004 standards.

The case study was conducted in two urban fringe sites in Nanjing – Tiexinqiao and Longtan, which are located respectively in south and north to the city core. Both sites accommodate resettled villagers in government-designated resettlement communities. Tiexinqiao was built in the early 2000s and Longtanin the mid to later 2000s. Tiexinqiao is closer to the city center than Longtan. Structured survey was conducted during March and May 2017. Among ninety eight valid questionnaire returns, fifty five were from Tiexinqiao (Chunjiang New Community) and forty three were from Longtan (Longtan Community). Sampling participants were randomly selected and survey unit was resettled villager household. The survey questionnaire includes five categories: economic and living environment indicators representing the dimension of material living conditions; social security coverage and employment situation indicators representing the dimension of social security and employment support; and indicators represent the dimension of social relationships, participation and attitudinal perceptions. A Like Scale was used ranging from 1 for very unsatisfied, 2 for partly unsatisfied, 3 for neutral, 4 for partly satisfied, to 5 for very satisfied; or 1 for strongly agree, 2 for partly agree, 3 for neutral, 4 for partly disagree, 5 for strongly disagree. This study used an ordinal logistic model to assess life satisfaction, expressed in two equations:

$$Y=\log P/(1-P)=\alpha+\beta_1 x_1+\beta_2 x_2+\ldots+\beta_n x_n \quad \text{Equation 1}$$

$$f(Y_1=1)=\log(\theta_1)=\alpha_1-b_1 x_1 \text{ where } \theta_1=prob(score\leq 1)/(1-prob(score\leq 1)) \quad \text{Equation 2}$$

P represents the probability of resettled villagers' life satisfaction scale, qualitative variable, or a variable with a binary feature after linearization. Resettled villager household's life satisfaction is classified into five levels from very unsatisfied, partly satisfied, neutral, partly satisfied to very satisfy. Given P as the probability that a resettled villager household issatisfied and the probability of unsatisfied is '1-P', $0<P<1$. Let α be the constant value, X_n are independent variables that denote various factors influencing resettled villagers' satisfaction level, and β_n is the partial regression coefficient in the logistic regression (Table 1).

Table-1: Define latent and explanatory variables with 24 variables.

Variable	Define Variable	Assigned Value of Variables	Mean
Y1	Satisfaction level with overall life quality	1= very unsatisfied, 2= partly unsatisfied, 3= neutral, 4= partly satisfied, 5= very satisfied	2.52
Y2	Satisfaction level with compensation standard and approach	1= very unsatisfied, 2= partly unsatisfied, 3= neutral, 4= partly satisfied, 5= very satisfied	2.38
Y3	Satisfaction level with material living conditions	1= very unsatisfied, 2= partly unsatisfied, 3= neutral, 4= partly satisfied, 5= very satisfied	2.33
Y4	Satisfaction level with social security	1= very unsatisfied, 2= partly unsatisfied, 3= neutral, 4= partly satisfied, 5= very satisfied	2.43
Y5	Satisfaction level with employment support	1= very unsatisfied, 2= partly unsatisfied, 3= neutral, 4= partly satisfied, 5= very satisfied	2.00
X1	Age	1= 18-30, 2= 31-45, 3= 46-60, 4= 61-70, 5= >70	3.33
X2	Education level	1= elementary school and below, 2=middle school, 3= equal to high school, 4= college and above	1.81
X3	Work status before and after acquisition	1= agricultural sector, 2= private industry, 3= migrant worker, 4= self-employed, 5= government/government-owned enterprise, 6= student, 7= unemployed, 8= retirement	before: 1.64 after: 5.60

Variable	Define Variable	Assigned Value of Variables	Mean
X4	Length (year) of resettlement	before 2004 =1, 2004-2011 =2, after 2011 =3	1.67
X5	Change in monthly income	1= significantly decrease, 2= decrease, 3= similar, 4= increase, 5= significantly increase	3.63
X6	Change in monthly expense	1= significantly decrease, 2= decrease, 3= similar, 4= increase, 5= significantly increase	4.41
X7a	Overall living environment	1= worse than before, 2= generally similar, 3= better than before, 0= not sure	1.99
X7b	Housing area	1= worse than before, 2= generally similar, 3= better than before, 0= not sure	1.52
X7c	Housing quality	1= worse than before, 2= generally similar, 3= better than before, 0= not sure	1.86
X7d	Utility facilities	1= worse than before, 2= generally similar, 3= better than before, 0= not sure	1.99
X7e	Transportation services	1= worse than before, 2= generally similar, 3= better than before, 0= not sure	2.48
X7f	Community safeguard	1= worse than before, 2= generally similar, 3= better than before, 0= not sure	2.18
X7g	Telecommunication services	1= worse than before, 2= generally similar, 3= better than before, 0= not sure	2.33
X7h	Convenience and richness of daily activities	1= worse than before, 2= generally similar, 3= better than before, 0= not sure	2.47
X8	Satisfaction level with endowment social insurance	1= very unsatisfied, 2= partly unsatisfied, 3= neutral, 4= partly satisfied, 5= very satisfied	2.24
X9	Satisfaction level with urban health-care insurance	1= very unsatisfied, 2= partly unsatisfied, 3= neutral, 4= partly satisfied, 5= very satisfied	2.26
X10	Satisfaction level with new rural cooperative health-care insurance	1= very unsatisfied, 2= partly unsatisfied, 3= neutral, 4= partly satisfied, 5= verysatisfied	2.97
X11	Satisfaction level with unemployment insurance	1= veryunsatisfied, 2= partly unsatisfied, 3= neutral, 4= partly satisfied, 5= verysatisfied	1.00
X12	Whether vocational training was offered or funded by town government or rural collective	1= Yes, 0= No	0.15
X13	Whether it was helpful or necessary	1= Yes, 0= No	0.19
X14	Do you have organizational access to job market information	1= Yes, 0= No	0.18
X15	Do you receive government assistance for employment	1= Yes, 0= No	0.42
X16	Feel hard to adapt to urban lifestyle and environment	1= strongly agree, 2= partly agree, 3= neutral, 4= partly disagree, 5= strongly disagree	2.38
X17	Prefer rural housing and living environment	1= stronglyagree, 2= partly agree, 3= neutral, 4= partly disagree, 5= strongly disagree	2.02
X18	Prefer farming lifestyle and feel psychologically close to land	1= stronglyagree, 2= partly agree, 3= neutral, 4= partly disagree, 5= strongly disagree	2.35
X19	Expect better living quality and security with rural land	1= stronglyagree, 2= partly agree, 3= neutral, 4= partly disagree, 5= strongly disagree	1.54
X20	Prefer to keep rural registration status and land rather than receive any compensation	1= strongly agree, 2= partly agree, 3= neutral, 4= partly disagree, 5= strongly disagree	2.48
X21	Reduce frequency to contact with old friends and relatives	1= strongly agree, 2= partly agree, 3= neutral, 4= partly disagree, 5= strongly disagree	2.38
X22	Add frequency to meet with new friends and neighbors	1= strongly disagree, 2= partly disagree, 3= neutral, 4= partly agree, 5= strongly agree	3.17
X23	Participation in community activities and development	1= strongly disagree, 2= partly disagree, 3= neutral, 4= partly agree, 5= strongly agree	2.58
X24	Awareness of public notice about relevant compensation policies	1= barely concern, 2= know a little bit, 3= somewhat familiar, 4= fully knowledgeable, 0= no policy notice	1.68

RESEARCH FINDINGS

Descriptive Analysis

Among the ninety eight resettled villagers, sixty were male and thirty eight were female, with a mean age of fifty one years old. 84.5% of these resettled villagers already converted their rural household registration status to urban, sponsored by the local government. The status made them eligible for urban social security welfare. More than half of these surveyed villagers were resettled before 2004, and only about 10.7% were relocated after the 2011 policy reform, leaving the rest displaced in the years between 2004 and 2011. Resettled villagers with elementary school education or illiterate had the largest share (46.6%), and those with college/university education or above only had a mere share of 4.8%. Before land expropriation, 73.8% of resettled villagers worked in agricultural sector, and 9.7% were in local private industries, 6.8% seasonal migrant workers, 7.8% self-employed, and only 1.9% in government or town and village enterprises (TVEs). After resettlement, 43.6% of resettled villagers chose to retire (which was well reflected by the median age of 51 in the survey), 22.8% were in local private industries, 10.9% were small business owners. Resettlement changed villagers' employment and many were pushed to work in non-agricultural sectors or become unemployed. The employment changes were closely related to educational attainment – none of those with post-secondary or higher education attainment, typically young- and middle-aged, engaged in agricultural work prior to land expropriation.

After land expropriation, more than 60.0% of resettled villagers were unsatisfied with their material living conditions, and more than 70.0% of resettled villagers expressed strong dissatisfaction with their current employment situations, while only 11.4% held a positive attitude toward life quality. On one hand, about 90.4% of resettled villagers who felt dissatisfied with their overall life quality also expressed dissatisfaction about their material living conditions. About 88.5% of resettled villagers who felt dissatisfied with their overall life quality also expressed dissatisfaction about social security programs, and 73.1% of resettled villagers who felt dissatisfied with their overall life quality also expressed dissatisfaction about employment assistance from the local government. On the other hand, among those who were satisfied with their overall life quality, 63.9% showed a positive attitude toward material living conditions, and 66.7% were satisfied with social security programs,but only 11.1% appeared to feel satisfied with employment assistance from the local government.

Among various compensation approaches, monetary compensation was the dominant one in all resettlement cases. About 41.6% of resettled villagers also received in-kind apartment unit compensation, and 31.7% of resettled villagers received social insurance such as endowment fund, health care, unemployment insurance and/or low-income subsidies. Only 2.0% of resettled villagers agreed that they received employment arrangement or vocational training as part of their compensation package.

Resettled villagers shared common choices in spending their monetary compensation fund – 45.5% of them used most of the compensation fund to purchase discounted apartment units exclusively available for them, and 30.7% of them used part of the compensation fund for furniture and interior decoration. About 24.8% of resettled villagers chose to use part of the compensation fund to purchase social security package. Only 11.9% of resettled villagers were able to reserve some monetary compensation for financial investment. While about 55.6% of resettled villagers reported that their monthly income increased after land expropriation, all surveyed villagers complained that their monthly expenditure grew significantly after land expropriation.

Among about 40.8% of resettled villagers indicated that they were satisfied with living environment, most of whom lived in Longtan, while about 37.8% of resettled villagers expressed very low satisfaction with living environment, most of whom lived in Tiexinqiao. In-kind apartment unit was part of the compensation package, the average area of in-kind apartment unit floor area was 103 m^2 before 2004, 114 m^2 between 2004 and 2011, and 246 m^2 after 2011. About 74.0% of resettled villagers were allocated only one apartment unit; almost all of them received the compensation before 2011. Those households that received more than three apartment units were typically resettled after 2011. A few villagers resettled after 2011 in Longtan admitted that they received several apartment units as part of their compensation packages. While the total floor areas of these multiple units were large, each unit's floor area was insufficient to accommodate a traditionally large household of five to six family members. Therefore, many resettled households preferred to have large-sized apartment units.

Resettled villagers demonstrated improved satisfaction with social insurance policy. About 70.0% of the villagers who were resettled before 2004 expressed strong dissatisfaction with their social security arrangement. About 66.7% of the villagers who were relocated after 2004 felt partly satisfied or very satisfied with their social security arrangement.

Among those who were displaced after 2011, almost 80.0% of them were at least partly satisfied with their social security package. About 80.6% of resettled villagers reported that they were covered by endowment social insurance programs, 87.8% of resettled villagers claimed that they were covered by urban health care. However, only 23.5% of these surveyed were covered by unemployment insurance. The survey demonstrates the lack of employment assistance programs in both communities. Only 14.6% of resettled villagers received vocational training after land expropriation, and 11.7% of resettled villagers agreed that the vocational training was supported by local township administration. Many resettled villagers opted out training workshops for various reasons such as age, time and financial restrictions, course contents, and lack of practical objectives of training programs. A few villagers found the vocational training that they received from the local government was not helpful in finding a position in the job market. Instead, those who chose to attend technical skill related training programs by themselves found them helpful. Social capital and social media played important roles in resettled villagers' job seeking. About 30.6% of surveyed villagers admitted that they relied on social networks of relatives and friends in finding jobs and social media was also widely used in finding jobs (39.8%). The conventional way of resorting to employment intermediary agencies became less popular (16.3%). Close to 60.0% of resettled villagers groused about receiving little assistance from government in their searching for employment.

Social participation was reflected by villagers' intention to involve in community activities and their engagement in community development. Resettled villagers' awareness of compensation and resettlement policies was also an indication of their social participation. Up to 55.4% of resettled villagers showed little interest in community affairs and activities and 55.1% of villagers had very limited knowledge of compensation and resettlement related policies. When asked about their interactions with others, 60.0% of resettled villagers admitted that they reduced contacts with rural relatives, neighbours, and friends after resettlement. Meanwhile, 52.0% of resettled villagers became acquainted with new neighbours and friends after resettlement. A large share of resettled villagers showed a strong inclination to rural living environment and lifestyle – about 60.0% of villagers claimed that they would rather give up their new urban household registration status and compensation package in exchange for their (lost) rural land.

Ordinal Regression Analysis

Cronbach's Alpha reliability analysis was performed to test independent variables in order to examine whether the multiple questions measure a same dependent variable. The Cronbach's Alpha of each dimension is summarized in Table 2. The negative Alpha value for personal socioeconomic attributes was calculated from a negative average covariance among the variables, which was against the assumption of the reliability model. This was because of a non-consistent scale of measurement among the variables (X1-X4). It indicates that these variables did not have good fitness when being incorporated into a regression model. However, it does not mean this dimension had little importance to life satisfaction assessment. All values in Table 4 indicate a high level of internal consistency. But the factors of personal socioeconomic attributes and employment support appeared to be not correlated or consistent. Therefore, these variables may not have good fitness in measuring resettled villagers' satisfaction in a continuous regression model.

Table 3 shows that the overall life quality was positively correlated with the material living condition and social security dimensions, with a significance value lower than 0.01. The overall life quality seems less relevant to the employment dimension and the significance value did not support a convincible statistical relationship between the two. The dimension of material living conditions was closely correlated to the social security dimension and the employment dimension. In addition, there was significant relationship between the social security and the employment dimensions. All discussed positive relationships were accepted with a high significance level (p-value < 0.05).

Table-2: Alpha reliability analysis of influencing factor clusters.

Influencing Factors	Cronbach's Alpha	N of Variables
Personal socioeconoic attributes	Negative	X1 - X4
Material living conditions	0.681	X5 - X7
Living environment	0.747	X7a - X7h
Social security	0.739	X8 - X11
Employment support	0.392	X12 - X15
Perceptive and social dimension	0.828	X16 -X24

Table-3: Correlations between life quality satisfaction and levels of satisfactions in sub-dimensions.

Correlations					
		Y1: Life Quality	**Y3: Material Conditions**	**Y4: Social Security**	**Y5: Employment**
Y1: Life Qality	Pearson Correlation	1	0.720**	0.663**	0.193
	Sig. (2-Tailed)		0.000	0.000	0.058
Y3: Material Conditions	Pearson Correlation		1	0.684**	0.319**
	Sig. (2-Tailed)			0.000	0.001
Y4: Social Security	Pearson Correlation			1	0.347*
	Sig. (2-Tailed)				0.000
Y5: Employment	Pearson Correlation	0.193	0.319**	0.347**	1
	Sig. (2-Tailed)	0.058	0.001	0.000	
** Correlation is significant at the 0.01 level (2-tailed).					

The analysis using the ordinal logit model for the overall life quality shows that the satisfaction with material living conditions and social security had a positive influence on the overall life satisfaction. The dimension of material living conditions was a stronger contribution to villagers' life quality satisfaction than the social security dimension. Ordinal logit model regression can also be conducted for material living conditions, social security and employment support, as well as social relationships, participation, and attitudinal perceptions to reveal more detailed relationships. For instance, resettled villagers' frequency in interacting with their rural relatives, friends and neighbours, and their preference for rural lifestyle and traditional attachment to rural land indicated that the more they cling to their rural lifestyle, the lower their overall life quality satisfaction was.

CONCLUSION

The study shows that resettled villagers' higher adaptation capability in living in urban environment and less preference for rural lifestyleand rural amenity can facilitate their satisfaction with various aspects in urban living. Several policy implications can be proposed. First, reformed compensation and resettlement should give consideration to both economic well-being and non-economic aspects to reflect the multifunction of rural land that is lost to urbanization. Second, compensation and resettlement approaches can include more alternatives for employment support, extended endowment security insurance and health care insurance.Unemployment insurance coverage needs to be expanded so that more resettled villagers can benefit from the programs. Third, local government,in collaboration with non-government interests, needs to pay more attention to resettlement community management to address concerns in housing conditions, public facilities, community safety, and community activities to create a better living experience for resettled villagers.

REFERENCES

Allardt, E., 1993, "Having, Loving, Being: An Alternative to the Swedish Model of Welfare Research", *The Quality of Life*, 8, 88-95.

Bayram, N., Aytac, S., Aytac, M., Sam, N., and Bilgel, N., 2012, Poverty, Social Exclusion and Life Satisfaction: A Study from Turkey, "*Journal of Poverty"*, 16(4), 375-391.

Bellani, L., and D'Ambrosio, C., 2011, Deprivation, Social Exclusion and Subjective Well-Being, "*Social Indicators Research"*, 104(1), 67-86.

Bohnke, P., 2005, *First European Quality of Life Survey: Life Satisfaction, Happiness and Sense of Belonging*. Office for Official Publications in the European Communities.

Chen, D., Tang, K. K., Zhao, L., and Zhang, Y., 2013, "Will China's Cooperative Medical System Fail Again? Insight from Farmer Satisfaction Survey, *Health Promotion International*, 30(2), 251-261.

Diener, E., 2000, "Subjective Well-Being: The Science of Happiness and a Proposal for a National Index", *American Psychologist*, 55(1), 34.

Diener, E., Oishi, S., and Lucas, R. E., 2003, Personality, Culture, and Subjective Well-Being: Emotional and Cognitive Evaluations of Life, *Annual review of psychology*, 54(1), 403-425.

Duan, J. H., and Chen, J. B., 2009, "Statistical Investigation and Analysis on Satisfaction Degree of Chinese Urban and Rural People", *Statistics and Information Forum*, 24(4), 79-84 (in Chinese).

Helliwell, J., 2001, "Social Capital, the Economy and Well-Being", *The Review of Economic Performance and Social Progress*, in: Andrew Sharpe and Keith Banting, Di (ed.), *The Review of Economic Performance and Social Progress 2001: The Longest Decade: Canada in the 1990s,* Volume 1 Centre for the Study of Living Standards, The Institute for Research on Public Policy.

Hu, W., Zhang, X., Song, Y., Shen, L., Liu, J., and Zhang, A., 2014, "Life Satisfaction Approach to Farmers' Compensation for Land Acquisition: Empirical Study from the Suburbs of Wuhan City", *Chinese Journal of Population Resources and Environment*, 12(4), 316-323.

Liang, Y., and Zhu, D., 2015, "Subjective Well-Being of Chinese Landless Peasants in Relatively Developed Regions: Measurement using PANAS and SWLS", *Social Indicators Research*, 123(3), 817-835.

Liu, Y., He, S., and Wu, F., 2008, "Urban Pauperization Under China's Social Exclusion: A Case Study of Nanjing", *Journal of Urban Affairs*, 30(1), 21-36.

Luo, Y. M., and Fan, L. M., 2008, The Economic Effects of Rural Infrastructure and Farmers' Satisfaction Research Based on 44 Administrative Village in Shandong Province, *Inquiry on Economic Issue*, 12, 67-73 (in Chinese).

Ma, K., and Hu, L., 2014, "The Research of Landless Peasants Social Risks Management Which is Based on the Perspective of Social Security", *International Integration for Regional Public Management (ICPM)*, 126-130. Atlantis Press.

Putnam, R., 2001, "Social Capital: Measurement and Consequences", *Canadian Journal of Policy Research*, 2(1), 41-51.

Silver, H., 1994, "Social Exclusion and Social Solidarity: Three Paradigms", *International Labour Review*, 133, 531-578.

Shui, W., Bai, J., Zhang, S., and Chen, Y., 2014, "Analysis of the Influencing Factors on Resettled Farmer's Satisfaction under the Policy of the Balance between Urban Construction Land Increasing and Rural Construction Land Decreasing: A Case Study of China's Xinjin County in Chengdu City", *Sustainability*, 6(12), 8522-8535.

Tang, S., Hao, P., and Huang, X., 2016, "Land Conversion and Urban Settlement Intentions of the Rural Population in China: A case study of suburban Nanjing", *Habitat International*, 51, 149-15.

Wu, S., and Qin, Q., 2008,Research Progress of the Identity Recognition of Land-Lost Farmers During the Process of Urbanization", *Journal of Anhui Agricultural Sciences*, 36(23), 193–196 (in Chinese).

Zhang, H. and Tong, X., 2006, "Self-Identity of the Passive-Urbanized Group in the Process of Obtaining Urban Adaptability and Modernity: An Empirical Study on 561 Land-Displaced Peasants in Nanjing", *Sociological Studies*, 2, 84–106.

Zhang, S. and Qian, Z., 2020, Villagers' acculturation in China's land expropriation-induced resettlement neighborhood: A Shanghai case. International Journal of Intercultural Relations, 74, pp.174-188.

Zhou, J., Yao, P., Xu, L., and Chen, Z., 2014, Land Requisition System Reform on the Background of Urban-Rural Integration: Reform Practice and Performance of Nanjing", *Modern City Studies*, 08, 25-30 (in Chinese).

ANALYSIS OF COMMUTERS' PERCEPTIONS ABOUT CARPOOLING SERVICE: A CASE STUDY IN LAHORE

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ABSTRACT

The increase in urban population and private vehicle ownership has resulted in traffic congestion on road networks. The traffic congestion tends to increase social cost in terms of increased travel delays, road crashes and environmental pollution. Traffic congestion also increases the generalized travel cost of road users. There is a need to look for alternative travel options to ensure sustainable development of the society and transportation infrastructure. This study aims to identify the significant relationships between the socio-economic demographics (SEDs) of the travelers and their intentions with carpooling. The data was collected with the help of a questionnaire survey. This survey was conducted in Lahore city and three hundred and ninety four samples were obtained. The data was analyzed using frequency analysis and ordered probit regression analysis. The results revealed that the traveler's marital status, education, daily trip distance, current travel mode, household income, car ownership and possession of a driving license had a significant influence on their willingness to adopt a carpooling alternative. Besides the trip, purpose of carpooling and the number of persons with whom to share a ride had significant correlations with carpooling. These significant attributes implicate that travelers' specific characteristics play an important role in their decision to carpool. Carpooling programs are required to design, seeking the significant characteristics of travelers in the context of Lahore city as well as in other regions. These findings provide useful information to the transport planners and decision-makers in designing the transportation policies related to carpooling strategies.

Keywords: Travel Behavior, Carpooling, Traffic Congestion, SEDs, Lahore.

INTRODUCTION

Rapid increase in the urban population poses a serious threat to the transportation infrastructure, as it tends to increase the travel demand. The population of Lahore city has increased tremendously in the last two decades and at present it is more than 11.13 million (Units and Pakhtunkhwa, 2017). Private vehicle ownership is also increasing at an alarming rate, and people prefer to use their vehicles instead of public transportation facility. The private modes have a major share in the model share of Lahore city i.e. around 40% (JICA, 2012). The majority of the residents are using their private vehicles for commuting. This trend of private usage generates more traffic on the roads and results in traffic congestion. Traffic congestion causes an increase in social cost in terms of increasing energy consumption, environmental pollution and accidents. At present, every year Lahore city is facing a problem of smog due to air pollution and transportation infrastructure is one of the main contributors in this context. There is a need to assess the potential of other travel alternatives to ensure the sustainable development of the city. In this context, the Travel Demand Management (TDM) strategies can be incorporated along with supply-side measures to address traffic congestion problems. The TDM strategies focus on changing the travel demand in time and space by influencing individual travel behaviour (Meyer, 1999; Ferguson, 1990). These travel alternatives in the TDM framework may include the development of public transport systems, ride-sharing programs, carpooling and vanpooling schemes. Carpooling is a ride-sharing program where commuters share the route and cost of travelling through. These programs are arranged with the cooperation and consent of the riders. The ride-sharing programs and carpooling schemes are usually helpful to reduce the traffic congestion and fuel consumption and

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in improving the environmental quality in the cities (Do and Jung, 2018; Seyedabrishami et al., 2012). The concept of high occupancy vehicle lanes (HOVs) helps to reduce traffic congestion and improve vehicle occupancy through carpooling as it offers an opportunity to share rides for different reasons (Daganzo and Cassidy, 2008; Olsson et al., 2019). Carpooling is a TDM strategy that offers a travel alternative to the commuters based on their mutual understanding and cooperation.It helps commuters to save travel costs and time with proper communication (Zhou and Kockelman, 2011; Zhou et al., 2014).

Many factors affect the acceptability and success of a TDM measure, such as carpooling. These factors may include infrastructural, institutional, social and legal concerns (Chan and Shaheen, 2012; Javid et al., 2017; Friginal et al., 2014). The characteristics of the travelers affect the success of carpooling such as traveler's profession, gender, marital status and income (Ullah et al., 2019; Neoh et al., 2017; Blumenberg & Smart, 2010). The service attributes of traveling alternatives including travel cost and time, registration fees, and capital costs are found significant factors in the acceptance of car-sharing systems (Javid et al., 2014; Ullah et al., 2019). Incentive schemes on carpooling and disincentives on the use of private cars contribute significantly to the promotion of ride-sharing programs(Javid et al., 2017; Chan & Shaheen, 2012; Bruglieri et al., 2011). Car avoiders and car limiters use car share to withstand mobility stress due to key life events (Jain et al., 2020). Psychological factors also have importance, including monetary and non-monetary benefits and environmental concerns(Olsson et al., 2019). Cheap parking facilities and preferential parking treatment at parking places can help in enhancing the carpooling strategy (Olsson et al., 2019; Li et al., 2007). Results of a study report that safety, flexibility and parking cost-savings are the main motives for people to consider carpooling as a passenger, whereas convenience and social interaction are the main reasons for drivers for favoring carpooling(Park et al., 2018). The commuters showed a willingness to use a carpooling program in Dhaka and stated that safety and security would be major obstacles in the success of such car-sharing programs(Saadat and Ahmed, 2018).

A range of factors as mentioned earlier affects the implementation and success of the carpooling strategy. It is very important to assess the potential of such sophisticated TDM measures in the local socio-economic context of each city. Therefore, this paper aims to identify the relationship between traveller's socio-economic demographics (SEDs) and their intentions to use carpooling. A questionnaire survey was designed and conducted in Lahore city to gather travellers' intentions to use carpooling. Ordered regression analysis was conducted using the probit model.

RESEARCH METHODS

The main research methods included the design of a questionnaire, survey and statistical analysis of the collected data.

Questionnaire Design

A questionnaire was designed in this study comprising of traveller's socioeconomic demographics (SEDs), and responses on intentions to use carpooling as a travel mode. The personal and travel characteristics included age, gender, marital status, profession, trip purpose, household income, education, vehicle ownership, number of household members, possession of a driving license, daily travelling mode, travel distance and travel time of the commuting trips. These attributes were chosen to assess their relationship with carpooling potential. The second part of the questionnaire included the respondents' responses on intentions to use carpooling as a daily travelling mode. The respondents were asked that if a carpooling opportunity existed in a combination of HOV lanes, would they be willing to carpool. The HOVs lanes are lanes that are specified for the use of those vehicles occupying more than two or three persons in a vehicle including the driver. This statement was evaluated on the following scale such as never, occasionally, and always. The description and graphics were also presented in the questionnaire related to the concept of carpooling and HOV lanes in the highway system. This part also included a statement on respondents' intentions to share a ride carpool with numbers of people, e.g. 1 person, 2 persons, 3 persons, and more than 3 persons. The respondents were also asked to report their main purpose of carpooling (e.g. travel to university, travel to an office, and travel to shopping) and expectation of a reduction in travel costs.

Survey and Sampling

This survey was conducted at selected locations in Lahore city. The selected locations mainly included some government and private educational institutes and working organizations. These places were selected considering the objectives of the designed questionnaire. The target respondents were the students and employees of the educational institutes and employees of other selected organizations. This survey was conducted with the help of university undergraduate students. All the students were instructed regarding the contents and

objectives of the questionnaire survey. Respondents were selected randomly at the selected locations. All the respondents were interviewed with the help of survey team members.

Data Analysis Methods

A simple frequency analysis was conducted for the distribution of responses related to the willingness to carpool. Cross analysis was also conducted of respondents' personal and travel characteristics with their intentions to carpool. Ordered Probit (OP) analysis was conducted to predict traveler's carpooling intentions concerning their personal and trip attributes. The OP model was initially developed by. Ordered regression models are suitable to treat the ordinal data. It was assumed that the values of the *Y* variable show the order of the measured items; for example, let 'Y_i' is the likelihood to carpool of a traveler '*i*' as shown in Eq. (1) and (2).

$$Y_i = \begin{cases} 0: \text{never} \\ 1: \text{occasionally} \\ 2: \text{always} \end{cases} \quad (1)$$

$$Y_i = \beta_i X_i + \varepsilon \quad (2)$$

Where;

Y_i = objective or outcomes variable of travelers' intentions to carpool

X_i = a vector of independent or explanatory variables comprising of traveler's SEDs

β_i = parameter coefficients of explanatory variables to be estimated.

ε = error term which is assumed to be randomly distributed accounts for the error in the measurement of observed variables due to external constraints

The objective variable of the traveler's intentions to carpool was introduced as an ordinal variable in the ordered probit model. Explanatory variables on socioeconomic demographics (SEDs) were coded as binary variables (0, 1), for the modeling purpose. Many variables were coded and tested in the model but some of them did not make any significant relationship with the objective variable of carpooling; therefore, those insignificant variables were removed and not reported in the results.

RESULTS AND DISCUSSION

Descriptive Statistics of Sample

The total collected samples were three hundred and ninety-four. The descriptive statistics of the sample is presented in Table 1. Almost 84.8 % of the respondents were male which was higher than the actual male population in the study area. The main reasons for the high share of male respondents was their higher share in the education institutes and other selected organizations. Also, the share of working women was less in the overall population (Javid et al., 2014). Most of the respondents were single and under twenty five years of age. This was because most of the respondents were students. About 19.2% of the respondents used private cars, 38.6% used university and office transport, 11.7% used public transport, and 30.5% used motorcycles for commuting, respectively. The share of public transport was almost the same as it was in the modal share of Lahore city (JICA, 2012). For most of the respondents, the commuting trip distance was below 20 km and for 36% it was more than 20 km. Almost 45.7 % of the respondents had no car, 31% had one car, and 22.3% had more than two cars at their homes. Only 32% of the respondents had a valid driving license.

Table-1: Descriptive statistics of respondents' characteristics.

Characteristics	Distribution(%)
Gender	Male (84.8), female (15.2)
Marital status	Single (82.8), Married (15.3)
Age (Years)	Under 25 (82.7), 26-30 (12.2), over 30 (5)
Household size	Up to five members (47.7), More than five (52.3)
Profession	Student (64), employees (27.5), others (8.5)
Household income (PKR)	<20,000 (34.5), 21,000-60,000 (23.3), more than 60,000 (42.2)
Travel mode	Private car (19.2), university/office bus (38.6), public transport (11.), motorcycle (42.2)
Travel purpose	Education (78.6), Work (18.2), others (3.2)
Trip distance	Under 20 km (64), above 20 km (36)
Travel cost per day	Under 100 PKR (51), 200-300 PKR (31), above 300 PKR (18)
Household car ownership	None (45.7), 1 car (31), 2 or more cars (22.3)
Driving license	Yes (32), no (68)

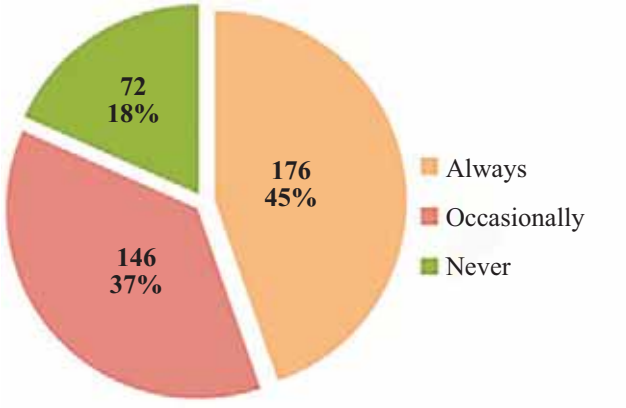

Figure-1a: Carpooling willingness.

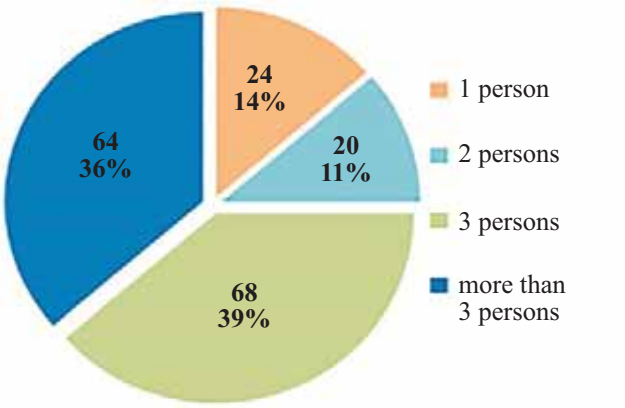

Figure-1b: Number of persons for carpooling.

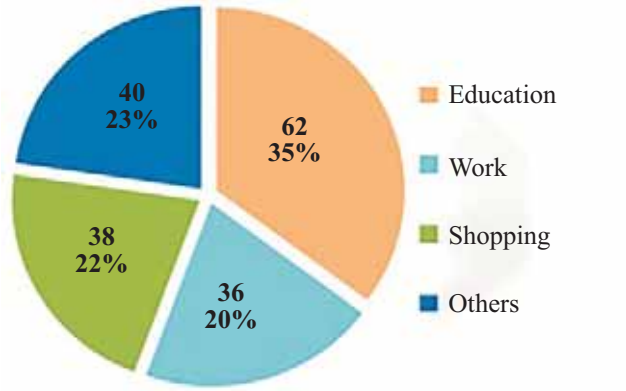

Figure-1c: The Main Purpose of Carpooling.

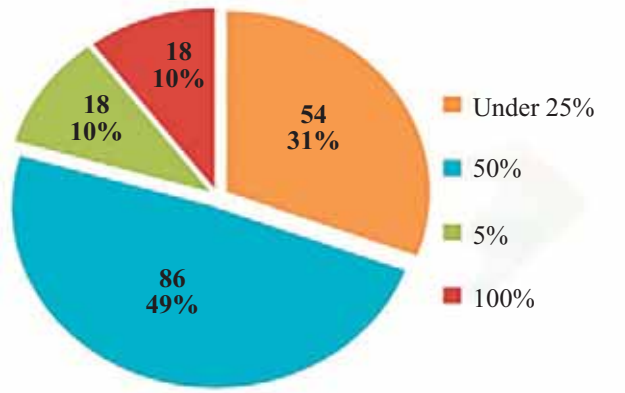

Figure-1d: Cost Reduction Expectation with Carpooling.

Figure-1: Distribution of Responses for Intentions with Carpooling Strategy.

Distribution of Responses for Intentions with Carpooling

Figure 1(a) shows the respondent's willingness to consider carpooling as a travelling mode in conjunction with HOV lanes. Almost 82% of the respondents were willing to consider carpooling if there was an opportunity either always or occasionally. Figure 1(b) shows that more than 75% of the targeted travellers had intentions to share ride with three or more than three persons. This potential to share a ride with more persons was helpful both for the riders as well as from social aspects. On one side, it would help in reducing the travel cost of each rider and, on other side, it would also help in reducing the use of low occupancy vehicles which in return would help in reducing the traffic congestion (Erdoðan et al., 2015; Malodia & Singla, 2016; Galland et al., 2014). Figure 1(c) shows that the main trip purpose of carpooling included 35% for education, 20% for work, 22% for shopping, and 23% for other purposes, respectively. This distribution was consistent with the sample distribution as most of the respondents were students. Survey results in Figure 1(d) depict that the majority of the respondents expected around 50% reduction in travel cost with carpooling, which was quite logical as 75% or 100% reduction in travel costs would not be possible. Also, the cost reduction depended on the availability of the required number of riders for carpool (Delhomme and Gheorghiu, 2016; De Almeida Correia et al., 2013).

Cross Distribution f Respondents' Intentions for Carpooling

A cross-analysis was conducted between respondents' SEDs and their intentions towards carpooling. Figure 2 presents a comparison of respondents carpooling intentions with their characteristics. The respondents who use university or office transport have fewer intentions to carpool, as they feel that using such transport is cheaper than carpooling and also it is more convenient for them(Olsson et al., 2019; Javid et al., 2017). More than 75% of the public transport users reported that they would always consider carpooling as a travelling mode. A good number of current car and motorcycle car users also showed positive intentions for carpooling.

More than 80% of the respondents with a trip distance less than 20 km showed positive intentions towards carpooling and around 70% of respondents with trip distance more than 20 km showed willingness to carpool. The tendency of carpooling was almost the same for owning a no car and one car at the household. However, this trend increased as car ownership per household increased. Most of the respondents who did not possess a driving license had the intention to carpool. It is clear from Figure 3 that those respondents who spend less on daily travel had more potential for carpooling. Figure 3(a) shows that most of the respondents who agreed for carpooling wanted to share a ride with three or more than three persons. This was true, as the increase in the number of riders decreased the travel cost per person. Figure 3(b) showed that more than 70% of the respondents had a willingness to carpool with a 50% reduction in the travel costs. It meant that the reduction in travel costs by 50% would be handy in attracting people towards carpooling. The increase in the number of riders per vehicle would also help in this context. Most of the respondents preferred carpooling for educational trips as shown in Figure 3(c). This was consistent with sample distribution as most of the respondents were students. There was also good potential for carpooling among respondents for shopping-related trips.

Ordered Probit Modelling

An ordered regression analysis was done for respondent's willingness for carpooling using probit models. The objective or outcome variable of traveler's carpooling interests was defined as never (0), occasionally (1), and always (2). The explanatory observed variables of respondent's SEDs were identified and coded as binary variables (0, 1). These variables were coded, purposefully seeking to assess the influence of particular characteristics of travelers as presented below:

- Marital status (single:0, married:1)
- Household income (low income:0, otherwise:1)
- Education (bachelor or above: 0, otherwise: 1)
- Profession (employees:0, otherwise:1)
- Travel mode (public transport:0, otherwise:1; university/office transport:0, otherwise:1; motorcycle:0, otherwise:1)
- Trip distance (less than 20 km: 0, otherwise: 1)
- Car ownership (own a car: 0, otherwise: 1)
- Have a driving license (yes: 0, no: 1)
- Trip purpose with carpooling (Shopping:0, otherwise:1; work:0, otherwise:1)
- Number of persons to share a ride (3 persons or more:0, otherwise:1)

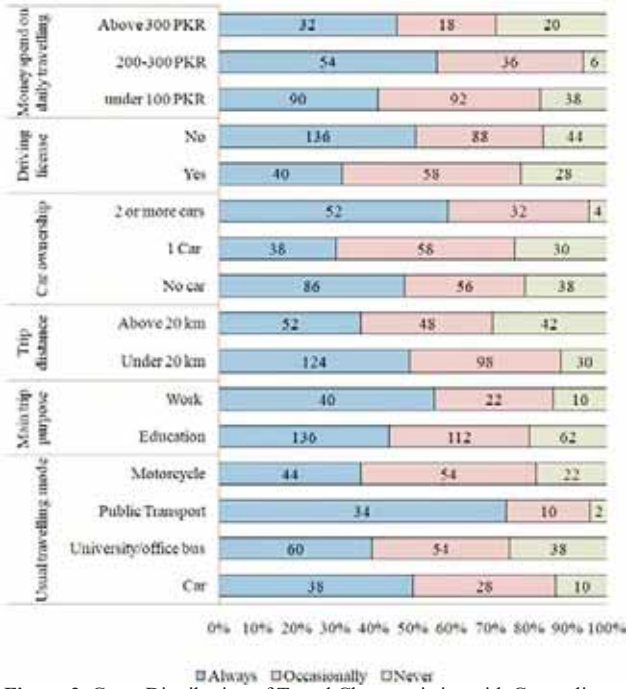

Figure-2: Cross Distribution of Travel Characteristics with Carpooling Intentions.

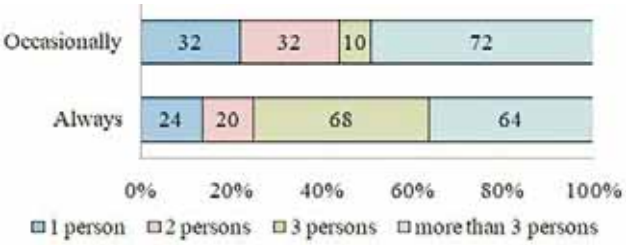

Figure-3a: Carpooling Willingness Versus the Number of Persons to Share a Ride.

Figure-3b: Carpooling Willingness Versus % Reduction in Travel Cost.

Figure-3c: Carpooling Willingness Versus the Main Purpose of Carpooling.

Figure-3: Distribution of Carpooling Willingness Versus Different Carpooling Features.

The results of ordered probit modelling for respondents' willingness to carpool are presented in Table 2. The marital status as single formed a positive relationship with carpooling, which implied that travellers with single marital status would prefer to carpool more as they have fewer family liabilities. This finding was in agreement with the results of other studies (Amoh-Gyimah and Aidoo, 2013; Park et al., 2018). The negative coefficient value of bachelor or above education variable showed that those respondents who belong to the high education group would have low tendencies to carpool. This was true as the people who had more education generally belong to middle and high-income groups of the society, and increased travelling cost may not be an issue for them (Javid et al., 2014; Javid et al., 2016). The variable of household income under 30,000 PKR had developed a positive association with carpooling, which predicted that the travellers who belonged to a low education group would prefer to carpool as carpooling helped them to use better transport service with reduced cost. The persons who were employees had a negative potential to carpool, as the coefficient was negative. It meant that the other respondents in the sample would have better potential to carpool such as students. The respondents whose usual travel mode was office/university transport and motorcycle had negative relationships with a willingness to carpool. This was true as the office and university transport services were cheap and shared travel alternatives. However, the current public transport users had a positive association in availing a carpooling opportunity. The people who owned a private vehicle did not prefer carpooling. Travellers who owned cars usually belonged to the high-income group and such people generally had a low tendency to carpool. The respondents with daily trip distance below 20 km had also a positive tendency to use carpooling. It depicted that it in easy for travellers to manage to carpool if the trip distance was less than 20 km, and for long-distance trips, the circumstances was be different. Commuting distance is significant in predicting carpooling tendency (Park et al., 2018). The travellers who had a car at their households also prefered to avail carpooling with their family members, friends, and colleagues. The possession of a driving license resulted in a negative influence on travellers' potential to carpool, as they liked to drive alone for commuting. However, other travellers liked to travel as a passenger if there was an opportunity. The modelling results showed that the travellers who were willing to share ride with more people had more potential to avail carpooling alternatives as more riders meant less travel cost per person. These results imply that some of the respondents may decline to carpool if they find less number of riders. Most of the riders would prefer carpooling for shopping and work trips. The value of the likelihood ratio is more than 0.200 and values of Pseudo R-Square were also reasonable, which showed that the obtained estimates of the model had good predictability of respondents' behaviour (Winship and Mare, 1984).

Table-2: Results of Ordered Probit Modelling for Willingness to Carpool.

Explanatory variables		**Willingness to do carpooling**	
		Parameter values	**p-value**
Marital status (Single)		0.39	0.044
Education (bachelor or above)		-0.589	0.000
Household income under 30,000 PKR		0.863	0.000
Profession (employees)		-0.758	0.000
Travel mode (office/University transport)		-0.811	0.000
Travel mode (public transport)		0.593	0.011
Travel mode (motorcycle transport)		-0.331	0.045
Travel distance less than 20 km per trip		0.599	0.000
Household car ownership		0.387	0.016
Possessing a driving license		-0.398	0.007
Number of persons to share a ride is 3 or more		1.038	0.000
Purpose of carpooling (Work trip)		2.279	0.000
Purpose of carpooling (Shopping trip)		0.631	0.001
Pseudo R-Square	Cox and Snell	0.351	

CONCLUSIONS AND IMPLICATIONS

This paper attempted to identify the significant relationships between the characteristics of travelers and their intentions to carpool in Lahore city. The survey results revealed that about 82% of the targeted respondents showed willingness to avail carpooling if there was an opportunity. Most of the respondents reported to share ride with three or more than three potential riders and they expected around 50% reduction in the travel costs with carpooling. The main purpose of carpooling included shopping, work and education. The ordinal regression revealed that travelers' marital status, household income, profession, education, trip distances, car ownership, current travel mode, the purpose of carpooling, driving license possession, and number of persons to share a ride were significant determinants of their intentions toward carpooling. The travelers who were single and belonged to the low-income category had more potential to carpool; therefore, such citizens should be the target of shared mobility policies and transport facilities. However, Furthermore, the people who were highly educated and those who were working professionals had a low tendency for carpooling. The current public transport users had more potential for carpooling than private vehicle users. A trip distance of less than 20 km was associated positively with carpooling, which implied that travelers with a shorter trip in an urban environment had significant potential for carpooling. The trip purpose of carpooling also affected the individual's likelihood to carpool under the given circumstances. These findings implied that the carpooling policy had potential in the context of Lahore, as it helped the riders to reduce their travel cost, especially for those who traveled alone on private vehicles. Thus the low-middle income people could be a better target group of this policy. Some organizations and educational institutions based carpooling programs may be more feasible. The implementation of such programs would help in reducing private dependency and enhance vehicle occupancy. The implementation of carpooling may bring economic and environmental efficiency as well as efficiency in transportation infrastructure. Consequently, this would help in alleviating traffic congestion in Lahore.

The scope and implications of these study findings have limitations as the sample mainly consisted of a specific segment of Lahore. The detailed assessment of travelers' attitudes is required to develop comprehensive transportation policies related to carpooling. Future studies should focus on assessing the social-cognitive aspects of carpooling with a large sample size in the context of Lahore city.

REFERENCES

Amoh-Gyimah, R. and Aidoo, E.N, 2013, Mode of Transport to Work by Government Employees in the Kumasi Metropolis, Ghana, "*Journal of Transport Geography*", 31, 35–43.

Blumenberg, E. and Smart, M., 2010, "Getting by With a Little Help from My Friends...and Family: Immigrants and Carpooling", Transportation and .

Bruglieri, M., Ciccarelli, D., Colornia, A. and Luè, A., 2011, "PoliUniPool: A Carpooling System for Universities", *Procedia - Social and Behavioral Sciences*.

Chan, N.D. and Shaheen, S.A., 2012, "Ridesharing in North America: Past, Present, and Future", *Transport Reviews*.

Daganzo, C.F. and Cassidy, M.J., 2008, "Effects of High Occupancy Vehicle Lanes on Freeway Congestion", *Transportation Research Part B: Methodological*, 42 (10), 861–872.

De Almeida Correia, G.H., de Abreu e Silva, J. and Viegas, J.M., 2013, "Using Latent Attitudinal Variables Estimated Through a Structural Equations Model for Understanding Carpooling Propensity", *Transportation Planning and Technology*, 36 (6), 499–519.

Delhomme, P. and Gheorghiu, A., 2016, "Comparing French Carpoolers and Non-Carpoolers: Which Factors Contribute the Most to Carpooling?", *Transportation Research Part D: Transport and Environment*.

Do, M. and Jung, H., 2018, "The Socio-Economic Benefits of Sharing Economy: Colleague-Based Carpooling Service in Korea", *Journal of Open Innovation: Technology, Market, and Complexity*, 4 (3), 40.

Erdoðan, S., Cirillo, C. and Tremblay, J.M., 2015, "Ridesharing as a Green Commute Alternative: A Campus Case Study", *International Journal of Sustainable Transportation*, 9 (5), 377–388.

Ferguson, E., 1990, "Transportation Demand Management Planning, Development, and Implementation", *Journal of the American Planning Association*, 56 (4), 442–456.

Friginal, J., Gambs, S., Guiochet, J. and Killijian, M.O., 2014, "Towards Privacy-Driven Design of a Dynamic Carpooling System", *Pervasive and Mobile Computing*.

Galland, S., Knapen, L., Yasar, A.U.H., Gaud, N., Janssens, D., Lamotte, O., Koukam, A. and Wets, G., 2014, "Multi-agent Simulation of Individual Mobility Behavior in Carpooling", *Transportation Research Part C: Emerging Technologies*.

Jain, T., Johnson, M. and Rose, G., 2020, "Exploring the Process of Travel Behaviour Change and Mobility Trajectories Associated with Car Share Adoption", T*ravel Behaviour and Society*, 18, 17–131.

Javid, M.A., Mehmood, T., Asif, H.M., Vaince, A.U. and Raza, M., 2017, "Travelers' Attitudes Toward Carpooling in Lahore: Motives and Constraints", *Journal of Modern Transportation*, 25 (4), 268–278.

Javid, M.A., Okamura, T., Nakamura, F., Tanaka, S. and Wang, R., 2016, "People's Behavioral Intentions Towards Public Transport in Lahore: Role of Situational Constraints, Mobility Restrictions and Incentives, *KSCE Journal of Civil Engineering*, 20 (1), 401–410.

Javid, M.A., Okamura, T., Nakamura, F., Tanaka, S. and Wang, R., 2014, "Public Perceptions to Travel Demand Management Measures in Lahore, Pakistan: Analysis and Implications", *Proceedings of the Pakistan Academy of Sciences*, 51 (1), 17–29.

JICA, 2012, "The Project for Lahore Urban Transport Master Plan in the Islamic Republic of Pakistan", Viewed 10 Aughust 2020, from: <https://openjicareport.jica.go.jp/pdf/12068110_01.pdf.

Li, J., Embry, P., Mattingly, S.P., Sadabadi, K.F., Rasmidatta, I. and Burris, M.W., 2007, "Who Chooses to Carpool and Why? Examination of Texas Carpoolers", *Transportation Research Record*, 2021 (2021), 110–117.

Malodia, S. and Singla, H., 2016, "A study of Carpooling Behaviour Using a Stated Preference Web Survey in Selected Cities of India. Transportation Planning and Technology, 39 (5), 538–550.

Meyer, M.D., 1999, "Demand Management as an Element of Transportation Policy: Using Carrots and Sticks to Influence Travel Behavior", *Transportation Research Part A: Policy and Practice*, 33 (7–8), 575–599.

Neoh, J.G., Chipulu, M. and Marshall, A., 2017, "What encourages people to carpool? An evaluation of factors with meta-analysis", *Transportation*.

Olsson, L.E., Maier, R. and Friman, M., 2019, "Why Do They Ride with Others? Meta-Analysis of Factors Influencing Travelers to Carpool", *Sustainability"*, 11 (8), 2414.

Park, Y., Chen, N. and Akar, G., 2018, "Who is Interested in Carpooling and Why: The Importance of Individual Characteristics, Role Preferences and Carpool Markets", *Transportation Research Record: Journal of the Transportation Research Board*, 2672 (8), 708–718.

Seyedabrishami, S., Mamdoohi, A., Barzegar, A. and Hasanpour, S., 2012, "Impact of Carpooling on Fuel Saving in Urban Transportation: Case Study of Tehran", *Procedia - Social and Behavioral Sciences*, 54, 323–331.

Ullah, I., Liu, K. and Vanduy, T., 2019, "Examining Travelers' Acceptance towards Car Sharing Systems—Peshawar City, Pakistan" *Sustainability*, 11 (3), 808.

Units, A. and Pakhtunkhwa, K., 2017, "District wise population by sex and rural/urban", Government of Pakistan, Islamabad.

Winship, C. and Mare, R.D.' 1984, "Regression Models with Ordinal Variables", *American Sociological Review*, 49 (4), 512.

Y. Saadat, S. and S. Ahmed, K., 2018, "Consumers' Perceptions on Car Sharing: A Preliminary Study in Dhaka City Independent Review of Bangladesh's Development View project", *World Journal of Social Sciences*, 8 (2), 43–56.

Zhou, B. and Kockelman, K.M., 2011, "Opportunities for and impacts of carsharing: A survey of the Austin, Texas market", *International Journal of Sustainable Transportation*, 5 (3), 135–152.

Zhou, G., Huang, K. and Mao, L., 2014, "Design of Commute Carpooling Based on Fixed Time and Routes", *International Journal of Vehicular Technology*, 1–8.

RESIDENTIAL QUALITY ASSESSMENT OF MULTI-STORY BUILDINGS THROUGH RESIDENCE EXPERIENCE: A CASE OF HYDERABAD, PAKISTAN

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ABSTRACT

In this modern era, multi-story housing is conceived as a sustainable and land-saving solution to increasing housing demand. In developing countries like Pakistan, unplanned and unsustainable multi-story housing development in major cities like Hyderabad. Housing quality is getting worse day by day, creating a negative impact on the physical and social well-being of inhabitants. The study identified the factors which are making a negative impact on multi-story housing quality. The research is based on a thorough literature review, variables which helped categorize into safety and security, environment, life convenience, space utilization, utilities and services. To record the residents' opinion, the variables were inserted in a structured questionnaire with a 4-point Likert scale. Systematic sampling was applied to select a random sample of sixty buildings with an interval of 5. Using multiple regression analysis, four variables, including outdoor noise, fire protection, lack of elevator facility and drainage, were found to have a negative impact. The study is significant as the results can be considered as a guide for planning and development agencies to improve the multi-story housing quality by ensuring the inclusion of influential variables in the present and future development of multi-story buildings.

Keywords: Housing Quality, Multi-Story Buildings, Quality of Life, Multiple Regression, Pakistan.

INTRODUCTION

Multi-story housing is currently recognized as a global phenomenon (Je, et. al., 200) Multi-Story housing was on a decline in the mid-1970s but now most policymakers, architects, planners and designers around the world have reaccepted multi-story housing as the most compact housing form (Olotuah, 200). Many investors believe that multi-story housing is more efficient form of housing as compared to other residential types and has many benefits, such as less land consumption, higher energy efficiency and lower resource consumption (Kenn edy and Miller 2015). Housing quality of multi-story buildings is essential as it provides a peaceful environment to the inhabitants (Mat, et. al., 2013). It was found that housing quality is primarily based on the household income level as high income usually leads to a higher quality of housing (Chen Guang, et, al,. 2012). Since housing quality does not depend only on the internal characteristics of the housing units, there are some other external factors (say, community's surrounding environment, livability, walkability.) that are responsible for making the housing quality better. Hence, consideration of both aspects is important (Othuman, et. al., 2014). However, many researchers conclude that sustainable multi-story housing involves the provision of infrastructural services that could bring about sustainable growth and development through improved environmental conditions and livelihood. In evaluating the quality of residential

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development, human, infrastructural and environmental characteristics are core determinants of how residents interpret the housing quality (Othuman, et. al., 2014). Moreover, the literature review revealed that the perception of housing quality by residents is usually recorded as weak, if the buildings lack basic amenities that make housing unfit for inhabitants (Mat et. al., 2013).

In Pakistan, multi-story housing remains a controversial housing form. One of the focus of debates is on its quality issues (Rashid, et. al., 201). Many researchers claim that quality problems were the key reasons people avoided living there (Haghi, et. al., 2018). Evidence from the literature illustrated several variables that can be used in determining the housing quality in developing countries, such as Pakistan. Variables include: adequate privacy and space, security, environment (such as proper lighting, heating, and ventilation) and utility services (such as water supply, electricity, and gas (Brkaniae, 2017).

This study aimes to identify the factors which are creating a negative impact on multi-story housing quality in Hyderabad, Pakistan. The literature suggests statistical modeling as the critical analysis tool, using multiple linear regression is the optimum method. Hence, it was applied to construct statistical models for each category of variables for the cases documented.

LITERATURE REVIEW

Housing quality is one of the primary criteria in assessing quality of life and it is evaluated along other paradigms of street quality criteria, visual and noise quality for the assessment of environmental quality. From the viewpoint of urbanism, buildings should be constructed on the ideal and most healthy urban areas. In a subjective perspective, lodging should meet the self-related demands, needs and should provide the occupants with the spiritual social and hygienic and serene qualities (Chenguang, et. al., 2012). Based on the results of research by kurian and thampuran (2011) the order of importance of seven components in the quality of the housing is as followes: construction material and methods, security and safety, environment, space utilization infrastructures design, and life convenience. Several studies were found from the literature that assessed the multi-story housing quality. A study of subtropical Brisbane assessed the factors which are creating a negative impact on multi-story housing quality (Kennedy and Millen, 2015). Privacy was found as the most important factor and its absence could negatively impact housing quality. While discussing multi-story housing quality in Tianjin, China, a study found that environment was a factor having negative impact on multi-story housing quality (Chenguang et.al., 2012). While analyzing the factors having a negative impact on multi-story housing quality, a study in Tehran, Iran, found the quality of physical aspects as the most influential factor. Hence, it emphasized enhancing the condition of physical aspects to improve the overall multi-story housing quality (Haghi, et. al., 2018). A study conducted in Pakistan found utilities and services and the surrounding environment as the two main factors which are negatively impacting multi-story housing quality (Rashid et. al., 201). It is evident in the literative review that multi-story housing quality is a phenomenon that cannot be generalized (Chatterjee, 2009). It varies from country to country, even within cities of a country, depending upon the physical, socioeconomic and environmental aspects. Thus, for every urban area, an evaluation of multi-story housing quality is the need of time.

A study in Korea evaluated the factors affecting the housing quality of apartments (Yim, et. al, 2011). This study conducted questionnaire survey to record the response of apartment's residents. The study covers fourty seven apartments units which were selected by using systematic sampling. From each building one resident participated. The answers were rated using 4 point Likert scale. The collected data was analyzed through linear regression to identify the impact of housing quality factors. The study found space utilization and life convenience as the core determinants to decrease the quality of the apartments.

Regression models with one dependent variable and more than one independent variables are called multiple linear regression or multilinear regression (uyanyk and Guller, 2013). It is a statistical technique for estimating the relationship among variables, which have reason and result relation, and make prediction for the topic by using the relation. As the approach was adopted by various authors (Rashid, et. al., 201, Yim, et. al., 2011) to determine the impacts using a regression model; the approach was also used in this study.

The findings of the study revealed that no country in the world is devoid of the housing problem. Though, the situation is controlled in cities of developed countries, but the impacts of rapid urbanization and slow urban planning process in major third world cities like Hyderabad, Pakistan, makes the housing quality questionable (Haghi, et. al., 2018). As a result, multi-story housing quality is getting worse, which creates a negative impact on urban areas (Brkaniae, 2017). The problem further leads to the expansion of other

problematic conditions, such as poor indoor environment, lack of ventilation, inadequate lighting, inadequate basic facilities (like electricity, gas and water) poor maintenance, absence of security and safety.

RESEARCH DESIGN

Study Area

For this study, Hyderabad city Taluka was selected. It is an administrative subdivision of the Hyderabad District located in Sindh, Pakistan. It covers an area of 20.37 square kilometers, with a population of 75,960. In Hyderabad city Taluka, multi-story housing is the most common housing form and is considered as of inferior quality, among other housing types. The vertical development is mostly driven by private developers who ignore almost all aspects of building design. Hence, the buildings fail to deliver a quality lifestyle to the inhabitants. Additionally, the problem has been compounded by the rapid rates of population and economic growth. Despite all these, neither effort has been made to address the issues of multi-story housing, nor have the factors having a negative influence on multi story housing quality been identified. Therefore, this research fills the gap by identifying the factors that are negatively impacting on multi-story housing quality in Hyderabad city Taluka.

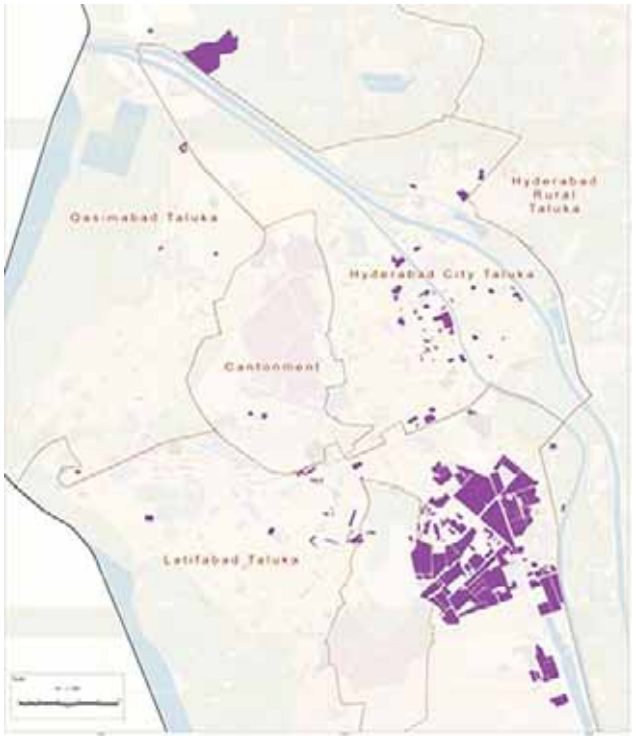

Figure-1: Hyderabad District Map.

Research Methodology

The methodology for this research is a mixture of site observation and questionnaire survey (Othuman, et. al., 2014). To collect the data a questionnaire survey method was adopted (Rashid et. al., 201). Based on predefined factors of housing quality, the questionnaire was designed accordingly. The responses were rated using a 4-point Likert scale so that the level of responsibility of factors could be measured (Haghi, et. al., 2018). Due to lack of time and resources, systematic sampling was used to cover the whole area. The first building was randomly selected and the next building was selected with an interval of 5 (Yim, et. al., 2011). After collection of data, analytical techniques of frequency distribution and statistical modelling (Multiple Linear Regression) were used to extract the required results. The reason for selecting multiple regression was to quantify the impacts of factors affecting multi-story housing quality (Rashid, et. al., 2017).

Sampling Plan

To construct a sampl plan the published literature was studied to select the suitable method for data collection and for selecting an accurate sample size. For this study, buildings having four stories (G+3) and above were selected for the survey (Chaltegee, 2009). Following the literature, systematic sampling was used to collect data. Out of two hundred and ninty registered multi-story buildings, sixty buildings were surveyed and studied. From each building one resident participated to record response. Hence a total sixty residents participated in questionnaire survey as described in Table 1.

Theoretical Framework

To have an inventory of variables to evaluate multi-story housing quality, a literature review was performed. As a result, several variables were identified that could assess multi-story housing based on the perception of residents. These variables are recognized worldwide and have been used by many authors to examine the multi-story housing quality. The study comprises of 1 dependent variable, i.e. multi-story housing quality, and independent variables categorized into 5 categories, i.e. life convenience (adequacy of parking, adequacy of elevator, and stairs), environment (air circulation, outdoor noise, sunlight, and temperature), security and safety (emergency exit, adequacy of fire protection system, and privacy), utilities and services (electricity, gas, water supply, and drainage), and space utilization (size of room, and open space). These variables

Table-1: Sampling Plan.

Study Area	Total Buildings	Sample Size (n=5)	Resident Participate from Each Building
Hyderabad City Taluka	290	60	1

were inserted in a structured questionnaire with a 4-point Likert scale so that the household perception could be recorded. Then, the data was analyzed using multiple linear regression.

RESULTS AND DISCUSSION

Environment

Table 2 demonstrates the model summary and parameter estimates for environmental factors. A value of 0.702 for 'R' indicates that the environmental factors have a significant impact on housing quality on multi-story buildings. A value of 0.493 for 'R2' depicts that the predictors lie close to the regression line, i.e., a good level of prediction. A value of 0.453 for 'Adjusted R2' reveals that 45.3% of residents recognize that environmental factors have a significant impact on housing quality. Whereas, outdoor noise was found to have a negative impact of multi-story housing quality with values of -0.431, respectively.

Security and Safety

Table 3 illustrates the model summary and parameter estimates for security and safety. A value of 0.806 for 'R' indicates that the security and safety factors are considered as vital factors by inhabitants to decide about the quality of a house. It is evident that everyone wants a secure and safe house. Without security and safety, people feel discomfort that consequently decreases housing quality. A value of 0.650 for 'R2' depicts that the predictors lie close to the regression line, i.e. a good level of prediction. A value of 0.629 for 'Adjusted R2' reveals that 62.9% of people consider security and safety as an important factor while selecting a house. Whereas, black of proper fire protection ststem was found as the only factor having a negative impact on multi-

Table-3: Regression Coefficients for Security and Safety Variables.

S. No.	Factor	Beta	Std Error	t	Sig
	Constant	2.444	0.342	7.145	0.000
X5	Emergency Exits	0.184	0.097	0.871	0.388
X6	Fire Protection	-0.451	0.111	-3.550	0.000
X7	Privacy	0.549	0.118	6.627	0.000

Table-2: Regression Coefficients for Environment Variables.

S. No.	Factor	Beta	Std Error	t	Sig
	Constant	2.530	0.509	4.96	0.000
X1	Air Circulation	0.84	0.097	0.871	0.388
X2	Outdoor Noise	-0.431	0.111	-3.871	0.000
X3	Sun Light	0.617	0.118	5.209	0.000
X4	Temperature	0.21	0.094	0.227	0.821

story housing quality. Its absence makes tenants feel unsafe.

Utilities and Services

Table 4 illustrates the model summary of the utility services factor. A value of 0.809 for 'R' indicates that utility services factors have a significant impact on all housing quality factors. A value of 0.654 for 'R2' depicts that the predictors lie close to the regression line. A value of 0.627 for 'Adjusted R2' reveals that 62.7% of residents think that utility services have a significant impact on housing quality. Whereas, drainage was found as the factor having a negative influence with a coefficient value of -0.416. This can be justified as Hyderabad city Taluka has experienced a marked increase in the residential density due to which the utility infrastructure has become overburdened. A utility line that was intended to serve a single-family unit is now serving a multi-story structure that accommodates more than fifty families.

Life Convenience

Table 5 demonstrates the model summary for life convenience. A value of 0.817 for 'R' indicates that the life convenience factors have a significant role in decent quality of housing. A value of 0.668 for 'R2' depicts that the predictors lie critically close to the regression line, i.e., an excellent level of prediction. A value of 0.648 for 'Adjusted R2' reveals that 64.8% of poor quality of housing is due to lack of facilities needed to support the residents of a multi-story building. The absence elevator was found to have a negative impact as it was absent in G+3 buildings of Hyderabad city.

Table-4: Regression Coefficients for Utilities and Services Variables.

R=0.809, R^2=0.654, Adjusted R^2=0.627, Std. Error Estimate=0.486214					
S. No.	Factor	Beta	Std Error	t	Sig
	Constant	2.908	0.430	6.756	0.000
X8	Electricity	0.001	0.075	0.018	0.986
X9	Gas	0.674	0.091	7.414	0.000
X10	Water Supply	0.124	0.086	1.439	0.156
X11	Drainage	-0.416	0.075	-5.583	0.000

Space Utilization

Table 6 illustrates the model summary for space utilization. A value of 0.219 for 'R' indicates that the space utilization factors have less impact among all factors of housing quality in Hyderabad. A value of 0.48 for 'R2' depicts that the predictors are not outliers but lies away from the regression line, i.e., not a good level of prediction. A value of 0.11 6 for 'Adjusted R2' reveals that only 11% of the poor quality of housing is caused due to the space utilization factors. As the determination of the differences between actual and estimated variables is calculated through the 'standard error of the estimate', a value of 0.798180 illustrates that the difference between actual and estimated variables is quite high. Thus, what the model predicts is not accurate as of the real condition. The insignificance of this factor is because people are still unaware of the importance of open space and its utilization that leads to improper space management, which results in inefficient space utilization.

DISCUSSION

Considering the Beta (β) and Sig (p) values for the environment variables, that outdoor noise has a negative impact on multi-story housing quality. The problem is usually caused due to exposure to outside traffic noise, noise from adjacent apartments and noise from upper floors. Moreover, insulation is usually avoided in building construction. The effect is primarily psychological impacting productivity, general behavior, sleep disorders, and disturbance to conversations that affects the health and daily life of residents.

Among all security and safety variables, lack of fire protection facility had a negative impact on multi-story housing quality. Thus, it can be inferred that people are dissatisfied with their apartments in terms of fire protection facility. Due to a lack of awareness of the necessity of fire protection systems in buildings, the developers do not consider fire safety measures in building design. The situation is critical as its absence could have devastating consequences that might lead to loss of human lives and can cause respiratory problems among residents.

Among utilities and services, lack of adequate drainage had system a significant negative impact on multi-story housing quality. To meet the ever-increasing housing demand, construction of multi-story residential buildings on small size plots is a common practice that creates a burden on the infrastructure. This overburden leads to drainage and sanitation system failure and as a result, the pipelines leak or one choked and the sewerage water overflows on the streets and roads.

In terms of life convenience, lack of elevator facility is the most common element that is absent in multi-story buildings of Hyderabad city Taluka. The reason is lack of interest of developers regarding user comfort. To cut the cost of the building construction projects, the developers neglect provision of elevators and utilize that space into any other possible room/facility to earn more profits. The negligence of this facility causes mobility issues, especially for patients, disabled persons, and the elderly.

It is concluded that outdoor noise, lack of fire protection, poor drainage, and absence of elevators were the main factors having negative impact on the multi-story housing quality of Hyderabad city Taluka.

CONCLUSION

In the last decade, many policymakers, architects, planners and designers around the world have accepted multi-story housing as the most optimum housing type to accommodate the increase in urban population. But due to poor planning and inefficient zoning in third world cities like Hyderabad, the solution has been converted into malaise, as multi-story buildings lack basic elements like safety and security, adequate livable environment and utilities and

Table-5: Regression Coefficients for Life Convenience Variables.

R=0.871, R^2=0.667, Adjusted R^2=0.648, Std. Error Estimate=0.46359					
S. No.	**Factor**	**Beta**	**Std Error**	**t**	**Sig**
	Constant	2.297	0.342	6.709	0.000
X12	Parking Space	0.251	0.064	3.929	0.000
X13	Elevator	-0.485	0.077	-6.327	0.000
X14	Stair	0.556	0.084	6.585	0.000

Table-6: Regression Coefficients for Space Utilization Variables.

R=0.219, R^2=0.048, Adjusted R^2=0.11, Std. Error Estimate=0.798180					
S. No.	**Factor**	**Beta**	**Std Error**	**t**	**Sig**
	Constant	2.885	0.282	10.109	0.000
X15	Size of Room	-0.213	0.431	-0.493	0.624
X16	Open Space	-0.392	0.403	0.974	0.335

services. Based on the results, it was found that four significant factors had a negative impact on multi-story housing quality, i.e., outdoor noise, lack of adequate fire protection, poor drainage and absence of elevators. Hence, several measures are required on the aforementioned variables to improve the multi-story housing quality in Hyderabad city. The results of the study provided a foundation for improving the overall housing quality of multi-story buildings.

ACKNOWLEDGMENT

I, Muhammad Ali would like to express special thanks to coauthors who helped to complete this paper and provided the opportunity to learn many new things. I am really thankful to them.

REFERENCES

Brkaniae, I., 2017, "Housing Quality Assessment Criteria", Elektronieki Easopis Gradevinskog Fakulteta Osijek, 37-47.

Chatterjee, M, 2009, "Perception of Housing Environment Among Hight Rise Dwellers", *Journal of the Indian Academy of Applied Psychology*, 35(Special 1).

Chenguang, Li, Lu, Sun, Jones, P., 2012, " Liveability of High-Rise Housing Estates: A Resident Centered Hight-Rise Residential Environment Evaluation in Tranjin, China", 48th ISOCARP Congress.

Haghi, M. R., Samavati, S., Eskandari, A., 2018, "An Evaluation of Housing Quality in Two Types of Conventional Housing Vs. Apartments: Case Study: Haft Hoz Neighborhood and the 1st Phase of Ekbatan Community in Tehran", *Space Ontology International Journal*, 7(2): 23-24.

Je, H, Lee, J, Cheong S, Shin, S-W, 2007, "A Study on Residential Quality Index of Super High-Rise Apartment Housing through Survey with Experts", P*roceedings of the International Conference on Sustainbale Building Asia*, 27-29 June 2007, Seoul, Korea in House Publishing.

Kennedy, R., Buys, L., Miller, E., 2015, "Residents' Experiences of Privacy and Comfort in Multi-Storey Apartment Dwellings in Subtropical Brisbane", *Sustanability*, 7(6): 7741-61.

Kurian, S. M., Thampuran, A., 2011, "Assessment of Houding Quality: Institute of Town Planners", *India Journal*, (2):74-85.

Mat, Noor, N., Eves, C., A. Mutalibun, 2013, "High Rise Residential Building Quality: Residents Satisfaction Survey", In: Manley K., Kajewski S, (eds), *Proceedings of the 19th International CIB World Building Congress, Brisbane Construction and Society*, Australia: Queensland University of Technology, P. 1-10.

Olotuah, AO, 2007, "Housing Quaity in Suburban Areas (An Empirical Study of Oba-Ile, Nigeria)", *Journal of Architecture and Built Environment,* 34.

Othuman, M., Mohamed MF., Raman S. N., Iman P. T. M., Mohammad Y., Che A., 2014, "Outdoor Environment of Low-Cost Housing: A Case Study of Flat Taman Desa Sentosa", E3S Web of Conferences.

Rashid, J., Hussain, I., Syed S., 2017, "Insight of the Quality of Housing of Pakistan Households: Using New Methodology and the Countrywide Unit Record Data" Forman Journal of Economic Studies, 00:121-33.

Uyanyk, G. K. Guler, N., 2013, "A Study on Multiple Linear Regression Analysis", Procedia-Soc Behav sci, 106:234-40.

Yim, H. L., Lee, B. H., Kim, J. H., Kim, J. J., 2011, "The Effect of the Quaity of Apartment Houses on the Residentail Satisfaction nd Corporation Performance", *Proc 28th Int Symp Autom Robot Constr ISARC,* 1394-400.

ECOTOURIM AND ARCHITECTURE: PERSPECTIVE OF CHOTIARI WETLAND COMPLEX-SINDH, PAKISTAN

*Humaira Nazir**

ABSTRACT

Ecotourism has the strongest pro-poor effect on people living around wetlands, as the visitors come to the site they create room for direct marketing, thereby incentivizing the development of an economic fiscal multiplier effect. Because of unsustainable incentives, the pattern of "trying livelihoods" in the Chotiari Wetland Complex, which is in Sindh-District Sanghar, has been dwindling. Furthermore, some evolving development actors, as non-governmental organizations (NGOs), Sindh Tourism Development Corporation (STDC), and WWF- Pakistan have attempted to take control of the local community's destiny by recognizing tourism development as a way of enhancing their livelihoods. The objective of the research is to find and explain the current status of tourism development and its impact on the local communities and environment of Chotiari Wetland Complex another objective is to establish the architectural ethics in planning and developing tourist's facilities that bridge the gap between ecotourism and its architecture and is beneficial for the community and genral environment. A review of some of the contemporary literature indicates that the primary factors that connect ecotourism to architecture and contribute to the upliftment of the local community and highlighting the lack of literature that focuses on the architecture of ecotourism in wetlands with a hot arid climate. An analytical study of the hot arid area of the Chotiari Wetlands' Vernacular Architecture is addressed in this research, outlining the factors influencing its significance. This is accompanied by a discussion of the potential of the Chotiari Wetlands' vernacular architecture as a basis for the development of eco-tourism architecture. The methodology adopted for the study was a case study with a combined technique of qualitative research. Data was collected through private walks, surveys, observations, photographs, videos, sketches, focused gathering discussions, on-site meetings with involved stakeholders, and study of existing literature.

Considering the findings of the study, along with the observed natural resources in the area traditional mud straw, and reed houses have been proven to have potential regarding eco-tourism and to be best suited for the area, both for the dwelling of residents and the accommodation of tourists with the elimination of deficiencies. It is also revealed that the current tourism architecture is not user-friendly and does not adapt to the local context and the environment. Moreover, the local community is interested in tourism-related income generation activities.

The paper concludes that architects and resource planners must take the concept of vernacular architecture as a key principle for future development and construction of ecotourism architecture with the involvement of local communities.

Keywords: Ecotourism, Journey, Chotiari Wetland Complex, Sindh, Vernacular Architecture.

INTRODUCTION

Pakistan is a developing country in South Asia and is approachable for tours from many other regions. In Pakistan the tourism industry is developing rapidly because of its many destinations that attract tourists. Among all these destinations, wetlands are the ones that possess unique characteristics. Wetlands are areas that comprise of reservoirs, canals, rivers, lakes, ponds, mangroves, sandy coasts, salt pans, and inland or coastal, artificial, or natural resources. The essential factor that separates wetlands from other landforms or water bodies is the distinctive vegetation of hydrophytic plants, appropriated to the specific hydric soil. In Pakistan, nineteen wetlands Ramsar sites exist, from which nine are locate in the Sindh region and the Chotiari wetland complex is one of them (Wikipedia, 2019).

Technological advancements, physical, socio-economic, and institutional development is the primary force for the development of entertainment, relaxation and leisure activities in any Wetland Complex. The introduction of tourism as a significant sector is one of the most notable

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shifts in post-war financial activity. Travel was previously a privilege for a wealthy few, rich, powerful and curious individuals but now this has changed. Basic resources for tourism are historic, cultural, and natural resources of the host destinations. By protecting and improving these resources and avoiding any negative impact on them from the development of tourism activities and facilities success of tourism can be achieved. Observing the development of tourism in many regions reveals that tourism affects the built environment adversely. Large-scale development of touristic amenities and other infrastructure tends to alter an area's land use and disturbs a destination's natural ecological harmony. For instance, in Chotiari Wetland Complex, tourism facilities are being developed but it poses problems, as the forms are unsuitable symbols of cultural growth. It also adversely affects wetland and its ecosystem, such as ruins the wetland with infrastructures development, inappropriate disposal of waste, extraction of materials for buildings, and so on. To cope with the issue, the concept of Ecotourism is often viewed as a successful method for encouraging sustainable development. Many regard ecotourism as a feasible way to preserve the local environment and provide local communities with social and financial advantages.

Sustainable development in ecotourism facilities and activities could change the life of tourism hosting communities. Sustainable development can be in the form of eco-lodges and small-scale activities that give tourists exposure to the natural and cultural world of the area. It will also give different opportunity to local people to boost their economy. Moreover, sustainable development strategies aid to overcome the issue of the energy crisis of the region through sustainable architecture (TES, 1998).

This study identifies a research gap regarding strategies for the architecture of ecotourism facilities that need to be fulfilled. Besides, there is lacking cultural, environmental, and economic indicators that can be used to make tourism and its related architecture culturally, environmentally and economically sustainable.

LITERATURE STUDY

Wetlands, ecotourism and sustainable development

Wetlands are precious ecosystems covering approximately six percent of the land surface of the world (Ramsar Convention, 2018). They offer significant tourism and recreation facilities and are one of the vital elements of the worldwide tourism experience. Therefore, they are likely to be the main component of the development in demand for touristic places as well. As per the Ramsar Convention wetlands are, “Areas of the marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with static or flowing water, fresh, brackish or salt, including regions of marine water not exceeding six meters in depth at low tide.”

Individuals are naturally attracted to water, to coastal wetlands such as coral reefs and beaches, and inland wetlands, for example lakes and rivers. Wetlands give important tourism possibilities that can be a source of revenue for many developing countries, bringing financial advantages for domestic and local economies (Figure 1). Well-managed development of tourism guarantes sustainable livelihoods of local communities and this demanded ecotourism. The Ecotourism Society (TES, 1998) describes ecotourism as "a responsible journey to natural territories, which preserves the environment and supports the health of the local individuals." Therefore, it is now one of the most common and quickest developing tourism fields. Development rates for ecotourism are assessed to go around to yearly, in contrast to for tourism in general, with the best development in the ecotourism business expected to occur in the worldwide business. (Dimanche and Smith 1996; Lindberg 1997; Mader 1998; Reingold 1993).

There are many wetland destinations around the globe that host eco tourists and one of them is Lake Ichkeul, in the Mediterranean wetlands. It has a National Park, a Ramsar Site, a Biosphere Reserve, and a World Heritage site of UNESCO. It is a major stopover for hundreds and thousands of migrant birds who come to eat and nest there, including ducks, geese, storks, and pink flamingos. The lake is a famous location for tourism and recreation, because of its ecological significance. Every year, Lake Ichkeul National

Figure-1: Main Principles of Eco-Tourism.

Park gets around fifty thousand tourists. The tourist attractions include nature paths and guided tours, a museum, douars sightseeing (tented camps), local villages visits, bird watching, mountain biking, hiking, and sports trekking on Djebel Ichkeul (Figure 2). A welcome center (Figure 3) is built there using locally available materials that are contextual and environment responsive and facilitate tourists with all necessities (Tripadvisor, 2019).

Sustainable development in and around wetlands is necessary for supporting wetland's stakeholders (Panda.org, 2018). "Sustainable development is a strategy that responds to the needs of today without harming the ability of coming generations to fulfill their own needs." (World Commission on Environment and Development, 1987). Additionally, sustainability is presented as a multifaceted phenomenon that has three pillars: environmental, social, and economic. In sustainable development, these three pillars work together to protect resources of the environment, preserve socio-cultural capital and heritage and build up the system of the economy So that it responds to the requirements of present and coming generations (Mason, 2014). The World Conservation Strategy (referred to in Robin and Poon, 2009) in 1991, defined the principles of sustainable development in detail. The principles comprised; looking after and care for the society and communities; upgrading human life quality; saving the earth's liveliness and diversity; limiting the consumption of non-renewable resources; changing mentalities and practices; empowering communities to take care of their environments; giving a national system to coordinating development and protection and making a worldwide union. Therefore, ecotourism development's dimensions in relation to sustainable development related to the environmental, economic and social aspects of tourism growth and an appropriate balance must be developed between these dimensions to preserve its long-term sustainability (Figure 4).

Figure-2: Activities for Tourists.
Source: Trip Advisor, 2019

Ecotourism and Architecture

Sustainability and 'being sustainable' can be considered as key drivers that create a close connection between ecotourism and architecture. Ecotourism and vernacular architecture each try to react to the societal requirements of a given group or a community in an environmentally harmonious, socially suitable and economically feasible way. Architecture's sustainability philosophy is expressed through various activities aimed at reducing a building's adverse effect on its surroundings and taking care of its users and adjacent community's quality of life. Each region has its sustainability profiles, sometimes linked to vernacular architecture and ancient traditional building methods.

Considering the case of Feynan Ecolodge that is situated in Jordan's biggest nature reserve, the Dana Biosphere Reserve facilitaties tourists around the globe (Figure 5). The lodge consists of thirty rooms and is designed in arid landscape

Figure-3: Welcome Centre.
Source: Trip Advisor, 2019

Figure-4: Sustainable Development Through Eco-Tourism.
Source: Kiper, T, 2013

based on the research of desert architecture. It utilizes architectural components that are ecologically shaped like traditional houses in Jordan, by using locally available materials and techniques. The use of domes, vaults and mud skin is all linked to the region's local and traditional building architectural style. Concrete blocks with double layers are used for its construction, with the air cavity in between for good heat insulation. In the southern and western sides, sculpture type stone chips are used as shading devices (Figures 6). It maximizes solar energy utilization and generaties electricity using photovoltaic (PV) panels that can store up to three days of electricity to account for cloudy days. Additionally, all biodegradable waste is transfered into fertilizer by composte and uses reusable containers to collect supplies and minimize all other packaging waste. There is a decentralized wastewater treatment solution. The objective of reusing water is to create a micro-ecosystem around the lodge, with plantation of native trees that not only creates a vista, but also gives shade and sitting spaces to the visitors and local community. To bring economic benefits to the local community, the lodge employs locals from the community and supplies up to eighty percent of food and products from neighboring villages. This generates jobs, promotes the local economy, and generates an authentic local guest experience. A lodge store also displays and sells local crafts and artwork that helps promote the region's wealthy Bedouin culture.

The reviewed literature and examples of wetlands, ecotourism, and eco-lodge, reveal found that architecture holds a crucial role in ecotourism as a reflection of the natural environment through space. Eco lodges and sustainable resorts it well blended with the surroundings espond to local livelihoods, culture, and art. However, a knowledge gap regarding strategies for the development of ecotourism architecture exists, this can make a connection between the key features of both ecotourism and architecture as being sustainable, in Wetlands with hot, arid climate is still existing that is presented in this research as the key gap in knowledge in these fields while focusing the valuable destination of Chotiari Wetland of the hot, arid climate.

Figure-5: Sustainable Eco Lodge.
Source: Sarah, 2015

RESEARCH METHODOLOG

The combined technique, case study, and qualitative approach are used to attain the study goals. Secondary data collection sources comprised of relevant books, published journals, blogs, research papers, and reliable news articles, and websites, etc.

Primary data is collected by selecting a case study of the Chotiari Wetland Complex. Three villages of Chotiari namely, Baqar *Goth*, Phulail *Goth*, and Faqir Wanhyal Mangrio *Goth* were chosen due to having the potential for ecotourism. Field visit in the selected villages was done from March 28 to April 1, 2019. The objectives of the visit were to understand the design of built forms for tourists, to analyse Baqar lake resort, and a tourist's welcome center. In addition, vernacular architecture was studied to get knowledge of local materials and construction strategies. For qualitative research, the sample size was fifteen local people from which twelve male and three females and two officials. The objective of these interview was to know about the lifestyle, culture, way of earning of local communities and initiatives taken by the government to upgrade the area for tourism development. Results were derived by google mapping, pie charts, bar graphs, and analiycial tables are taken.

CASE STUDY AREA (IDENTIFICATION OF SITES)

Chotiari is situated approximately two hundred and eithy-seven kilometers from Karachi and spread over four thousand

Figure-6: Sun Shading Devices.
Source: Audleytravel.com, T, 2019

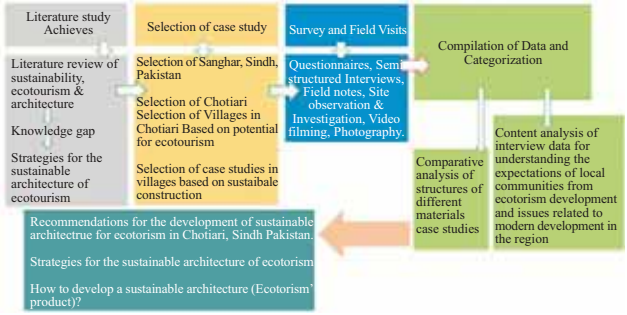


Figure-7: Framework of Research Methodology.

eight hundred and five square kilometers along the Indian boundary in the district of Sanghar near Achro Thar Desert, Sindh (Figures 8 & 9).

The climate of Chotiari Wetland is that of a "desert." There is virtually no rainfall all year long. May and June are the hottest months, when the temperature rises to 40 to 45 °C and December to February are the coolest months. Normally nights are relatively colder than days.

There are three villages of Chotiari that have tourism potential and selected for study namely Baqar Goth, Phulail Goth, and Faqir Wanhyal Mangrio *Goth* (Figure 10). Baqar village is easily accessible from Sanghar city by a link road, while the rest of the two *Goths*, Phulail and Faqir Wanhyal Mangrio *Goth* have no road access. In Phulail *Goth* people can access only by boats and in Faqir Wanhyal Mangrio *Goth* a naturally made path serves as a road that can be used by four wheel special jeeps.

Considering the basic infrastructure facilities of the *Goths*, responses of local community indicate that they have not provided basic infrastructure facilities (Graph 01).

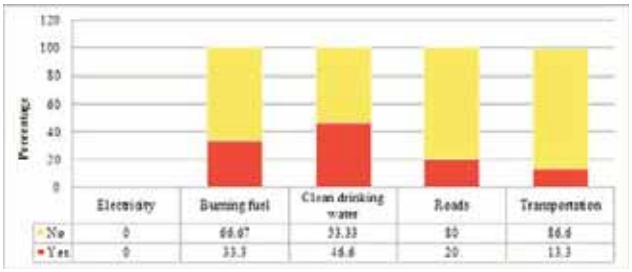
Chotiari Wetland and Ecotourism

The ecofriendly area, especially the three selected villages, are famous locations for tourism and recreation, regarding their ecological significance and tourism development activities by the local government, NGO and WWF Pakistan.

Figure-9: Map showing location of Chotiari region in District Sanghar

Figure-8: Map showing geography of Pakistan and location of Sanghar

After the development of tourism facilities, Chotiari Wetland has been receiving around two thusand tourists every year since 2012. It has a diverse variety of deep-water wetlands, shallow marches, historical lakes (*dhands*) that hit a maximum depth of furty five meters, (Figure 11), and historical buildings (Figure 12). The old and historic shrine of Hazrat Shah Mardan Shah Pir Pagaro Shrine in Bakar *Goth* is also of great significance as followers of Pir Pagaro, (a leader of the Hur Movement against British Rule in Sindh), show great reverence towards it. Activities for tourists include local village's visits with meeting local people and experiencing their culture, bird watching, wildlife surveillance, hiking on dunes with panoramic views of the marshes, nature trail walking in the deserted area, launching boat tours on the lakes and waterways (Figure 13).



Graph-1: Infrastructure of Chotiari's Selected Goths

Figure-10: Map showing 3 selected villages of Chotiari

Figure-11: Baqaar Lake

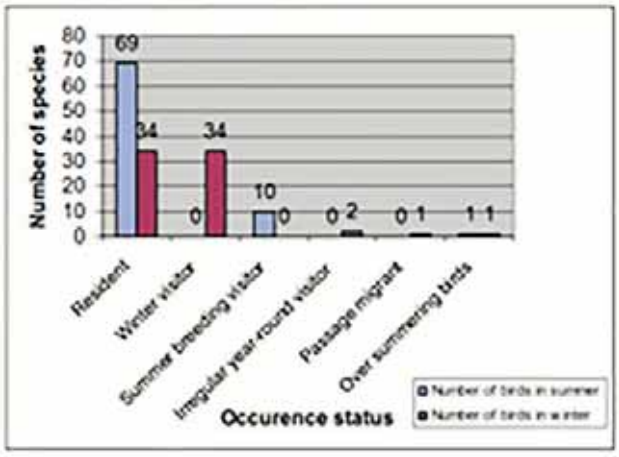


Figure-14: Species occurrence in Chotiari Reservoir showing seasonal status of birds.
Source: WWF-Pakistan

The Nara canal, situated in the surrounding area, offers an amazing natural sight of riverine forest fields. Additionally, Chotiari Wetland Complex is home to a wide variety of flora and fauna (Figure 14) and a significant stopping point for thousands of migratory birds who come to eat and breed there, including Great egret, Desert Lark, Houbara Bustard, Bay backed Shrike, that add value to the overall pleasure of the trip of tourists (Figure 15).

Ecotourism and its Architecture in Chotiari Wetland Complex

For the development of tourism, a welcome center named

Figure-13: Activities for Tourists in chotiari Wetland

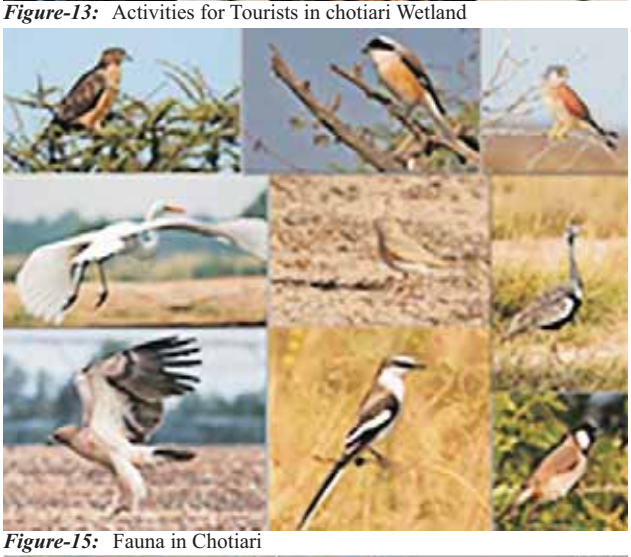


Figure-15: Fauna in Chotiari

Figure-16: Map of Baqar Goth with Highlighted Tourist's Facilities

Chotiari conservation and information center with a small wetland museum, having different artifacts like models of birds and their information for researchers and tourists was built by WWF-Pakistan in Baqar village (Figure 16). This center uses locally available materials (mud, straw, and reed), that is contextual and environment responsive and

Figure-12: A Century Old Structures of Junejo Tribes Attract Tourists

facilitates tourists with all necessities (Figure 17). Besides, the Baqar Lake Resort is also built in this *Goth* by Sindh Tourism Development Corporation (STDC) for the accommodation of tourists. This resort consists of four suites with a common shared boundary wall. Concrete blocks are used in the construction of this resort, that is not responding to the local context, and not environment responsive and user friendly (Figures 18-20).

In Faqir Wanhyal Mangrio *Goth*, an *otaq*, which comprises a *Landhi* and two *Chowrna*, is also built by a local NGO (Sindh development foundation), for tourists by using locally available materials and local techniques. However, lack of sun shading devices, and proper mud plastering of structure, makes the structure very not during the day explained. (Figure 21 & 22). *Chowrnas* are built for selling local crafts. The concept of kitchen gardening is also introduced to empower the local community.

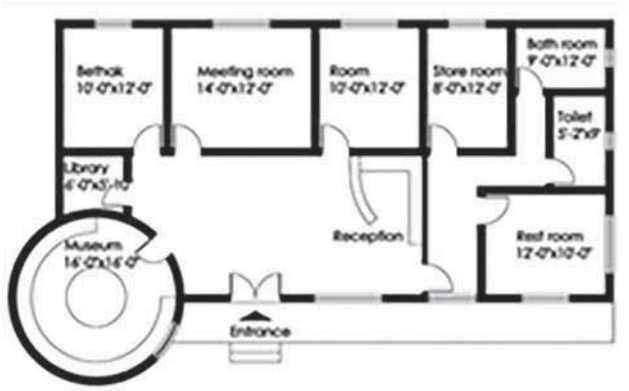


Figure-17: Plan of Visitor's Center

Figure-18: Exterior View of Visitor's Center

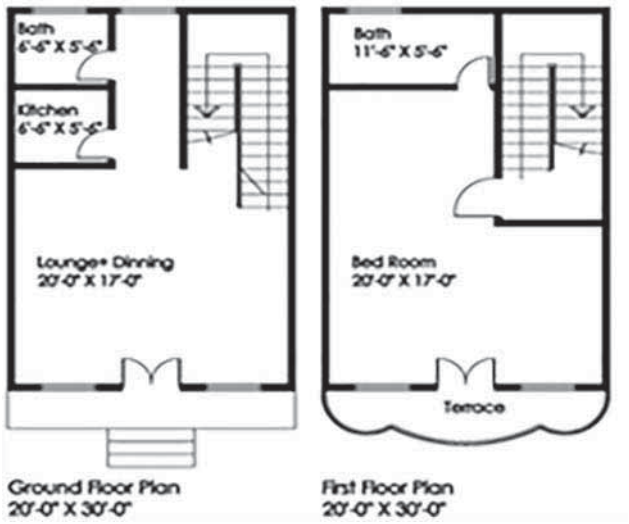


Figure-19: Floor Plan of Resort

Figure-20: Exterior and interior Views of Resort

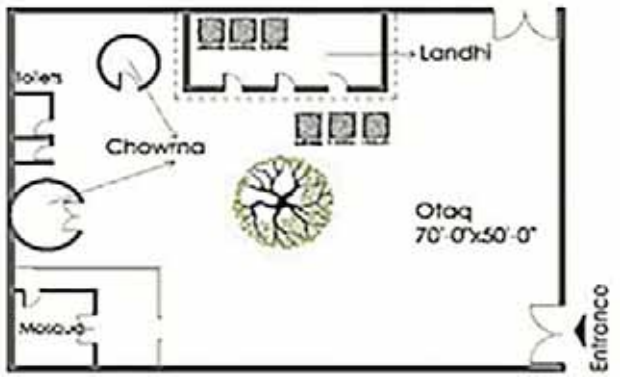


Figure-21: Plan of Otaq

Figure-22: Exterior of Landhi+ Chowrna & Entrance of Otaq

Traditional Architecture of Chotiari Wetland

The following materials are readily available in Chotiari and considered local materials of the region (Figure 23). Three plant species Typha sp. along with Phragmites and Saccharum sp. provide refuge shelter, and breeding grounds to the locals.

Materials of local architecture are straw, reed and bamboo for structural frames and roofs with thatch and mud plaster which lower the cost and environmental impact (Figure 24).

Untrained people and locals without any professional input usually participate in the construction process, without incorporating new technology and techniques to cope with negative impact of the current construction techniques, like termite attack on wood, destruction of structures due to wind storms, no sufficient bed plates top leveling or consideration for distribution of load heat insulation and water penetration through walls and roof.

Impact of Tourism Development on the Economy of the Region

The livelihood of the individuals residing around the Chotiari wetland complex is depended on natural resources Figure 25 shows the daily wages of the major professions which help to suggest economic opportunities for the people through promoting ecotourism.

However, the construction of the Chotiari Dam adversely affected the lives of natives and their economy. The area's beautiful lakes have been transformed into a bigger storage dam, called the Chotiari Reservoir, that has resulted in dying fishes due to diversion of water of natural lakes an other negative impact as shown in Figure 26, is that it forced people to migrate to other areas for survival. This scenario indicates that to bring advantage to the local community there is a requirement for sustainable development with overed facilities and activities should be economically beneficial, socially responsive and environmentally friendly.

Conversely, locals do not consider current tourism development as an activity that brings benefits for them and they find negative impacts of tourism in the region. Unsustainable construction is done to facilitate tourists that in return does not encourage them to revisit the area, Figure 27 shows the data collected from locals to understand the impact of tourism in the area.

Tourists were interviewed to understand their experiences about the area. Figure 28 shows the response of the tourists

Figure-23: Map Showing Availability of Materials with the Name of Nearby Places of Chotiari

Figure-24: Tuck Show Plastered with Mud in Phulail Goth

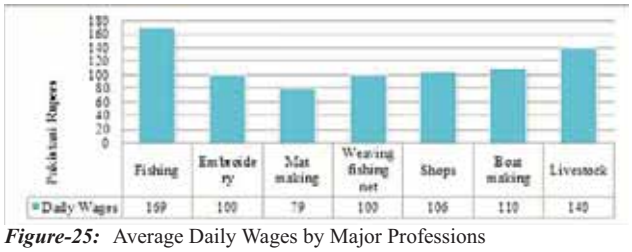


Figure-25: Average Daily Wages by Major Professions

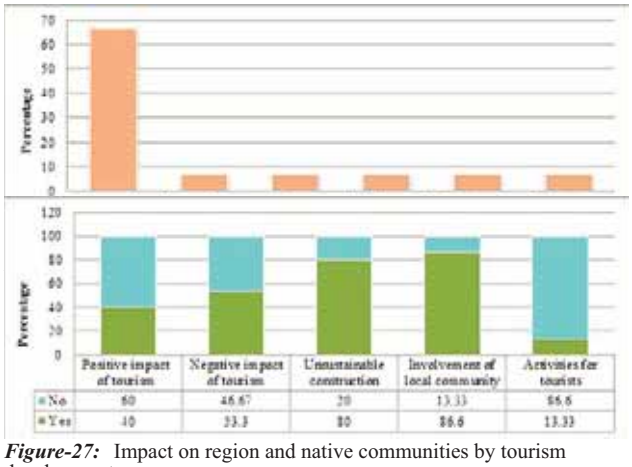


Figure-27: Impact on region and native communities by tourism development

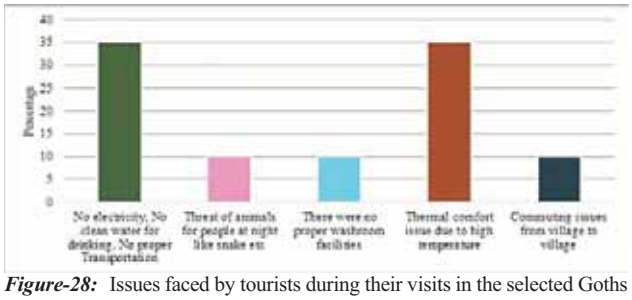


Figure-28: Issues faced by tourists during their visits in the selected Goths

to the question related to the Baqar Lake Resort structures being appropriate for the weather conditions of the region.

Figure 29 shows the response of tourists to the question related to the current touristic architecture of Chotiari wetland complex and it being related to the vernacular architecture of Chotiari.

All responses of the tourists pointed towards the need to construct architecture in accordance with the local climate and available infrastructure facilities, so that users can feel comfortable during their stay in this region and be encouraged to revisit the area.

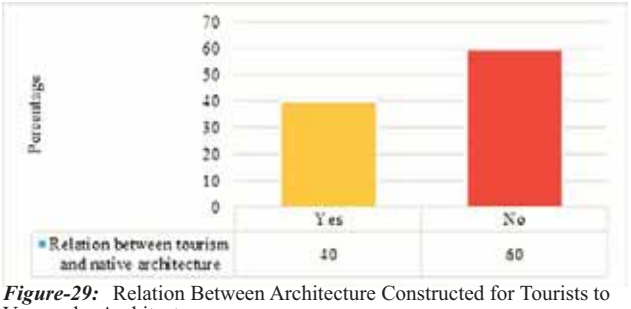


Figure-29: Relation Between Architecture Constructed for Tourists to Vernacular Architecture.

ANALYSIS

This study identified that this region has a potential for ecotourism but the development of tourism failed to create a connection between ecotourism and its architecture. Construction of local structures in the region should mostly be based on the accessible local materials as the cost of transporting materials is not affordable. Natural materials that are used in Chotiari are not only economical but also do not affect the environment negatively.

Mud, straw and reed are incredibly efficient materials that can be utilized successfully to construct speedy shelters. These all are sustainable material, accessible locally and the use of it is common to all villagers of Chotiari Wetland. Mud can be utilized for walls, including in finishing coats or by forming sun-dried bricks, the manufacturing of which is also very quick and easy and it is a good insulating material. Mud plaster acts as a barrier against regular rainfall, but the wall that becomes weak after the plaster is removed. If the wall starts to lose its exterior plaster, it is susceptible to decay. Mud has a strong thermal mass, particularly clay; it is very good for keeping temperature changes at a moderate level. In the desert heat, buildings built with mud and reed tend to be normally cool and hot in cold temperatures. Clay retains heat releasing it over a specific period. Adobe's thermal conductivity is specified as 0.24 KW/m /K and adobe as 0.18 KW/m/K (Goodhew and Griffiths, 2005). Research on adobe reveals that the high specific heat of the adobe helps heat to be absorbed throughout the day, contributing to cooler indoor spaces. The heat is released at night, keeping the interior warm (Parra-Saldivar and Batty, 2006). The ability to conduct heat is linked to moisture content (Rees et al., 2001). U-value, on the other hand, also plays an important role in the selection of materials. The lower the U-value, the better the heat insulation. Sun-baked bricks have excellent insulating properties. Sun-baked brick with both sides plaster have a U Value of 0.63 W/m²K and baked brick on plaster on the inside with U Value of 1.19 W/m²K. Timber roof with straw and 154 mm coating of mud has a U-value 0.3785 W/m²K. Reinforced brick concrete, with 154 mm mud coating, has U-Value of 1,0215 W/m²K. The least U-value is found when reed and straw matt are added to the structure. The thermal conductivity of Hemp Straw is given as 0.039-0.040 W/m²K and the embodied energy is given as 10MJ / kg (Greenspec, 2017). The inhabitants living in reed and bamboo structures reported that their homes offered more thermal comfort than the neighboring dwellings. This indicates that the usage of straw matt and reed is common and continues in contemporary practice, however, to prevent the degradation of buildings, precautionary measures need to be considered.

DISCUSSION

The study points out that the issues regarding tourism and sustainable development at chotiari and the following strategies are proposed for sustainable development:

* Local villagers should be trained in proper construction techniques to build sustainable lodges. The objective of constructing lodges via involving local communities, should be to support and promote the area's vernacular and environmentally friendly architecture. In this way, the local community can be supported economically and it will allow them to establish their independent local business and use appropriate construction technique to other construction projects.

* Local technical expertise, methods and natural and locally available materials should be used to construct lodges for tourists. Responsive materials used for construction can return to nature at the end of the lifespan of the building and establish a close natural cycle to achieve environmental sustainability. Tourists staying in these lodges can learn about new technologies. The key sustainable objective should be conveyed by the structure of the building by it camouflages around the cliffs and the surrounding scenery.

* Additionally, lodge's should hire staff from local

community and provide them up to 80% of surrounding village's food and products. This will help promote local micro-enterprise by organizing open days to sell local craft and products to tourists. This will also create jobs, foster the local economy, and create an enjoyable experience for guests. Besides, cab be facilitated tourists with boating and fishing activities, that can be run by the local community.

* Solar photovoltaic (PV) systems have demonstrated their efficiency in Chotiari but on a smaller scale. It is proposed that local businesses utilize solar energy at a larger scale with a decentralized renewable energy system. This system consists of a mini-grid, a solar photovoltaic plant, based on solar energy with a regional supply system to a village. Therefore, local organizers with the help of the government must install a decentralized energy system in this region. Additionally, provide Solar Stoves for cooking should be provided to local communities. This will save their time and energy wasted in the collection of wood for cooking. Furthermore, solar pumps for irrigation and solar hand pumps should be installed at a common location for drinking water.

* In-situ (make an artificial natural environment for birds), and ex-situ (make seed banks, by pruning off seeds bearing branches, gene banks, and captive breeding), conservation strategies to maintain the biodiversity of the region should be adopted.

* The following architectural principles, based on a understanding of local centext, should be implemented.

→ Orientation: The east-west direction is the best orientation. Configuration along this direction reduces heat gain (Figure 30).

→ Forms: Rectangular or circular structures with greater wind penetration are favored over irregular shapes (Figure 31).

→ Walls: Must be solid and made by natural or recycled building materials, such as clay, sand, straw, burnt mud bricks, sun-dried mud bricks, wood and reed. If the use of other materials such as solid or hollow blocks of concrete cannot be avoidabed then they should be used with a cavity. Surfaces must be coated with mud plaster, cement mortar and lime wash.

→ Roof: Hip or conical roof structures should be built (Figure 32), to minimize the load of heat. Additionally, a double roof can also be used to eliminate the re-radiation of heat to the inside.

Figure-30: East-West Orientation.

Figure-31: Circular and Square Forms Must be Preferred than Irregular Forms.

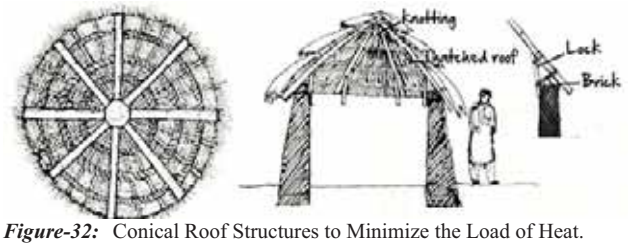


Figure-32: Conical Roof Structures to Minimize the Load of Heat.

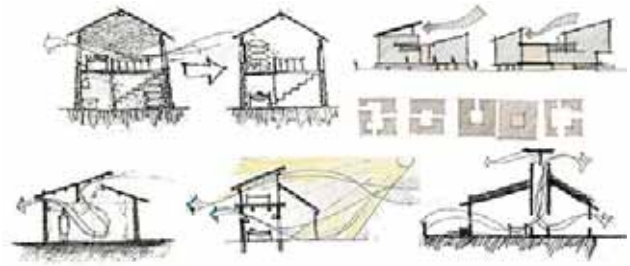


Figure-33: Fulfill energy Requirements by Passive Design.

→ Energy efficiency: Utilize Renewable Energy Sources to generate electricity, i.e. solar energy. energy requirements should be full filled by passive design, and choose energy-efficient appliances (Figure 33).

→ Natural setting: use existing terrains to fit in the new structures (Figure 34).

→ Courtyard: It should be part of the layout for natural ventilation and light. It must also be equipped with trees to increase the level of humidity (Figures- 35, 36).

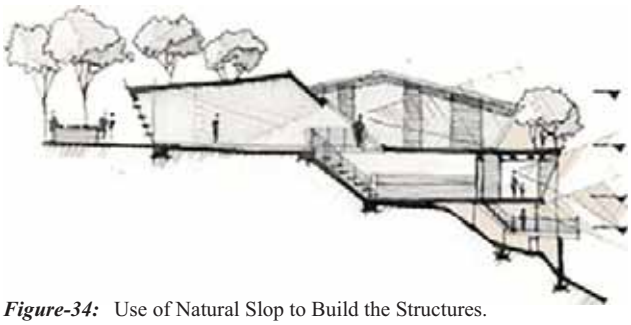


Figure-34: Use of Natural Slop to Build the Structures.

→ Shading devices: The size and number of openings facing the sun and the openings should be couered with traditional architectural elements/ overhangs. Necessary vegetation around the eco-lodges for shadingshould be used. No roof should be built without eaves (Figures 37).

∗ Some other significant points to be considered when developing ecotourism architecture/facilities are discussed below.

→ Water resources must be properly monitored and managed, along with waste processing and disposal that can deter the lodge from polluting its natural resources.

→ Design for the more economical utilization of building materials blends the unique physical and cultural environments, by careful consideration to design, landscaping, color, and the utilization of vernacular architecture.

CONCLUSION

Wetlands around the globe have great potential for tourism that are being developed through sustainable strategies and eco-measures in tourism architecture. This supports the native communities through economic stability and culture growth and to raises public awareness about the ecosystem while protecting the natural resources. Although the Wetland Complex of Chotiari is a rich tourism spot, ecotourism, however, can be seen to be in its infancy, and existing facilities of tourism hare resulted in inappropriate design for this region. As the ecotourism industry is growing, the demand for well-planned and sustainable facilities is high and there seem to be a necessity in this region that is abundant in many bio-diversity and ecologic characteristics.

Ecotourism can produce significant economic benefits for local communities and will ultimately guarantee the area's sustainable development and turn it to be an eco-touristic region. One of the criteria for the development of a sustainable eco-tourist area is the development of architecture, derived from local architecture, following the ecotourism's principles, and termed as "eco-lodge". This type of architecture is

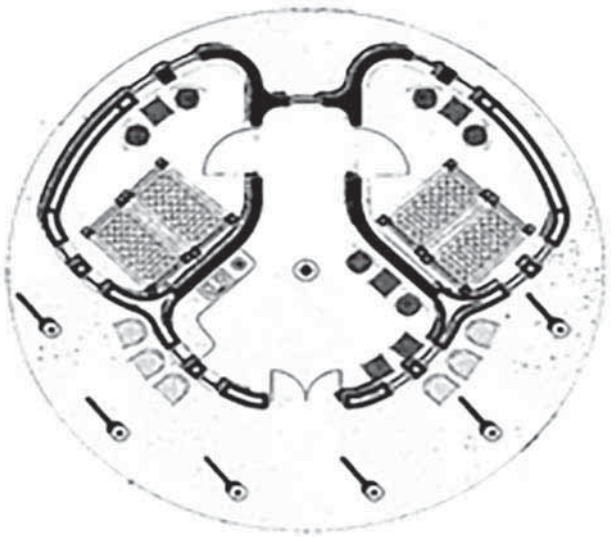


Figure-35: Solid Thick Walls Must be Used for Construction in Hot-Dry Climatic Regions.

Figure-36: Courtyard with Trees to Increase Level of Humidity

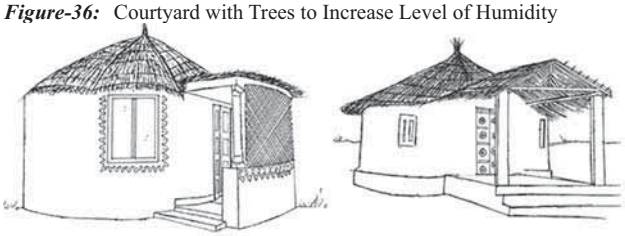


Figure-37: Use Overhangs and Sun-Screens for Providing Shadow in Summer and Sun in Winter.

designed and maintained in an environmentally sensitive way to protect its operating environment, and reflects back in time to the context and culture of the area. Therefore, it is the need of time to introduce sustainable ecotourism and eco-lodges culture across the various areas of the Chotiari Wetland Complex. Local governments, the private sector, developers, and local people can efficiently and actively be engaged and benefit from such an initiative. The Eco-lodges in the area should include the traditional construction methods, architectural style, and identity of the wetland to retain the personality of the wetland area.

REFERENCES

Audley Travel., 2019, *Responsible stays around the world,* viewed 12 September 2019, from https://www.audleytravel.com/us/blog/2019/september/responsible-stays-around-the-world

Authority, Z. W., 2012, Destination wetlands: supporting sustainable tourism. Secretariat of the Ramsar Convention on Wetlands, Gland, Switzerland, & World Tourism Organization (UNWTO), Madrid, Spain.

Bricker, K., 2017. The International Ecotourism Society. *Travel and Tourism Research Association: Advancing Tourism Research Globally,* viewed 25 October 2019, from *https://scholarworks.umass.edu/cgi/viewcontent.cgi?article=2033&context=ttra*

Discover Pakistan, 2019, *Chotiari wetlands complex*, viewed 24 November 2019, from https://www.discover-pakistan.com/chotiari-wetlands-complex.html

Dimanche, F. and Smith, G., 1996, Is ecotourism an appropriate answer to tourism's environmental concerns?. *Journal of Hospitality & Leisure Marketing*, *3*(4), pp.67-76.

En. Wikipedia. org., 2019, *Wetland*, viewed 5 June 2019, from https://en.wikipedia.org/wiki/Wetland

En. Wikipedia. org., 2019, *List of Ramsar wetland sites in Pakistan*, viewed 6 June 2019, from https://en.wikipedia.org/wiki/List_of_Ramsar_wetland_sites_in_Pakistan

Goodwin, E. J., 2017, Convention on Wetlands of International Importance, Especially as Waterfowl Habitat, 1971, (Ramsar). In *Elgar Encyclopedia of Environmental Law*Ê(pp. 101-108). Edward Elgar Publishing Limited.

Goodhew, S. & Griffiths, R., 2005, Sustainable earth walls to meet the building regulations, *Energy and Buildings,* 37 (5)**,** pp.451-459.

GREENSPEC.CO.UK., 2017, *Insulation materials and their thermal properties,* viewed 18 June 2019, from https://www.greenspace.co.uk/building-design/insulation-materials-thermal-properties.

InpaperMagazine, 2011, *Chotiari reservoir affectees*, DAWN.COM, viewed 12 October 2019, from https://www.dawn.com/news/670269.

Kiper, T., 2013, *Role of Ecotourism in Sustainable Development,*Êviewed 4 July 2019, from https://www.intechopen.com/books/advances-in-landscape-architecture/role-of-ecotourism-in-sustainable-development.

Lindberg, K., B. Furze, M. Staff, and R. Black., 1997, *Ecotourism in the Asia-Pacific Region: Issues and Outlook*. Bennington, VT; The Ecotourism Society.

Mader, R., 1998, Going Green: Focus on Ecotourism at Acapulco's Tianguis, *Business Mexico,* pp.34-35.

Mason, M., n.d., What *Is Sustainability and Why Is It Important*, Environmentalscience.org. viewed 24 July 2019, from https://www.environmentalscience.org/sustainability.

Magsi, H. and Torre, A., 2012, The effectiveness of environmental impact assessment on infrastructural development projects: case of Chotiari reservoir in Sindh, Pakistan, *Journal of Environmental Professionals Sri Lanka*, *1*(2), pp.46-57.

Mühlbauer, M., 2015, *Impacts of Tourism on Host Communities*, Grin.com, viewed 18 September 2019, from https://www.grin.com/document/109810.

Oliver P., 1998, Encyclopedia of Vernacular Architecture of the World. Cambridge; Cambridge University Press.

Parra-Saldivar, M.L. and Batty, W., 2006, Thermal behavior of adobe constructions, *Building and environment*, *41*(12), pp.1892-1904.

Qureshi, R., 2008, Preliminary floristic list of chotiari wetland complex, Nawab Shah, Sindh, Pakistan.Ê*Pak. J. Bot*, *40*(6), pp. 2281-2288, from http://pakbs.org/pjbot/PDFs/40(6)2281.pdf.

Qureshi, R. and Raza Bhatti, G., 2007, Nara Desert, Sindh, Pakistan: Part III: Range Types and Their Plant Resources.Ê*Rangelands*, 29(1), pp. 26–29.

Rees, S.W., Zhou, Z. and Thomas, H.R., 2001, The influence of soil moisture content variations on heat losses from earth-contact structures: an initial assessment.Ê*Building and Environment*,Ê*36*(2), pp.157-165.

Reingold, L., 1993, Identifying the Elusive Ecotourist, *Going Green: A Supplement to Tourism & Travel News*, pp.36-37.

Ramsar. org., 2012, *Wetland Tourism: Argentina - Iberá Marshes*, viewed 7 June 2019, from https://www.ramsar.org/sites/default/files/documents/pdf/case_studies_tourism/Argentina/Argentina_Ibera_EN-.pdf

Robin, C.Y. and Poon, C.S., 2009, Cultural shift towards sustainability in the construction industry of Hong Kong, *Journal of environmental management*,Ê*90*(11), pp.3616-3628, viewed 5 August 2019, from http://www.sciencedirect.com/science/article/pii/S0301479709002333.

Rais, M., Khan, M.Z., Abbass, D., Akber, G. and Nawaz, R., 2011, A qualitative study on wildlife of Chotiari Reservoir, Sanghar, Sindh, Pakistan.Ê*Pakistan Journal of Zoology*,Ê*43*(2). viewed 16 June 2019, from http://zsp.com.pk/237-247%20(4)%20PJZ-243-10.pdf

Sarah., 2015,Ê*8 reasons to visit Jordan,* EcoHotels, viewed 3 September 2019, from https://ecohotels.me/news-and-promotions/8-reasons-visit-jordan-2015.

Sindh Irrigation and Drainage Authority., 2012, *Preparation of Regional Plan for Left Bank of Indus-Proposed Project on Rehabilitation of Deh Akro – II and Chotiari Wetland Complex.* Pakistan; The Louis Berger Group Inc, viewed 15 July 2019, http://sida.org.pk/download/ibg/phaseIII.Feasibility.Dek%20Akro%2011.Chotiari.Wetland.GRK.FINAL.20.2012.PDF.

Sameer, 2014, *Chotiari Dam - an Ecosystem To Be Savored*, Pakistan Insider, viewed 07 July 2019, from https://insider.pk/travel/tourism/chotiari-dam-ecosystem-savored/

Siyal, A.A., Bhatti, A.M., Babar, M.M., Ansari, K., Saher, R. and Ahmed, S., 2019, Environmental Impact of Conversion of Natural Wetland into Reservoir: A Case Study of Chotiari Reservoir in Pakistan. In *World Environmental and Water Resources Congress 2019: Watershed Management, Irrigation and Drainage, and Water Resources Planning and Management* (pp. 15-27). Reston, VA: American Society of Civil Engineers.

Tripadvisor., 2021,Ê*Ichkeul National Park (Bizerte) - 2021 All You Need to Know BEFORE You Go (with Photos) – Tripadvisor*, viewed 10 August 2019, from https://www.tripadvisor.com/Attraction_Review-g480249-d324439-Reviews-Ichkeul_National_Park-Bizerte_Bizerte_Governorate.html

The Ecotourism Society., 1998, Ecotourism Statistical Fact Sheet, viewed 25 July 2019, from www.ecotourism.org.

World Wildlife Fund., n.d., *Wetlands | Habitats | WWF*, viewed 16 June 2019, from https://www.worldwildlife.org/habitats/wetlands.

WWF. Panda. org., 2018,Ê*What is the difference between ecotourism and sustainable tourism,* viewed 20 September 2019, from http://wwf.panda.org/our_work/oceans/solutions/reducing_tourism_impact/difference_between_ecotourism_sustainable_tourism.cfm.

Wood, M., 2002, *Ecotourism: Principles, practices and policies for sustainability*, UNEP. Viewed 18 September 2019, from http://wedocs.unep.org/bitstream/handle/20.500.11822/9045/-Ecotourism_%20%20Principles,%20Practices%20and%20Policies%20for%20Sustainability-2002518.pdf?sequence=2

PAKISTAN HEALTHCARE INFRASTRUCTURE AND COVID-19: A CASE FOR ISOLATION AND QUARANTINE FACILITIES OPTIMIZATION IN THE CONTEXT OF PAKISTAN

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*Asad Ghufran***

ABSTRACT

COVID-19 is one of the largest pandemic that hit the world at the end of 2019 and took the globe by a storm. With almost seven hundred fifty thousand affected and above thirty five thousand deaths at the time of writing this paper, it was declared by World Health Origination (WHO) a major global health crisis. Pakistan, a developing South Asian country having sixth largest population in the world having fragile and poor healthcare infrastructure also got hit badly with above one thousand six hundred affected and more than twenty deaths till the time of writing. With such a large health burden at stake and closing of all major socio-economic activities, with having very limited quarantine and isolation facilities, there was a dire need to explore the gap of existing healthcare infrastructure to cope with current circumstances.

In order to explore the current context with reference to the COVID-19 health burden, existing infrastructure and facilities were explored through literature review and documented against the criteria and outlined by WHO, with respect to quarantine and isolation facilities. Development of a basic concept about nature of COVID-19 was explored with respect to Pakistan and its spread in the country. Existing actions taken by the governing concerned bodies and future planning were also explored. It was concluded through comparative analysis and exploration of the current line of actions by the governing bodies, that existing infrastructure fails to fulfill the need of the current pandemic situation and transformation of existing healthcare facilities and other allied buildings, like hostels and educational institutions, would not help in development of quarantine and isolation facilities. Infact they will create higher level risks for contamination and management of the disaster at hand, since these do not fulfill the set criterion for isolation and quarantine facilities with functional and spatial aspects. A two stream approach is proposed to handle the current situation with focus on using existing facilities at one hand with limited usage for quarantine and isolation, while developing new functional facilities using fast construction systems of pre-fabricated construction this will enable quick delivery of such infrastructure to manage the COVID-19 in Pakistan with context and climatic sensitive designs. Proposed design interventions associated with quarantine and isolation units were further explored and using standardized cargo containers design solutions were proposed.

Keywords: COVID-19, Pakistan, Isolation Wards, Quarantine, Healthcare Design, Infection Control and Prevention.

INTRODUCTION

Large scale epidemics and spread of diseases across nations and countries have always caused threat to humanity. Since the history of mankind, such epidemics have caused great danger and loss to the society through destroying human capital and large scale devastation of socio-economic infrastructure (Bedford et al., 2019). Twenty first century is no exception, with SARS (Severe Acute Respiratory Syndrome) in 2002, Swine Flu (Pandemic H1N1/09) in 2009, Ebola in 2013 and COVID-19 (Novel Corona virus Pandemic) in 2019 (CDC, 2020a). It is evident that these events are large enough to jolt down the existing healthcare and socio-economic basis of the society to converge all efforts towards their eradication when saving human lives becomes the most significant objective of the time (Columbus, Brust and Arroliga, 2020). COVID-19 was first

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discovered in December 2019 Wuhan, China and later spread to more than one hundred sixty countries of the world resulting in the death toll to rise to above eleven thousand by mid March 2020 (Khan, el. al., 2020). Thus facilities to be able to adapt to these demanding times where facilitation, treatment, isolation, quarantine and control of the disease became a challenge even for the most advanced and developed countries (Brüssow, 2020). In developing countries like Pakistan, quarantine facilities were not available and no prior planning was made to control and restrict movement, the spread was mainly spontaneous. It lead to serious consequences with multiple provinces getting effected. Educational institutions were forced to shut down, academic activities were hindered, social and religious gatherings were prohibited and shopping centers were directed to close inthe early months, to avoid further spread of disease (Ahmad, el. al., 2020).

Pakistan has a fragile healthcare infrastructure with almost six beds per ten thousand population (WHO,2020). Facing COVID-19 was indeed one of the greatest challenge for the whole nation, as well as governing agencies and governments. The disease spread could be prevented through control measures on large scale, yet the spread due to lack of awareness, poor and inadequate diagnostic facilities, fragile socio-economic conditions of the majority of population, lack of healthcare facilities and infrastructure evident to happen (NIH, 2020b). Hence there was a strong need to evaluate how the existing facilities could be optimized for these current needs to address this life threatening situation all across the country.

LITERATURE REVIEW

Existing Pakistan Healthcare system and current scenarios

According to World Health Organization (2020), Pakistan consists of a diverse healthcare infrastructure comprising of two major components i.e. governmental and private hospitals. Though healthcare is the primary responsibility of the Federal and Provincial governments, yet the private share of facilities is no less. Service delivery is mainly organized and modulated through preventive, promotive, curative and rehabilitative efforts, with preventive and promotive efforts mainly through multiple organizations, including government run via different programs and projects (Bearman et al., 2020). These infrastructural facilities include basic health units, rural health units, district health units, secondary and tertiary level hospitals, and teaching hospitals, (Stahl and Falaschetti, 2012).

Details of public facilities, healthcare workforce (as of 2017) and population based statistics are outlined in Table 1.

However, it is evident from recent literature exploration that healthcare system and infrastructure fails to meet the needs of Pakistan. Some of the major key findings pointout that the government of Pakistan spends only 0.4-0.6 % of its budget on health, 78% and above people spend on medical treatment out of their own pockets. Health workforce is way below set standards by WHO and absence of programs for non-communicable diseases at provincial and federal levels makes the situation worse. Regulatory arrangements for medical treatment and medication itself are unsatisfactory. There is lack of medical, diagnostics and health promotion educational programs. Maternal and infant mortality rates are very high i.e.260/100,000 deaths and 61.27 per 1,000 live births, respectively, 19% of general population and 30% of children under the age of five years are suffering from mal-nutrition. Hence it can be easily stated that Pakistan is under extreme pressure to cope up with health and medical needs and facing another global health challenge in the form of COVID-19 is a nightmare for the public in general and governing bodies and concerned departments in specific.

Table-1: Public Facilities, Healthcare Workforce (as of 201) and Population Based Statistics.

S. No.	Facility	Count	Type	Count
1	Hospitals	1201	Registered Doctors	195896
2	Basic Health Units	5518	Registered Dentists	18333
3	Rural Health Centers	683	Registered Nurses	99228
4	Dispensaries	5802	Population per Doctor	1300
5	Maternity and Child Health Centers	731	Papulation per Dentist	10658
6	TB Centers	347	Papulation per Bed	1584
7	Beds in all Above Mentioned Facilities	123394		
8	Lady Health Workers	95000		

Source: Khan, 2019 and Stahl and Falaschetti, 2012.

COVID-19 AND PAKISTAN

At the outset of the government of Pakistan took initiatives in the form of allocating designated hospitals for infection patients, developing quarantine and isolation facilities through designated healthcare and setting up of temporary facilities (NIH, 2020a), infection control protocols establishments, closing of malls, educational institutions and large scale banning and restrictions of public gatherings, restricting cross-provincial movements, testing and screening of anticipated patients and travelers and developing emergency helpline numbers and center (NIH, 2020b).

Concept of Quarantine and Isolation for COVID-19

Quarantine is an old concept of keeping people away from other people who have either been in certain contact or have potentially been in contact with people suffering from transmittable pathologies (Khan et al., 2020). This criteria is followed uptil it is certain that the kept away person is not suffering from any such illness which can be part of any epidemic. The concept roots back in culture and history throughout the world where epidemics have evolved. Previously it was mainly referred to as specific time of isolation when people were kept away to ensure they are not effected from any communicable disease to restrict their movements. It is applicable to animals, humans and even things (Conti, 2016).

Isolation is mainly used for people who have been certified/identified that have been exposed to the epidemic or disease and have the potential to carry it on or pass on to other individuals. Isolation restricts the movement of sick persons to help stop the spread of certain diseases. It has previously been used in history, recently in cases of MERS and SARS spread and have provided evidence to support the containment of epidemics and communicable diseases (CDC, 2020b).

To judge the severity and the scale of impact in pandemics/epidemics, two major variables that contribute include severity and transmissibility. Centre for Diseare Control (CDC) and Prevention, USA and WHO have worked multiple plans and guidelines for the isolation of patients and quarantine to ensure detainment of the epidemic.

Proposed Quarantine measures for COVID-19 as per developed by CDC and WHO were mainly as follows (United Nations, 2020):

Countries should communicate and socialize these measures to avoid panic and ensure compliance. Countinies should provide clear, precise and updated guidelines, engage with communities and establish reliable communication channels. Countinies should provide patients with support in the form of medical, psychological, social and mental help along with food, shelter, water and treatment. Aspects of cultural, geographic and socio-economic factors should be evaluated all the time. Setting for quarantine should be appropriate for the number of people to be quarantined with minimum infection prevention and control measures and minimum requirements should be monitored for health of quarantined persons for the designated period.

For people within quarantine, spacious single room with ensuite toilets and least spacing of one meter gap between beds, adequate air ventilation, filtration systems, waste-management protocols, increased social distancing, provision for medication, food, water and hygiene are to be given. Protection for personal belongings, communication in language of patient preference, consultation, psycho-social support, communication setup with family for support and contact information incase they get contaminated/infected are also to e provided. Special consideration for elderly, women and children has to be made. Some of the anticipated settings could include hotels, dormitories and allied facilities. Any one developing symptoms of the disease may immediately be treated for COVID-19 prior to shifting to isolation wards or allied treatment facilities.

Necessary establishment of Infection Protection and Control (IPC) facilities (design based) and developing policies, procedures and protocols as per the contextual needs of the quarantine and local climatic conditions are also neccesary. Environmental controls play a vital role in managing quarantine. Using disinfectant clean touchable surfaces regularly including beds, tables, furniture, clothing washed at 60-90 degree Celsius is a pre requisite. Waste should be disposed off in sanitary landfill and optimum disposable items should be used. Continuous medical observation to be adopted and keen observational systems should be incorporated.

With respect to creation of isolation ward/space for the COVID-19 patients, the guidelines developed by the CDC (2020) mainly include the following aspects (CDC, 2020a): All preparation should be completed prior to patients arrival with staff and facility prepared for it. There should be limited entry points along with adherance to respiratory and allied hygiene practices for infection control. Installation of physical barriers with establishments of triage stations and isolation facilities is a pre-requisite. Separate isolation based waiting

and examination room are to be provided. The spaces for Healthcare service providers (HCP) should be separated with inlets to isolation where deemed necessary. COVID-19 patient or suspected patient to be given separate room or to be share between two patients only with attached bathroom. Air infection isolation rooms (AIIR) should be designated for patients under aerosol-generation procedures with negative pressure to relative surroundings and there should be six air changes minimum per hour. Unidirectional air flow with hepafilters are recommended. Limited transport and movement of patients is to be ensured. Medical equipment for the patients should be dedicated and not shared with other units within healthcare facility. Management of laundry, food service utensils and medical waste should also be performed in accordance with routine procedures.

Though these are some of the best practices set forth yet for a country with huge population and fragile healthcare infrastructure, following these would be nightmare since no major isolation and quarantine facilities have been established in recent times (CDC, 2020a). It is evident that due to a weak approach towards the COVID-19, the existing scenario will worsen and the overall number of fatalities and infected patients will multifold. Hence to opt for quarantine and isolation facilities, contextual base analysis is a must, to cover the spread of COVID-19 and ensure maximum safety of the public in general and engaged people in managing these facilities and patients in specific.

Developing Facilities for Quarantine and Isolation of COVID-19 Patients in Pakistan

In the midst of the existing scenarios of COVID-19 in Pakistan, the governing regimes and bodies have taken the step to develop isolation wards and quarantine facilities all across the country. Some of the hospitals have already been designated for the purpose. The patients have to follow strict measures for identification, diagnosis, treatment, release and in worse cases fatality. Measures are to be followed to take dead bodies to a graveyard without any religious or social rituals. Since existing hospitals and facilities are not developed on the same principles as that of the isolation or quarantine facilities. Designating allied spaces like large scale halls for the stated purpose would require more preparation, staff and facilities to transform these into specialized units for isolation and quarantine. Hence, there are two major options that could be proposed, based on the existing explored literature and case studies from multiple hospitals of China and other countries fighting back (Figure 1).

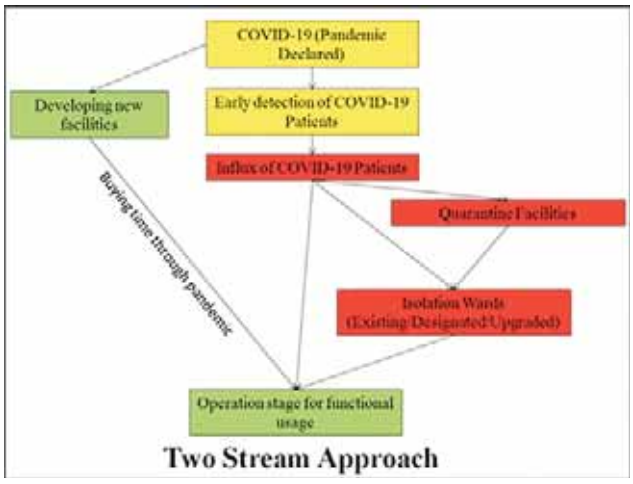


Figure-1: Two Stream Approach for Handing the Challenge of COVID-19.

One option for setting up qurantine centers could be hotels, with each room connected with a bathroom designated for the same room with one patient in each room. Since these facilities are limited and rooms are usually considered as luxurious item for the travelers, these spaces would not be able to be used in an optimum fashion. Schools and other dormitories could be an alternate, but it has to be ensured that since patients would not be able to have toilets/washrooms each attached with a room, it would be very hard to disinfect and control infection in the common corridors. It will be more critical for the healthcare staff and services providers, to monitor the situation since they will be facing extreme risk of contamination.

Apart from hotels and schools, one option could be using the hospital units that are separated from the main hospital. These may include facilities for staff and other academic units. Since these will be within the premises of the healthcare setting, managing them would be easy as compared to the other options for which more staff would have to be acquired and transported in multiple shifts. As per the Advisory from NIH (NIH, 2020b), no major guidelines have been set for the quarantine areas.

Learning from experiences of Wuhan, China and previous fights with epidemics of MERS and SARS, it can be stated that developing designated facilities with proper design and plan can help fight the outbreack better. The Chinese opted for development of pre-fabricated structures for two hospitals in Wuhan to ensure that the burden of disease is not shared with other hospitals. Using the existing forms of prefabricated construction, like shipping containers or allied structures can be a good option for developing these facilities.

Figure-2: Prefabricated / Portacabin Units During Construction. (Source: Wuhan, 2020)

Figure-4: Separate Corridors for staff and patients in Wuhan Hospital. Source: Wuhan, 2020

There is a need to opt for two streams based approach (Figure 1) in which new facilities are targeted with focus on isolation and healthcare for COVID-19 patients. This should be initiated at multiple healthcare institutions, including major hospitals, with the help of prefabricated structures and other modes of fast construction mechanisms, while on the other hand the existing designated spaces / infrastructure can be used for isolation and social distancing. With the passage of time, new structures could be ready to take more patients, while existing facilities can be giving support to patients all along.

Following are some of the major proposed aspects to be covered and taken into consideration while opting for new facilities or upgradation/optimization/modification of existing facilities to be used as isolation wards:

1. Incorporate as many aspects of design as discussed above, as per the guidelines provided by CDC for quarantine and isolation facilities.
2. All new facilities to focus on prefab-construction systems and opt for quick fabrication of systems on site (Figure 2).

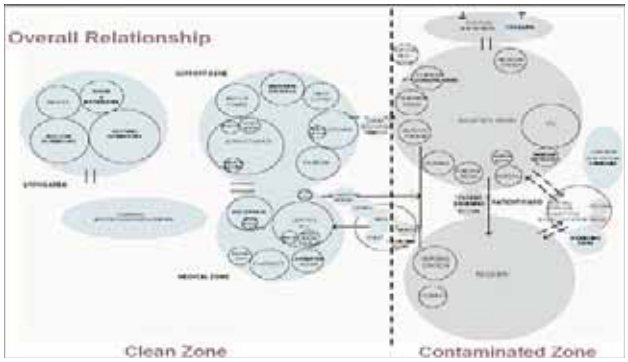


Figure-3: Bubble Diagram Followed for SARS Hospital Planing. Source: Tsou, et. al., 2004

3. Selected sites should be within the premises of an already existing healthcare facility / hospital so people can easily access and have awareness of the geographical location. It should have a new/separate gate and the premises should have clear signage for people with COVID-19 only (Figure 3).
4. The facility should have a separate entrance for medical staff and administration, along with medical supplies and support/allied engineering systems.
5. Designated Triage should be established to baseline the criticality of the patient. It would act as a welcome mat and first line of defense/interaction. Once the basis of the tagging is done in the triage, patient needs to be taken to the anticipated isolation facility or elsewhere. Associated facilities with the triage should be incorporated to ensure that facilitation may be completed and can lead to allied departments when required.
6. As per WHO and CDC guidelines, PPE and IPC should be maintained in all the spaces within the facility. Staff must adhere to devised rules and policies.
7. Separate corridors for the staff should be developed so they do not enter the patient designated spaces/rooms unless it deemed necessary (Figure 4).
8. Patients to be placed in negative pressure single rooms with attached toilets. Separate heating, ventilation air conditioning (HVAC) and plumbing systems should be designed to ensure waste and air flow does not come back into the internal spaces. Dedicated wards could also be used to ensure that is there some physical partition between beds with gap of atleast two meters or seven feet (Figure 5).
9. Double side opening based cabinets should be used so that caregivers do not enter the patient rooms (Figure 6).
10. It should be ensure that either single-use and disposable or dedicated equipment (e.g., stethoscopes, blood pressure cuffs, and thermometers) is present in each room.
11. Admitted patients who donot require suctioning, should be placed under droplet and contact precautions.

12. Admitted patients who require suctioning, should be placed under airborne isolation areas with contact precautions.
13. If negative pressure isolation is not available then placed in a room with ample ventilation. A fan facing away from the door, towards the outside of the building is encouraged, if possible.
14. Patients can be moved out of isolation only when symptoms improve and two consecutive swabs (sent one day apart) are negative.
15. Laundry, food service utensils and medical waste should be managed in accordance with safety routine procedures.
16. With respect to the local context, issues of cultural and religious aspects need special attention. There should be provision for communication with families using modern technologies. Provision for prayer space and medical/personal counseling with focus on attendants and families of the patients should be provided.
17. Safety and security of the premises should be entsured and only concerned personnel may enter the premises.
18. Transportation protocol within the facility should be ensured to help the HCW perform all operations and avoid risk of contamination.
19. In case of a fatality, defined route of transfer of deceased/deadbody from facility should be nsured along with defined specific protocols for burial.
20. Most significantly, it should be ensured that infection control and prevention is managed throughout the quarantine or isolation centers.

DESIGN CONSIDERATIONS

Healthcare facilities for quarantine and isolation are highly technical in their aspects of usage and maintenance. It is based on strict levels of movement and spatial configurations, that require extensive design interventions. In Pakistan, there are diverse climatic zones and hence one devised solution might not be able to cope with different climates. Hence there is a need to explore the devised design in multiple climatic locations.

Managing the negative air pressure is important to ensure that there is outward outflow of air and it does not come back inside. This helps in infection control. Two air changes per hour are mostly desired but ensuring that there is no leakage of air movement is a key factor. There has to be a test of the facility through simulation at the design stage to ensure it functions properly as desired. Computational Fluid Dynamics (CFD) could be of great help. Prior to commissioning of the physical facility, testing of air tightness would be necessary to ensure its functional optimization for extensive usage.

Figure-5: Designated Services Ducts for HVAC & Plumbing.
Source: Wuhan, 2020

Figure-6: Double Sided opening Cabinets.
Source: Wuhan, 2020

Uni-directional air flow and intact movement can be a tedious job with regular mode of construction but with pre-fabricated strutures, its more easy to insulate or make them air tight. This important function, which lies at the heart of the design, requires forced ventilation systems. Since consistent and reliable energy supply, in the form of electricity, would act as the backbone of the functional stability, optimizing for renewable energy usage through solar energy, using un-interrupted power (UPS) supply system or even a backup generator could facilitate the need.

PROPOSED DESIGN INTERVENTIONS

Proposed design interventions using standardized shipping containers are shared below. This design incorporates the solutions for quarantine facilities and isolation wards/units with respect to the availability of spaces and land within preferred and designated hospitals for treating COVID-19 patients. There is need to incorporate the local climatic

conditions methodologies and techniques that could be adopted to built them in as much time efficient manner as possible. This devised design should focus on ensuring the infection control processes and their implementation. Usage of Computational Fluid Dynamics (CFD) could be a very helpful tool for exploration of efficiency in these proposed design interventions.

CONCLUSIONS:

Fighting a pandemic is a great challenge for any advanced and developed nation across the globe. Such challenge for a developing country increases the magnitude multifolds. Hence addressing COVID-19 requires extreme measures. These will include quarantining the public where there is risk of the disease, with options of self and community isolation. Devising new strategies as per the need of the hour, engaging multiplayer approach where strategic and allied governmental bodies contribute to the cause, developing and enhancing the healthcare infrastructure along with improving the human capital, building confidence in the nation are all required. There has to be a well coordinated and planned line of action to be implemented and should be followed on to ensure healthcare infrastructure that may be able to cope with the challenge and allied departments/domains.

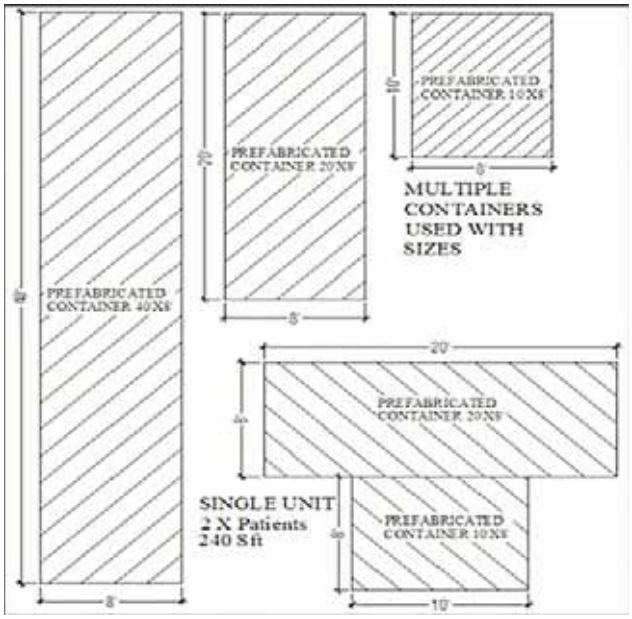


Figure-10: Multiple Shipping Containers used and Single Unit for Quarantine.

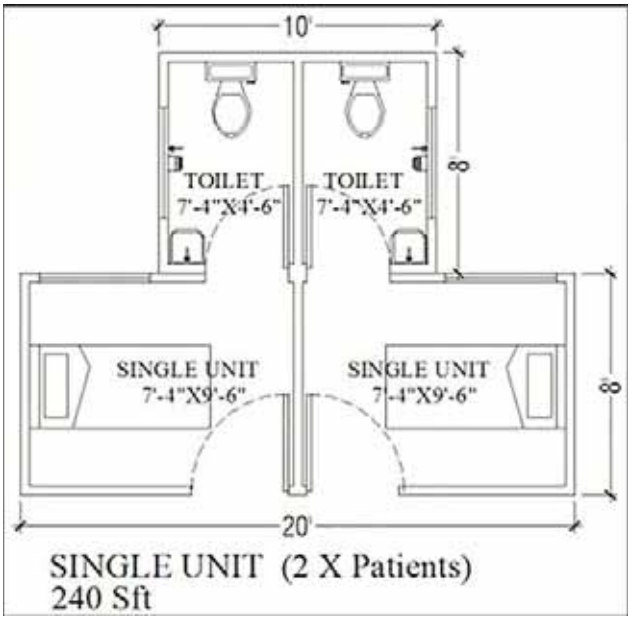


Figure-11: Architectural Plan for Single Unit Quarantine of Two Patients.

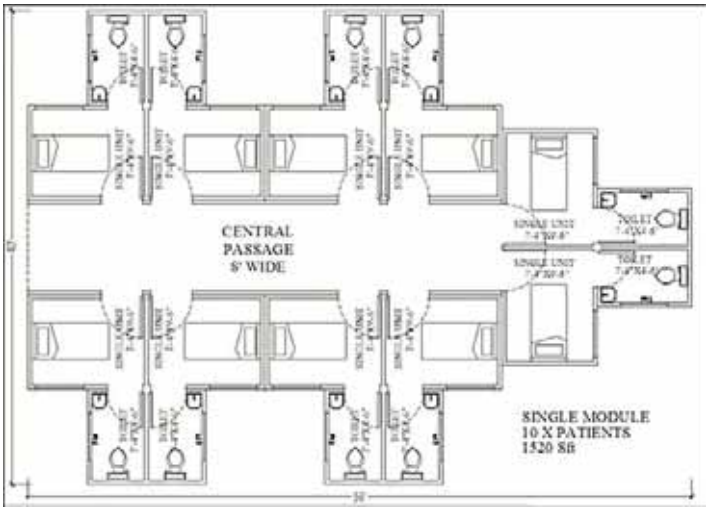


Figure-12: Architectural Plan for Single Module Quarantine of Ten Patients.

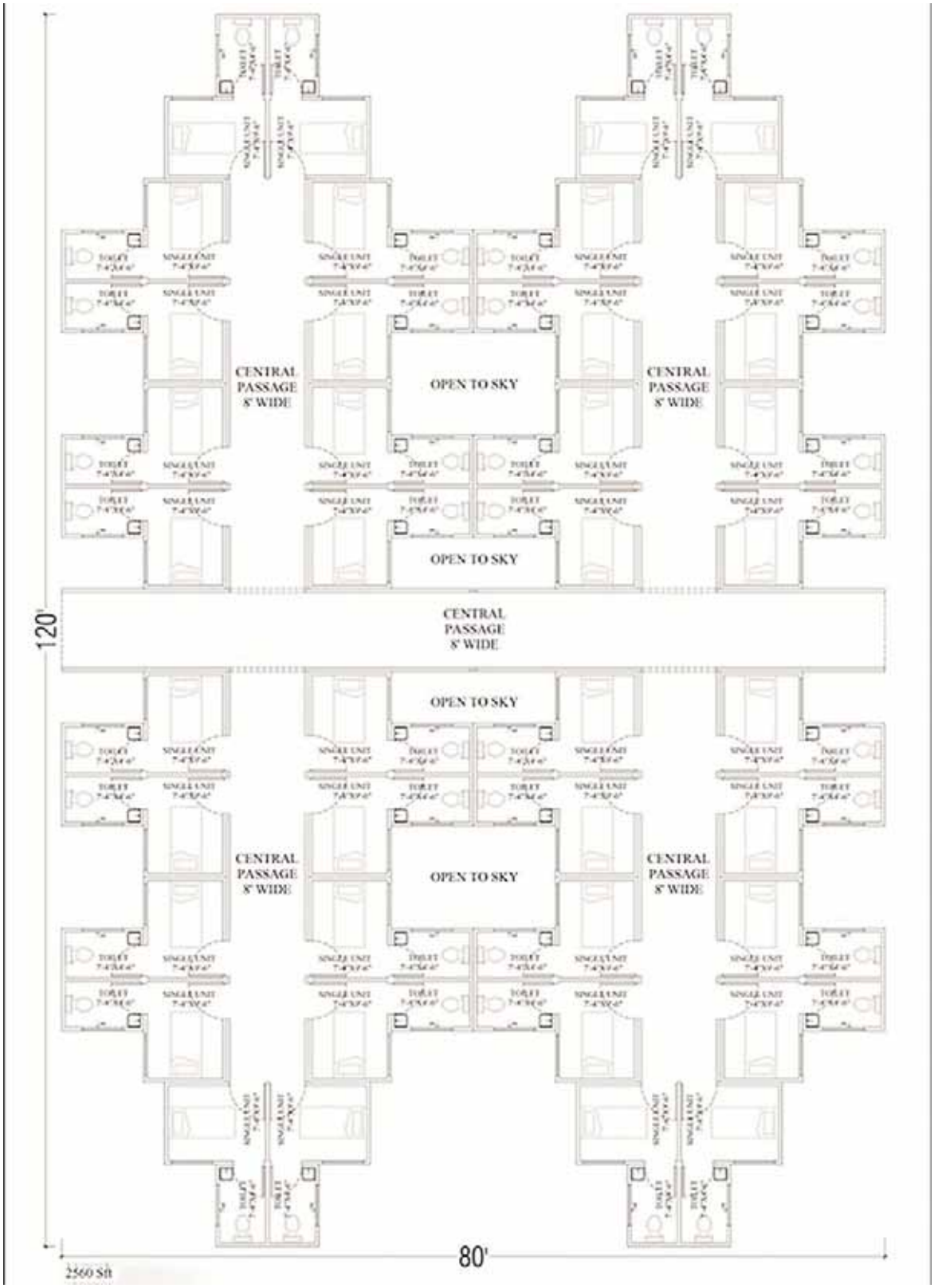


Figure-13: Architectural Plan for Four Module Quarantine of Forty Patients.

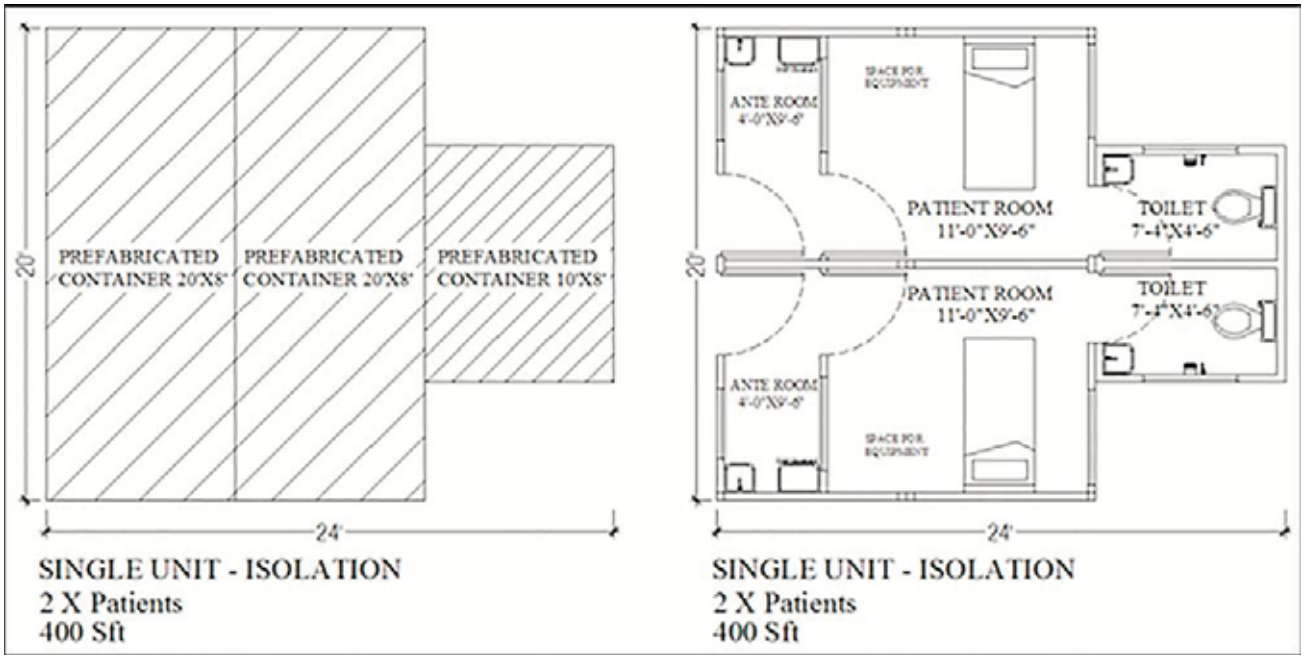


Figure-14: Multiple Shipping Containers used and Architectural Plan for Single Unit Isolation Room for Two Patients.

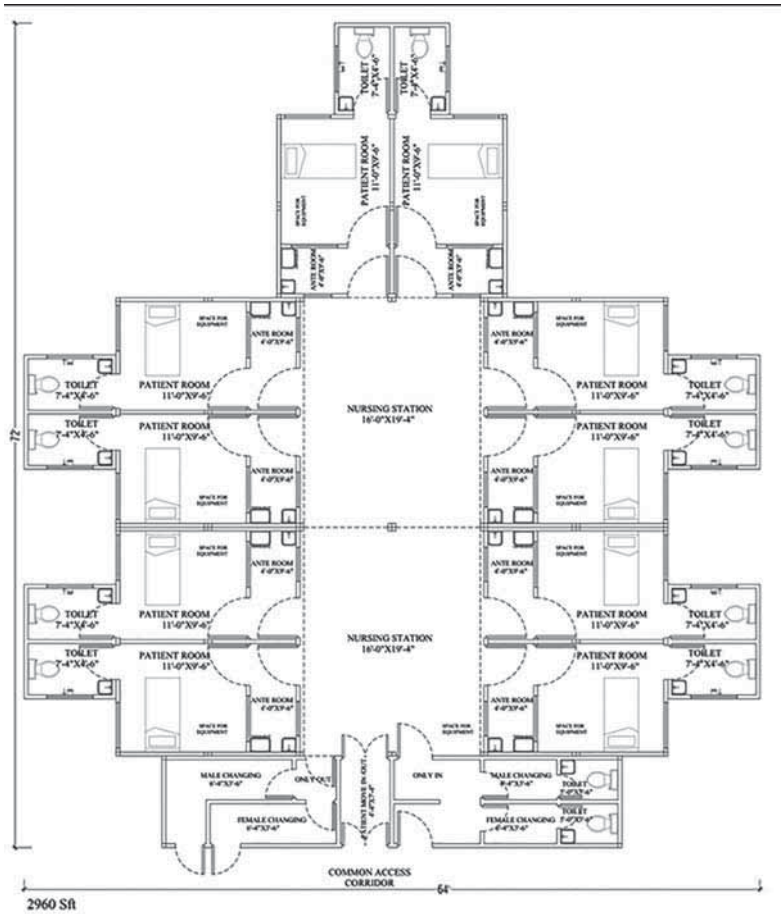


Figure-15: Architectural Plan for Single Module with Five Isolation Units of Ten Patients.

REFERENCES

Ahmad, T., Khan, M., Khan, F. M., and Hui, J., 2020, "Are We Ready for the New Fatal Coronavirus: scenario of Pakistan?" *Human Vaccines and Immunotherapeutics*,1–3.

Bearman, G., Pryor, R., Albert, H., Brath, L., Britton, A., Cooper, K., … Stevens, M. P., 2020, "Novel Coronavirus and Hospital Infection Prevention: Preparing for the Impromptu Speech", *Infection Control and Hospital Epidemiology*, 1–7.

Bedford, J., Farrar, J., Ihekweazu, C., Kang, G., Koopmans, M., & Nkengasong, J., 2019, "A New Twenty-First Century Science for Effective Epidemic Response. Nature", 575(7781), 130–136.

Brüssow, H., 2020, "The Novel Coronavirus – A Snapshot of Current Knowledge. Microbial Biotechnology", 0, 1751-7915.13557.

CDC, 2020a, "Interim Infection Prevention and Control Recommendations for Patients with Confirmed Coronavirus Disease 2019 (COVID-19) or Persons Under Investigation for COVID-19 in Healthcare Settings", Viewed from https://www.cdc.gov/coronavirus/2019-ncov/infection-control/control-recommendations.html?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Fcoronavirus%2F2019-ncov%2Fhcp%2Finfection-control.html

CDC, 2020b, "Isolation and Quarantine Concepts", Viewed 23 Jan. 2020, from

Columbus, C., Brust, K. B., and Arroliga, A. C., 2020, "Novel Coronavirus: an Emerging Global Threat. Baylor University Medical Center Proceedings", 0(0), 1–4.

Conti, A. A., 2016, *Quarantine through History. International Encyclopedia of Public Health*

Ibrahim, I. M., Abdelmalek, D. H., Elshahat, M. E., & Elfiky, A. A., 2020, "COVID-19 Spike-Host Cell Receptor GRP78 Binding Site Prediction", *Journal of Infection*.

Khan, S. A., 2019, "Situation Analysis of Health Care System of Pakistan: Post 18 Amendments. Health Care?", *Current Reviews*, 07(03), 1–9.

Khan, S., Siddique, R., Ali, A., Xue, M., and Nabi, G., 2020, "Novel Coronavirus, Poor Quarantine, and the Risk of Pandemic", *Journal of Hospital Infection*.

United Nations, 2020, "Considerations for Quarantine of Individuals in the Context of Containment for Coronavirus Disease", Viewed 12 Dec. 2019.

NIH, 2020a, "Designated Hospitals / Isolation Ward for COVID-19", Viewed 16 Feb. 2020 from .

NIH, P., 2020b, "Advisory on Mitigation Strategies Covid-19", Viewed 22 Jan. 2020 from

Stahl, M., and Falaschetti, D., 2012, "Public Sector. Encyclopedia of Health Care Management",

WHO, 2020, "Novel Coronavirus Global Research and Innovation forum: Towards a Research Roadmap. Viewed 20 Jan. 2020 from https://www.who.int/docs/default-source/coronaviruse/global-research-forum-draft-agenda-feb-6.pdf

Wuhan, 2020,

Tsou, et. al., 2004,

A PATTERN LANGUAGE: TOWNS, BUILDING, CONSTRUCTION

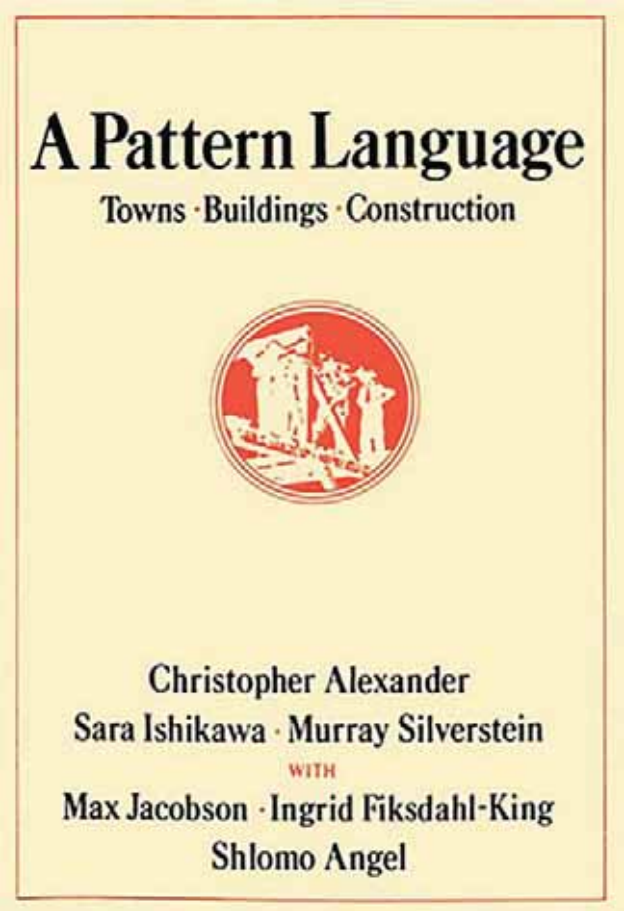
Christopher Alexander, Sara Ishikawa, Murray Silverstein, Max Jacobson, Lingrid Fiksdahl King and Shlomo Angel

Reviewed by Humaira Nazeer*

Late 1900s experienced the lack of fusion of personal and professional environments, with the alienating impact of poor design and architecture. It was, therefore, important to create a link between life at work and at the house, for the health of the residents and to promote happiness. To this end, the participation of the local residents in the task of improving and designing their own cities and houses were encouraged by presenting a treatise "A Pattern Language: Towns, Buildings, Construction".

A Pattern Language (1977), an instructive and a timeless classic volume on architecture, urban planning and living in a society, authored by architect, design theorist, designer, mathematician, and a former pupil of Harvard Graduate School of Design Christopher Alexander (Ph.D. '63). Alexander is also known as an Archimedes of urban planning, together with five of his colleagues at the University of California's Center for Environmental Structure, Berkeley. The book uses architecture, sociology, psychology, and anthropology to define the architectural settings that are most satisfying. In a nutshell, the philosophy of the book is that people always depend on several languages in developing their environments which, like the languages, they converse in, enable them to express and articulate an endless variety of projects, within a formal process that gives them cohesion. This purely utilitarian philosophy is explained in the context, that utility and functionality combine the requirement for aesthetics, sunshine and relation to the outdoors and religious conviction. All of these are also essential necessities for survival, apart from other basic types of utilities like shelter, place to keep your jackets and shoes when you enter a house, etc. This philosophy raises the question of what the requirements of a society are and, on that basis, provides a language for patterning cities and buildings.

The uncommon, yellowish covered textbook is divided into three parts: cities, buildings and construction. It sets out over eleven hundred useful pages, with the two hundred and fifty three patterns, that act as archetypal elements of design.



These are profoundly rooted in the nature of objects, that together form a "language" to talk of an unlimited diversity of designs, beginning with the layout of cities and continuing down to how to place lamps and shelves in the house. Big patterns for village towns, cities, community borders and roads surrounding the towns, are discussed in details and with small patterns for neighborhood cafés, pedestrianized streets and paths, medieval town's street patterns, foyers, fruit trees, manure, niches, fireplaces, private play spaces of children, dancing in the street and architecture of semi-independent neighborhoods within bigger cities.

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Patterns are fundamental to know whether our towns and living spaces are ailing. The pattern comprises of statements of those environmental issues that usually happen with the discussion of the problem, with an example and a solution. Design issues, such as how high the sill of a window should be? how many floors will there be to a building? how much land will grass and trees be given in a neighborhood? and how to create a better townscape with various identifiable parts of the village are tochled in the book. Suggestions about fencing, a lilac, a footpath, a wall, a front gate, and a roof amongst others, are given in the text. The premise here is that, each part has to connect with the other parts in order to build a place that can only be that place in the globe. Other the issues tached are about situating the rooms in a house for natural ventilation, light and dark, that of flow of activity and of the absence of copulation between couples when kids are there. The solution is suggested to provide realms of private "couple," a world where the man and woman's relationship, their innermost desires, can be expressed and lived through.

In short, the writers provide a timeless way to explain the "how and why" of constructing structures and community by moving from the macro to the micro features of design..

It is a special, enjoyable treatise in which the writers focus on how design should try to make people feel more relaxed, successful and happy in their life. Overall, it is an idealistic book that imagines a world where people strive to give everyone what they require. It is all about how we reside independently and together as citizens; and how the structures that we create around these lives either enhance or distract from that experiences. The authors, are quite outspoken and do not shy away from informing people confidently what the problematic is with the physical structures of the metropolitan, suburban, and rural parts of the country The authors are enthusiastic and haav logic about what they choose to believe. They have tried to build a sustainable urban and residential development process and have offered a variety of thought-provoking methods of implementing thier dreams.

One of the strengths of this book is that it sticks out from many other books, as it does not say all rules are set in one size and scale. Rather, based on the particular conditions, a design can blend patterns in various ways. This is an expression of outstanding technical prose. It offers universal, interlinked concepts that can be viewed in any order and that guide the reader directly to other patterns that might attract them. Almost every 's second page of the book includes an instruction to establish rules that follow the patterns described in that chapter and address the need to do so. Each pattern has multiple stars associated with it. Four stars mean the writer is pretty confident that there are no other patterns of similar value for this particular subject. One star indicates it is a good pattern, but there may be certain patterns that can also work well for a particular purpose. The writhers have a proposal for almost everything, where example where there are houses, where one work should , what one should do, where one needs to go for shopping and where one should relax. All the patterns are carefully laid out. A few of the patterns have also been criticized, specifically, those that connect with the architecture of cities and villages, however generally, the patterns offer a valuable guideline to what creates a comfortable place.

In general, the language of the text is very easy to read and apart from being a lengthy book, the whole text is divided into three to ten subjects which are very easy to pick and study. The text is a reflection of its time. The universal characteristics of the human mind and body are expressed in many concepts and it appears to be a companion to "The Timeless Way of Building." This book touches upon all the areas of American life, besides than specific civic codes.

One of the weaknesses of this tome is that there is no proper contents' page which the reader can refer to, two hundred and fifty three patterns in the content's table are displayed only as three. In addition, a few mistakes in the format of text are noticed, a few titles are not in capital letters, and some text that ought to be bold is not. Certain concepts are outdated, contradictory, or ambitious and misguiding. Often the text seems highly focused on homes of North America, even though it is a visionary creation.

It is recommended that anyone engaged in the human-built-environment study must read this book. I also suggest that policy-makers and planners should refer frequently to this book. I strongly recommend it to students too.

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BOOK REVIEW: Contributions for our 'Book Review' section are welcome in the form of a brief summary and a sample of the publication related to the field of archiecture, planning and developmen.

For Further Information, please write to JRAP Coordinator 2017-2018
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